Exploring Food Waste Reduction in Campus Dining Halls

By Kylie Merrow, Philip Penzien & Trevor Dubats

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Executive Summary

This project attempts to tackle the cumbersome issues inherent with food waste management in our campus dining halls. Food waste is an enormous contributor to the municipal waste stream, and its generation has significant immediate and long-term economic as well as environmental consequences that many Americans are oblivious to. Food waste is of particular interest to university administrators because nationally the cost of waste disposal has skyrocketed in recent years, and will likely only continue to increase. Additionally, there is a trend amongst universities towards reducing dining hall waste. If Western Michigan University wants to maintain its role as a leader in sustainability practices it will be necessary for our institution to consider our waste reducing options.

This paper will cover four main components:

First, we will provide detailed description of the methodology and data results of a waste audit we conducted in Western Michigan University's Bistro 3 dining hall on March 20, 2012. The purpose of this audit was two-fold:

(1) First, we wanted test the hypothesis that Bistro 3's cook-to-order/make-to-order food service style would produce less poundage waste per meal than WMU's other traditional buffet style cafeterias.
(2) Second, we wanted to be able to provide composting interns at the Office of Sustainability with information about the contents of post-consumer waste in our dining halls (i.e., the percentage of animal product to organic matter) to help further their research into vermicomposting potentials at Western.

Next, we present a best practice analysis of the current endeavors that have taken place in Western's dining halls to reduce waste. We will detail what we have done right in terms of waste reduction and resource conservation, and the affect that this has had on our institution. We will likewise discuss areas for future improvements

Also, a portion of this paper is a case study analysis detailing the successful initiatives at two leading green universities, similar in size to WMU, to both reduce and responsibly dispose of waste in their campus dining halls. In our case study we will discuss in detail the programs that have produced successful results at the following universities:

- Georgia Institute of Technology
- University of California – Davis

A portion of this paper will also discuss a potential option for reducing the pre-consumer waste generated in our dining halls by contracting with an external company specializing in waste reduction techniques.

Finally, we will conclude our paper with a detailed discussion of recommendations we would like to make to the university based on our research, which include:

- Performing comprehensive waste audits in all WMU dining halls
- Encouraging WMU to develop and nurture a university-wide culture of sustainability with a focus on waste reduction,
- Encouraging WMU to focus on educating our student body about this importance by expanding information, communication, and publicity about waste reduction and recycling
- Encouraging WMU to increase collaboration between Dining Services, the Office of Sustainability and Waste Management services to foster a more holistic approach to waste reduction in our campus dining halls, and to encourage sustainable-minded students to become involved in helping to educate dining services employees on sustainability issues.
- Strongly urging WMU to aggressively explore the potential for creating a campus-wide post-consumer waste composting system.
- Educating student consumers of WMU dining services about the vast amount of waste that is generated from their meals.
- Placing permanent signage in dining halls as a reminder not to waste food
- Asking WMU to explore other potentials for obtaining a greater percentage of total food that is locally, sustainably and organically produced.

Introduction

In America, food leftovers by weight account for the single largest component of the waste stream according to the EPA. (EPA Environmental Impact of US Food Waste). "Food leftovers" refer to both kitchen scraps (herein referred to as prep waste or pre-consumer waste), as well as uneaten food left on individual plates (herein referred to as post-consumer waste/plate waste). There is a profound disconnection in American culture about what happens to our food remains once we are finished with our meals, and many Americans are completely ignorant of the waste cycle and the staggering amount of waste our society produces through our eating practices. For example, in 2010 alone, Americans generated just under 35 million tons of food waste – more than any other material category but paper. Of this, 34 million tons (97%) was thrown away, making food waste the single largest component of the municipal waste stream reaching American landfills and incinerators. (EPA Basic Information About Food Waste). One source of this food waste is colleges and universities. Over 14 million students are enrolled in more than 3000 institutions of higher learning in the United States, where they generate on the order of 3.6 million tons of waste, or about 2% of the country's solid waste stream. (Saphire, 5). Food and food-related items may constitute 10 to 20% of this waste by weight at some schools, the largest component of the waste stream after paper. (Saphire, 5).

Aside from dealing with issues about how to dispose of the sheer mass of food waste produced, there are also other problems that are directly linked to food waste generation. For example, there is also much concern surrounding how to feed the growing population of the United States. The United States population is growing currently at a rate of 0.6% annually and is expected to gain 3 people per every 1000 annually as well through migration. Additionally the U.S. currently has a population of 309.7 million people[1] and is expected to increase to around 422.6 million people by 2050[2]. This means that the current food demand problems will only be growing larger with the addition of 122.9 million more people. If Americans could reduce their food waste by 20%, that would be enough to feed 25 million people[3], which is over 1/5th of the expected U.S. population increase. By wasting food we are also wasting our time, money, and resources. For example, over ¼ of total freshwater used in the U.S. can be attributed to food waste.[4] In 2003 food waste accounted for roughly 4% of U.S. oil consumption (~300 million barrels) meaning that methane is not the only greenhouse gas attributed to food waste. Those 300 million barrels of crude oil attributed to food waste roughly put out 952,000 tonnes of CO_2[5]

[1] 2010 Census Report
[2] Population Reference Bureau's 2010 Report
[3] NRDC 2010 Food Fact Report
[4] Hall, Dore, Chow, 2009
[5] 1 tonne CO2 = 3.15 barrels of crude oil

into our atmosphere. From all of this, we can conclude that generating food waste has significant immediate and long-term economic as well as environmental consequences that many Americans are oblivious to.

This American benightedness towards food waste is evident in the dining halls at WMU. According to a case study done by a former WMU student, Sarah Cambell, approximately 13,350 pounds of food waste is generated on campus daily. (Campbell, 4). The majority of this waste is either deposited in local landfills or disposed of directly into the sewage system by washing it down industrial garbage disposals in our campus kitchens – a process that results in thousands of gallons of waste water that requires treatment by the city at a cost to WMU[6], and a missed opportunity for a campus sustainability initiative.

Our initial vision with this project was to craft a composting pilot initiative that could be implemented on campus to tackle the problem of post-consumer waste in our dining halls. However, as we embarked upon our project's journey, we realized that this simply was not a feasible option for Western in its current state. Thus, we decided to focus our efforts on general waste generation, consumption and reduction in WMU's campus dining halls. By focusing on waste in a more broad sense, we hope to construct an organized base of food waste data, existing projects, and future suggestions. By building a base of food waste information, future groups have a stepping stone to use and make projects related to food waste more feasible.

If WMU were to stay on its current path of food waste management not many advancements would be made. Food audits would continue to be far and few between, leaving those concerned about food waste with unreliable data. Money would continue to be thrown out the window for food not consumed and for the removal of this waste as well. The university would not be the only one affected, as students would not have to opportunity to be shown how much food is actually wasted. Students would be deprived of this knowledge and their food waste habits would remain unaffected, thus inhibiting their ability to effectuate positive sustainable changes on our campus.

Focusing efforts towards waste reduction will help WMU be nationally recognized as a school with a great waste program. WMU has the opportunity to be a leader in waste management such as schools like The University of California-Davis and Georgia Institute of Technology. To be nationally recognized in waste management will not only save the university money, but could also draw in students to the university that are environmentally conscious. Another benefit of researching and practicing improved waste management techniques at WMU will be that the university would be an example for the other schools that signed the

[6] According to Sarah Campbell's 2007 Case Study that investigated options for composting on campus, the Kalamazoo Water Reclamation Plant charged WMU $0.29 for every cubic yard of waste water they treated for us in 2007 – a significant portion of which came from our current system of food waste disposal. (Campbell, 4).

Talloires Declaration. By focusing on waste reduction the university will be practicing institutional ecology, will help to create an institutional culture of sustainability, and will increase awareness of environmentally sustainable development around campus.[7] Reducing and learning about our waste also falls under the goals of WMU's master plan. The 6th goal of the master plan is to think ahead, so that WMU can deal with future issues in order to plan and support sustainability opportunities around WMU. With the increasing U.S. and World population, food security will likely be an area of major concern throughout the next century and by "thinking ahead" WMU can start to grapple with its own waste reduction early, and will hopefully be able to serve as a model of food conservation and sustainability for other schools looking to do their part.

In light of all this, we must also consider that conducting research through food waste audits, best practice evaluations, or through contracting with external companies specializing in waste reduction techniques, such as using Lean Path software, could have a potential for minor negative effects. Food waste audits and best practice evaluations would require money to pay for those who do the research. Lean Path is more expensive due to the cost of the software and the training that is involved as well. Other negative impacts include taking time/support away from other projects around campus and that major planning is involved with improving WMU's waste reduction. However, these potential negative impacts are all minor and would be offset due to the knowledge gained about WMU's waste habits, the potential money saved on food and waste, and by the further "greening" the university and its practices.

[7] Three actions promoted through the Talloires Declaration

Methodology & Discussion of the Evolution of Our Project Direction

When we first embarked upon this project, we initially had the idea of focusing on composting as a means for dealing with post-consumer waste generated in campus dining halls. Our vision was to perform a best practice analysis of other universities that have successfully implemented composting systems and use the information gained from our research to create a pilot project that could be implemented at WMU. The ultimate goal was to research the most effective and efficient means for WMU to implement a closed-loop campus-wide composting system and to explore the potential of having composting receptacles placed directly into campus dining halls. Students would be responsible for disposing of their post-consumer waste in the appropriate receptacle, where it could in turn be composted and used throughout campus as well as the local community. This would be a great way of fostering a culture of sustainability amongst students by directly connecting them to the waste cycle of the food that they consume.

When beginning our research into composting options for the university, we realized WMU was already committed to having a vermicomposting method and interns are currently exploring the potential for vermicomposting on campus. However, this research is still in its early stages and currently Western does not have the resources, infrastructure, or knowledge to implement the closed-loop composting vision that we desired. Since much research still needs to be performed before any type of post-consumer composting system can be implemented and since WMU already has a team of interns working on this research, we began to take the first steps towards a new path. We deemed it too impractical to attempt a composting pilot project at the university, since we still do not have all of the research and information necessary for such a project to get off the ground. Essentially, we were putting the cart before the horse, and thus, we decided to accept a different route for the focus of our project. We still were keen on the idea of focusing the project on waste generated by the dining services and felt that there is an intimate connection between people, the food that they consume, and the food that is neglected by all but the trash can. Thus we decided to still focus on exploring other potentials for waste reduction in dining halls at the university.

Meetings with university faculty and personnel also played a part in our change of the project focus and content. First, we met with Carolyn Noack, who runs Waste Management Services for the University. Although Carolyn expressed an interest in our project and saw that we were passionate about our ideas for a closed-loop composting system, she informed us that it was probably too ambitious to achieve given the universities current climate and the immense coordination that would be required between departments. Other areas of concern expressed to us consisted of a lack of funding potentials, a lack of space for a composting site

and the reluctance of the university to embark on such an enormous effort, even if it proved to be beneficial once it was operational.

Next, we met with John Lee and Dean Siminescue who are the vermicomposting interns at WMU. Our meetings with the interns again showed us that our composting vision was impractical for Western in its current state. They explained that designing a pilot composting project would prove to be a waste of our time. They felt that by the time a composting project would finally be able to get off the ground, the university would likely be in a completely different position with regards to composting and the ability to implement a project on campus-wide basis. Essentially, their research regarding vermicomposting would have to be concluded before any composting pilot project could be tailored for the university. The potential of performing a waste audit in Bistro 3 was discussed between us and if data from a food waste audit could benefit the research that they were performing in any way. Waste audits previously conducted by Carolyn Noack we also brought up during this conversation.This peaked the interns interest in learning about the breakdown of the contents of post-consumer waste in dining halls. (What percentage of animal products, versus organic matter, versus other components the post-consumer waste consisted of. It was expressed that if we were able to somehow ascertain this information while performing our waste audit that it would definitely be beneficial to the intern's research.

Next, we met with Judy Gipper to tour the dining services facility in the Bernhard Center. We wanted to discuss the potential for placing composting bins into the dining halls, and to gain a better understanding of how our current waste system in the dining halls works and what efforts they have done to reduce dining call waste and consumption. Upon meeting with Judy, we likewise all realized that our proposed project was not feasible, given Western's current state of affairs. Judy discussed with our some of the initiatives the university has taken to reduce waste in dining halls, such as going trayless. She educated us on Western's current partnership with Bear-Foot Farms that allows the university to sustainable dispose of its pre-consumer prep waste. She also talked about Bistro 3, explaining the distinction between Bistro 3's cook-to-order system of food production, versus the other dining halls' traditional buffet style. Judy shared with us that she believed that Bistro 3 would produce less waste than the other cafeterias for this reason. She wholeheartedly believed that less waste would be produced in Bistro 3, and suggested that we perform a waste audit to prove her hypothesis. She explained that the results of our waste audit could help revamp the university's dining services and would give her the information necessary to suggest that all dining halls switch over to the make-to-order style. Judy was very convincing, and her passion for waste reduction in the dining halls was contagious. We ultimately decided to use the audit method and perform a waste audit in Bistro 3 to research her hypothesis.

Judy, based on her expertise and experience with dining hall counts, helped us pick the day on which the audit would be performed. We also got back in contact with Carolyn and informed her about our desire to perform a waste audit in Bistro 3. Carolyn provided us with the audit protocol that she had used when performing her waste audits at the Hoekje/Bigelow and the Valley 1 dining halls from 2008 and 2011. Although the previous audits included both prep-waste and post-consumer waste, we decided to only focus on the post-consumer waste aspect as we were limited in space, time and volunteers. We ended up performing the audit at Bistro 3 on March 20, 2012. (Please refer to our Bistro 3 Waste Audit section on page 11 for a more detailed explanation of the audit process).

After talking with Dr. Glasser about our decision to perform an audit in Bistro 3, it was recommended that we add more to our project in order to give it more substance and relevance. We discussed with Dr. Glasser the option of doing a best practice analysis or case study of food and recycling programs at other universities. We decided to perform case studies of two universities that had outstanding scores on the College Sustainability Report Card website(Greenreportcard.com). We sorted through dozens of schools who had “A” rankings in the “Food and Recycling” areas and chose the two universities that stood out among the rest of the other “A” ranked schools. The schools chosen were University of California Davis and Georgia Institute of Technology. Most of the food and recycling data was found at each individual school’s website and from the Green Report Card site.Likewise, we also decided to perform a best practice evaluation of Western and analyze our current system for waste reduction and sustainability within our own dining halls. We wanted to evaluate our current initiatives as a university and compare with the universities chosen. In turn we wanted to pull best practices from the case studies so that they could be applied to WMU in order to help make us a more sustainable institute.

While finding best practice ways to prevent food waste in dining hall cafeterias, a website for LeanPath came up. LeanPath is a company that sells training, scales, and software to corporations with cafeterias and to college/university cafeterias. The system used greatly reduces the amount of pre-consumer waste in cafeterias, while reducing the amount of food purchased by these organizations. We first contacted Judy Gipper to see if she had heard of LeanPath’s products and she replied that she didn’t know much about them and if we were to research it, she would like to see our work on the topic.

Audrey Copeland,who is the business and development manager at LeanPath, was then contacted for information regarding their services. While talking to Ms. Copeland, she gave us a half hour presentation on the ValuWaste tracking system, which gave us great insight into the product and how that product could greatly reduce the amount of food waste at our institution. After an hour and a half long phone conversation, Trevor was able to walk away with two

separate estimates. One estimate for running the system is in only one dining hall and the other is for running the system at all six dining halls. The purpose of obtaining this data was to be able to offer insight into how their services work, what LeanPath can do for the university, and be able to present LeanPath as a possible option for reducing food waste on campus.

Throughout of our project, the main goals we wanted to attain have changed greatly. The original focus consisted of researching composting and implementing a working composting program at Western. Since that ended up being unfeasible, the scope of our project shifted towards conducting a waste audit, providing information about food waste at Western, researching and comparing food waste practices of other similar universities to that of our own, and providing recommendations for food waste practices suitable for the university. By conducting our waste audit, researching other universities, and recommending practices, such as LeanPath, we hope to create a stepping stone that can be used by future projects to help further waste reduction initiatives on our campus and help WMU maintain its position as a frontrunner of green universities.

Bistro 3 Waste Audit

Introduction

On March 20, 2012 we performed a waste audit in Bistro 3 on WMU's campus. Bistro 3 is different from the other campus dining halls because its design encourages student interaction in a more dynamic and comfortable environment. It offers more fresh and healthy food choices that are prepared in sight of guests, and it emphasizes made-to-order/cook-to-order food options for students, thus allowing students to feel more connected to the food that they consume. Up to this date no food waste audits had been performed in Bistro 3, however, both Judy Gipper, who runs WMU's dining services, and Carolyn Noack, who is in charge of waste management, expected pound/per meal waste to be lower in Bistro 3 than in other campus cafeterias. Our goal was to test the hypothesis that less post-consumer waste per meal would be generated in Bistro 3 because of its emphasis on cook-to-order food versus the traditional buffet style dining options available in other dining halls. Likewise, we wanted to gain some insight into what the post-consumer waste consisted of (i.e., the ratio of organic material to animal products to carbohydrates) so that we could present this data to interns at the Office of Sustainability looking into post-consumer composting options for WMU.

Given time constraints and conflicting schedules we were only able to perform the waste audit on one day. (Previous waste audits by Carolyn Noack were performed over two days). We discussed this with Judy Gipper, who helped us decided that the best day to perform the audit would be March 20, because it was a Tuesday (middle of the week) and not during a holiday period. She said that this day would most likely provide us with the most accurate waste data.

Methodology

The waste audit began at 7:00 a.m. and was conducted until the dining facility closed at 8:15 p.m. The materials used were six 5-gallon buckets (of equal size), an industrial scale, and a support bar used to prop the buckets on top of the scale so an accurate reading of their weight could be ascertained.

In Bistro 3 when dining customers are finished with their meals they bring all of their used plates, cups and bowls to a designated area within the dining hall and deposit them on a moving conveyer belt that goes back into the kitchen where dining services employees dispose of the uneaten food/drink and clean the dishes. Uneaten food remains/post-consumer waste is then flushed through a system where it is ground up in an industrial garbage disposal and the remaining post-consumer mush is placed in trash bags for disposal. On the day we performed the waste audit instead of flushing the post-consumer waste as it was received, it was collected and weighed at hourly increments throughout the day.

In order the gauge out the content of the post-consumer waste we decided to separate the waste into three categories as it came down the conveyor belt. We used three 5-gallon buckets and labeled each one separately. Bucket 1 was for the collection of organic material, which included raw fruits and vegetables, salads with little to no condiments or animal products, cooked vegetables with little to no condiments or animal products and orange juice. (We omitted potatoes from the organic material bucket as the majority served in Bistro 3 are in a cooked or heavily processed form, such as French fries, or mashed potatoes). Bucket 2 was for the collection of carbohydrates, breads, all liquids (excluding orange juice, water and milk), potatoes/processed potato material, pasta dishes, cereals, salads containing large quantities of dressing, and various other non-animal product foods. (Bucket 2 essentially contained all material that was not organic matter or animal products). Bucket 3 was for the collection of animal products such as meats, cheeses, milk, eggs, etc. We made efforts to separate out the post-consumer waste as efficiently as possible, putting each component of a remaining dish in its proper bucket. For example, for uneaten hamburgers, we would put the bun in bucket 2, the meat and cheese in bucket 3, and any organic material in bucket 1. For cereal, we would pour the milk in bucket 3 and pour the remaining cereal into bucket 2. For slices of pizza, we would pull off the cheese and meat for placement in bucket 3 and put the remainder in bucket 2. For stir fries we would pull out in-tack vegetables that didn't have a lot of sauce on them for placement in bucket 1 and put the remainder in bucket 2.

The following table is a summary of foods that were placed into each bucket:

Table 1: Breakdown of Food in Buckets

Breakdown of Foods in Buckets		
Bucket 1 **Organic Material**	**Bucket 2** **Carbohydrates / All other leftovers**	**Bucket 3** **Animal Products**

- Raw vegetables
- Raw fruits
  o Oranges
  o Bananas
  o Grapefruit
  o Grapes
- Salads (with little to no condiments or animal products)
- Cooked vegetables (with little to no condiments or animal products)
- Orange juice
	- Breads
	- Pastas
	- Salads with heavy dressing
	- Cereal
	- Cakes/cookies/deserts
	- Potatoes/Processed potatoes
	- Pizza crust
	- Condiments/dips
	- Rice/stir fry
	- Soups/stews/chili
		- Meats
		- Cheese
		- Milk
		- Yogurt
		- Ice Cream
		- Eggs

Although we took great care to separate out the post-consumer waste into the appropriate buckets, there was some cross-contamination that was unavoidable. For example, Bistro 3 serves a large number of baked pasta dishes. When we would receive these we would attempt to pull the cheese off of the top and place it in bucket 3, but we were often unable to pull out individual pieces of meat from the pasta bake, and generally the remainder (pasta, cooked veggies, and pieces of meat) was placed in bucket 2.

As previously stated, we began collecting and separating post- consumer materials at 7:00 a.m. We then weighed each bucket on an industrial scale at every hour interval. (I.e., first collection period was from 7:00 a.m. to 7:59 a.m., and buckets were weighed at 8:00 a.m.). We had a total of six buckets, two for each category of post-consumer waste, and every time we weighed a bucket on the hour mark we would switch it out with its corresponding back-up bucket. After the food was weighed it was dumped into the flushing system to be ground up in the industrial garbage disposal.

Data / Results

The results of our waste audit are summarized in the tables below, which shows the hourly intervals that we weighed food waste at, the total meals that were served during each interval, the total post-consumer food waste (in pounds) generated during each interval, and a calculated figure of the post-consumer waste per meal served during each interval. (Please note that the "Waste Per Meal" category was calculated by dividing the total food waste (in pounds) by the total guests for each interval).

Table 2: Waste Per Meal in Bistro 3

Waste Per Meal in Bistro 3 (Audit Performed March 20, 2011)			
Time	**Total Guests (total meals served)**	**Total Food Waste (in pounds)**	**Waste Per Meal (pounds/meal)**
7:00 am - 7:59 am	54	12.00	0.222
8:00 am - 8:59 am	93	13.50	0.145
9:00 am - 9:59 am	80	21.00	0.263
10:00 am - 10:59 am	112	27.50	0.246
11:00 am - 11:59 am	183	26.00	0.142
12:00 pm - 12:59 pm	210	56.75	0.270
1:00 pm - 1:59 pm	146	48.50	0.332
2:00 pm - 2:59 pm	106	28.25	0.267
3:00 pm - 3:59 pm	130	17.25	0.133
4:00 pm - 4:59 pm	187	24.50	0.131
5:00 pm - 5:59 pm	301	39.00	0.130
6:00 pm - 6:59 pm	241	71.25	0.296
7:00 pm - 7:59 pm	151	80.75	0.535
Total	**1994**	**466.25**	**0.234**

On March 20, 2012 a total of 1,994 meals were served in Bistro 3 between the hours of 7:00 a.m. and 8:15 p.m. (See Appendix 3, Food Service Bistro 3: Total Meals Served by Time). From these meals a total of 466.25 pounds of post-consumer waste was generated.

To calculate the pounds of post-consumer waste generated per meal served, we divided the total meals served by the total pounds of waste produced:

1,994 meals / 466.25 lbs = 0.234 lbs/meal

Thus, we determined that 0.234 pounds of post-consumer waste was generated for each meal served on March 20, 2012. This equates to approximately 3.7 ounces. (Please refer to Table 2 above, which depicts the total meals served during each interval [e.g., 7:00 a.m. to 7:59 a.m.], the total food waste generated during each interval, and a breakdown of the pounds of waste generated per meal during each interval.) (Please note that the column titled "Total Food Waste (in pounds)" is the combined total of each of the three categories [organic material, animal products, and carbohydrates]).

Breakdown of Material in Post-Consumer Waste

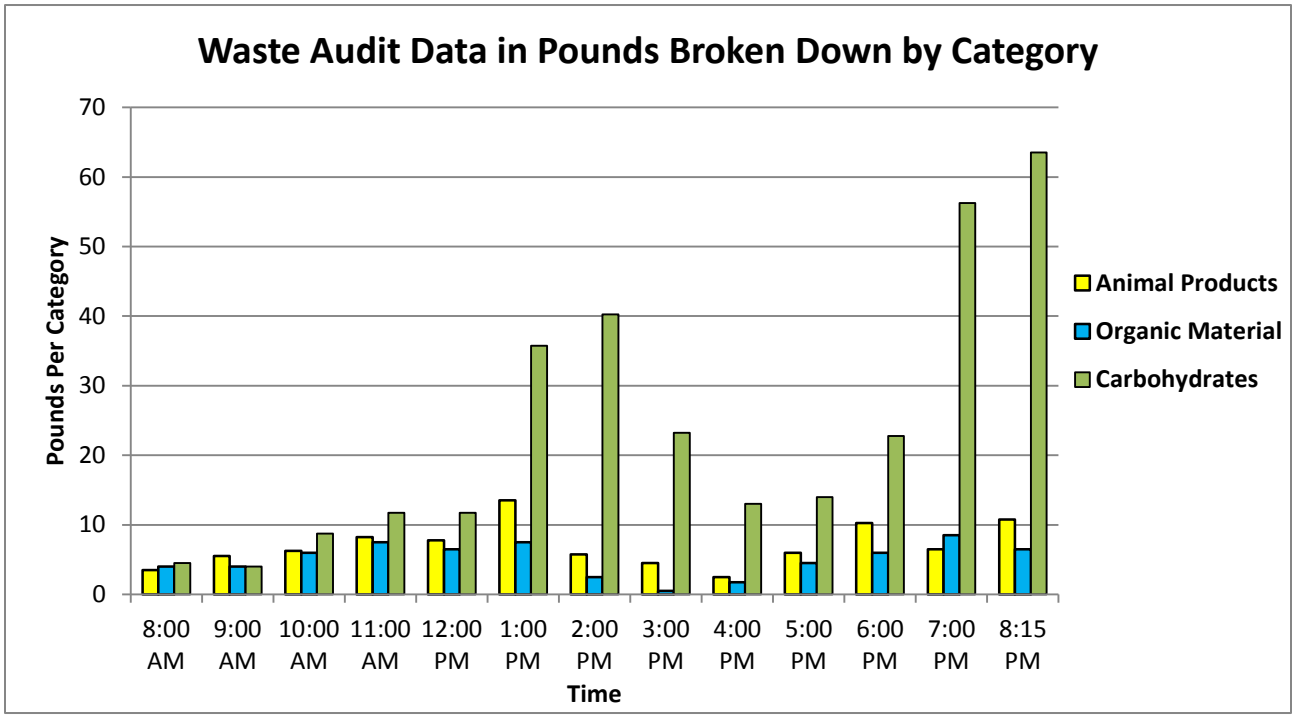
Of the total 466.25 lbs of waste generated, 65.75 lbs were organic material (vegetables/fruits, etc.), 91.00 lbs were animal products, and 309.50 lbs were carbohydrates/leftovers. Please refer to Table 3 below for a summary of this data, which indicates the weight in pounds of (1) animal products, (2) organic matter, and (3) carbohydrates at each of the time intervals that buckets were weighed, along with a "Total" column for each interval.

Table 3: Waste Audit Data for Bistro 3 (Broken Down by Category / All Values in Lbs)

Waste Audit Data for Bistro 3 (Broken Down By Category / All Values in Lbs)				
Time	**Animal Products**	**Organic Material**	**Carbohydrates**	**Total**
8:00 AM	3.50	4.00	4.50	12.00
9:00 AM	5.50	4.00	4.00	13.50
10:00 AM	6.25	6.00	8.75	21.00
11:00 AM	8.25	7.50	11.75	27.50
12:00 PM	7.75	6.50	11.75	26.00
1:00 PM	13.50	7.50	35.75	56.75
2:00 PM	5.75	2.50	40.25	48.50
3:00 PM	4.50	0.50	23.25	28.25
4:00 PM	2.50	1.75	13.00	17.25
5:00 PM	6.00	4.50	14.00	24.50
6:00 PM	10.25	6.00	22.75	39.00
7:00 PM	6.50	8.50	56.25	71.25
8:15 PM	10.75	6.50	63.50	80.75
Totals:	**91.00**	**65.75**	**309.50**	**466.25**

We have also included a visual representation of this data in the form of a chart for the reader's clarification and better understanding. Please refer to Chart 1 on the following page titled Waste Audit Data in Pounds Broken Down by Category**:**

Chart 1: Waste Audit Data in Pounds Broken Down by Category



To calculate the ratio of animal products to organic material to carbohydrates, we simply divide the total waste for each category by the total post-consumer waste for all of the categories combined. For example, to calculate the percentage makeup of animal product in the total post-consumer waste we would divide 91.00 by 466.25:

91.00 lbs of animal products / 466.25 lbs of total waste = 19.517%

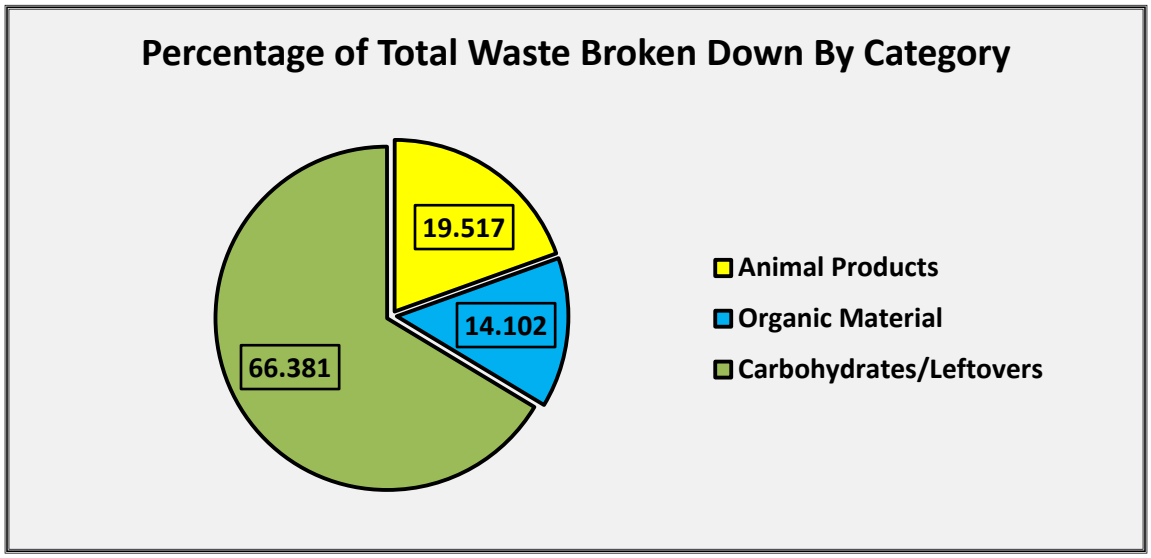
This means that the total post-consumer waste consisted of 19.517% animal products.

When we perform this calculation for each of the categories we determine a ratio of organic material to animal products to carbohydrates to be 14.102 : 19.517 : 66.381, respectively. This means that of the total waste generated, 14.102% composed of organic material, 19.517% composed of animal products, and the majority of 66.381% composed of carbohydrates, liquids, baked dishes, etc. Please refer to Table 4 on the following page for summary of this data, and to Chart 2below for a graphical representation of this breakdown.

Table 4: Percentage of Total Waste Broken Down by Category

Percentage of Total Waste Broken Down By Category	
Animal Products	19.517%
Organic Material (Vegetables/Fruit)	14.102%
Carbohydrates/Leftovers	66.381%
Total:	100.00%

Chart 2: Percentage of Total Waste Broken Down By Category



Although post-consumer waste had not been separated into three different categories in previous waste audits, we felt that it was necessary and beneficial to do so in order to gain an understanding of what the post-consumer waste generated in campus dining halls consists of. This data may prove to be helpful in the future for the Office of Sustainability interns currently researching vermicomposting potentials at Western Michigan University, because now they will be able to ascertain the makeup of post-consumer waste generated in WMU's dining halls.

Previous Waste Audits & Results

Waste audits have been performed in the past in WMU dining halls by Carolyn Noack, who runs WMU's Waste Management Department. On April 19 and April 20, 2011 she performed comprehensive audits in both Hoekje/Bigelow Dining Hall and Valley 1 Dining Hall. Although the university has since gone completely trayless in all dining halls, trays were still in use in Hoekje/Bigelow when the 2011 audit was performed; however, Valley 1 was trayless at the time. Noack's audits included both prep-waste and post-consumer waste. Noack, too, attempted to gauge out the makeup of post-consumer waste to determine what percentage of

plate scraps would potentially be able to be composted. In her audit, she collected post-consumer meat and bone separately from all other post-consumer plate scrap materials. (Unlike our audit, however, she combined organic material with all other leftovers). She also weighed prep waste, which we did not include in our study. The data from the 2011 audits is summarized in paragraphs below.

The data for the Hoekje/Bigelow audit (in which trays were in use at the time the audit was performed) follows in Table 5 below:

Table 5: Waste Totals for Hoekje/Bigelow Dining

Waste Totals for Hoekje/Bigelow Dining **Waste Audit Performed on 4-19 and 4-20-11** **(All Values in Lbs)**				
	4/19/2011	4/20/2011	Total	Average Per Day
Total Meals Served	2236	2099	4335	2168
Total Waste	665.00	724.00	1389.00	694.50
Prep Waste	123.50	106.00	229.50	114.75
Post-Consumer Waste*	494.50	553.50	1048.00	524.00
Meat/Bones**	47.00	64.50	111.50	55.75
PC Waste + Meat/Bones	541.50	618.00	1159.50	579.75

*Post-Consumer Waste refers to all plate scraps, less any meat and bones

**Meat/Bones refers to animal product plate scraps collected separately from all other plate scraps

From this data, we can ascertain that a total of 4,335 meals were served in Hoekje/Bigelow over the course of April 19 and April 20, 2011 (2,236 served on April 19, and 2,099 served on April 20). These meals generated a total of 1,159.5 lbs of post-consumer waste (including all plate scraps [meat, vegetables, carbohydrates, etc.]), with 541.5 lbs generated on April 19, and 618 lbs generated on April 20. This gives an average total post-consumer waste for the two days of 579.75 lbs/day.

To calculate the total post-consumer waste per meal we simply divide the total waste produced by the total meals served by for the day:

April 19: 541.5 lbs / 2,236 meals = 0.24 lbs/meal

April 20: 618.0 lbs / 2,099 meals = 0.29 lbs/meal

Table 6 on the following page sums up the pounds per meal data and calculations and provides an average pound/meal total for the two days:

Table 6: Hoekje/Bigelow* Pounds/Meal Waste Totals

Hoekje/Bigelow* Pounds/Meal Waste Totals Waste Audit Performed on 4-19 and 4-20-11			
Day	Total Meals Served	Total PC Waste + Meat/Bones (Values in Lbs)	Total PC Waste & Meat/Bones per Meal (Values in Lbs)
4/19/2011	2236	541.50	0.24
4/20/2011	2099	618.00	0.29
Average	2168	579.75	0.27

*Trays in use. Trays to be discontinued May 9, 2011.

Thus, based on the data obtained from Carolyn's waste audit of Hoekje/Bigelow on April 19-20, 2011, we can conclude that on average dining hall consumers at Hoekje/Bigelow produce an average of 0.27 pounds of post-consumer waste per meal:

Average (4/19-4/20): 579.75 lbs / 2,168 meals = 0.27 lbs/meal

This equates to approximately 4.3 ounces.

The data for the Valley I audit (in which trays were NOT in use at the time the audit was performed) follows in Table 7 below:

Table 7: Waste Totals for Valley I Dining

Waste Totals for Vally I Dining Waste Audit Performed on 4-19 and 4-20-11 (All Values in Lbs)				
	4/19/2011	4/20/2011	Total	Average Per Day
Total Meals Served	1579	1778	3357	1679
Total Waste	382.70	278.00	660.70	330.35
Prep Waste	55.00	41.00	96.00	48.00
Post-Consumer Waste*	287.50	255.50	543.00	271.50
Meat/Bones**	40.20	11.50	51.70	25.85
PC Waste + Meat/Bones	327.70	267.00	594.70	297.35

*Post-Consumer Waste refers to all plate scraps, less any meat and bones

**Meat/Bones refers to animal product plate scraps collected separately from all other plate scraps

From this data, we can ascertain that a total of 3,357 meals were served in Valley I over the course of April 19 and April 20, 2011 (1,579 served on April 19, and 1,788 served on April 20). These meals generated a total of 594.7 lbs of post-consumer waste (including all plate scraps [meat, vegetables, carbohydrates, etc.]), with 327.7 lbs generated on April 19, and 267 lbs generated on April 20. This gives an average total post-consumer waste for the two days of 297.35 lbs/day.

To calculate the total post-consumer waste per meal we simply divide the total waste produced by the total meals served by for the day:

April 19: 327.7 lbs / 1,579 meals = 0.21 lbs/meal

April 20: 267.0 lbs / 1,778 meals = 0.15 lbs/meal

Table 8 below sums up the pounds per meal data and calculations and provides an average pound/meal total for the two days:

Table 8: Valley I Pounds/Meal Waste Totals**

Valley I** Pounds/Meal Waste Totals Waste Audit Performed on 4-19 and 4-20-11			
Day	Total Meals Served	Total PC Waste + Meat/Bones (Values in Lbs)	Total PC Waste & Meat/Bones per Meal (Values in Lbs)
4/19/2011	1579	327.70	0.21
4/20/2011	1778	267.00	0.15
Average	1679	297.35	0.18

**Trayless

Thus, based on the data obtained from Carolyn's waste audit of Valley I on April 19-20, 2011, we can conclude that on average dining hall consumers at Valley I produce an average of 0.18 pounds of post-consumer waste per meal:

Average (4/19-4/20): 297.35 lbs / 1,679 meals = 0.18 lbs/meal

This equates to approximately 2.9 ounces.

Observations / Comparison to Results of Previous Audits

Upon performing the audit and analyzing the data obtained from same, we have concluded that our hypothesis proved to be incorrect, or at the very least, that we do not have enough data to make a valid conclusion about our hypothesis.

The goal of our hypothesis regarding the waste audit was to test and see if post-consumer waste in Bistro 3, given the dining hall's make-to-order service style, would be significantly less when compared to waste audits done in other dining halls that operate under a traditional buffet style. After completing the food waste audit and analyzing the data we obtained, we have concluded that our hypothesis proved to be incorrect. The results of the waste audit showed that throughout the day a total of 466.25 pounds of post-consumer food was wasted and that 1,994 meals were served during the audit at Bistro 3. When dividing the total food waste by the number of meals served, we get an average of 0.234 lbs per meal, or 3.7 ounces.

As stated earlier, previous waste audits have been conducted at the Hoejke/Bigelow cafeteria and as well as the Valley I dining hall. The Hoejke/Bigelow dining hall used trays while the Valley I dining hall had already gone trayless. When comparing our waste audit data to the data collected from the Hoejke/Bigelow audit, we see that our average waste per meal is slightly less in Bistro 3. This, however, is to be assumed because trays were still in use during the Hoejke/Bigelow audit, and were not in use during the audit of Bistro 3. By subtracting the average waste per meal of 0.27 lbs from the two day waste audit at Hoejke/Bigelow from our average of 0.234 lbs per meal from the audit at Bistro 3, the difference in waste per meal is 0.036 lbs per meal, or 0.58 ounces. This is not a significant difference in weight, as it only equates to a difference of about a half an ounce of waste. Likewise, it does necessarily tend to disprove our hypothesis, and at the very least, it does not prove anything. From this we can conclude that marginally less waste per meal was produced in Bistro 3 on March 20, 2012 than in Hoekje/Bigelow on April 19 and 20, 2011. However, this was already assumed to be the case because trays were in use at Hoekje/Bigelow when Carolyn's audit was performed. Although it is not a significant amount, it tends to indicate that Bistro 3's make-to-order food service style does not produce less waste than buffet style service.

Though this may be, there are factors that could have affected the end totals for both audits. These factors include that the audits were conducted at different times, at different locations, using different methodology, and by different people[8]. Due to these factors, discrepancies could occur such as different students with different waste habits, the kind of

[8] A detailed explanation of the factors that may have affected the Bistro 3 audit data are covered in greater detail in the next section.

food served (i.e. differences in taste and quality of food), and differences in methods used during the audit, etc. Consequently, it is possible that a portion of the difference in food waste could be attributed to these factors. Yet, it is also plausible that our hypothesis was wrong and that Bistro 3's make-to-order food service style simply doesn't produce less waste than traditional buffet style cafeterias. Nevertheless, differences between the two audits could have been overlooked which would affect the data collected.

When comparing our waste audit data to that of Valley I we see a slight difference between the two. At Valley I, the average waste per meal came out to 0.18 lbs per meal served. This is slightly less than the pound-per-meal value of 0.234 obtained from the Bistro 3 audit. By subtracting the average waste per meal of 0.18 lbs from the two day waste audit at Valley I from our average of 0.234 lbs per meal from the audit at Bistro 3, the difference in waste is 0.054 lbs per meal. This equates to a difference of approximately 0.86 ounces of post-consumer waste per meal between Valley I and Bistro 3. Again, this data would tend to disprove our hypothesis that cook-to-order dining halls produce less waste than buffet dining halls, as more waste was produced (albeit marginally) in Bistro 3 than in Valley I. However, based on our analysis and in light of lack of other comparison data, we believe that a difference of 0.86 ounces is not significant enough to conclusively say that Bistro 3 produces more waste than Valley I. The only definite conclusion we can make from all of this is that that data *does not prove* our initial hypothesis to be correct. If anything, it suggests that cook-to-order service produces a similar amount of waste as buffet style service.

A final comparison of the data from the three different food waste audits shows that the results do not line up with our proposed hypothesis. The average waste per meal for Hojke/Bigelow was slightly more than the average that we collected, a difference of 0.036 lbs per meal. The average waste per meal for the Valley I audit also came out to be slightly less than the average we received, a difference of 0.054 lbs per meal. Yet, we do not feel that these amounts are significant enough to make any definite conclusions from. Yet, we do feel that there should have been a bigger difference between Hoekje/Bigelow and Bistro 3, given that Hoekje/Bigleow still used trays at the time. This causes us to question the integrity of the previous waste audit data, and has forced us to deeply consider the limitations of our study and how they could have affected the results we obtained.

Limitations to our Waste Audit Study

Although we tried to be extremely thorough and careful with our audit, there are limitations inherent in any study. During this section we will discuss some of the limitations present in ours.

The main limitation to our food waste audit was that we were only able to perform the audit on one day due to time constraints, conflicting schedule, and lack of volunteers. Thus, the scope of our data is very small and may not be an accurate representation the waste that is actually produced in Bistro 3. We feel that in the future, in order to obtain accurate data the audit would need to take place over multiple days, not just one, so as to have a broader set of data to analyze. We need to take into account that there could have been factors outside of our control that may have influenced the amount of people who dined at Bistro 3 and/or their food choices. It is possible when we did the food waste audit that we had an unusual amount of people coming in to eat on that particular day. This would distort the real amount of food waste on a typical day. Also, we have little to compare our data to, as this was the first audit performed in Bistro 3. Having data to compare our results to would have given us something to base our findings off of and see if we truly did have an unusual amount of people eating in the cafeteria.

There were also limitations with the equipment that we used to perform the audit. There were many issues with the scale we used that needed to be compensated for. The scale was not an industrial scale, but rather a mechanical scale one would use at home to weigh a human. This made it difficult to weigh the buckets because the bottom of the bucket would cover up the dial which showed the measurement. So, we found a stand that perfectly held the bucket approximately nine inches off the scale which allowed us to see the dial and record the data. Also, the scale only went in increments of pounds, and because the scale was not digital, we had to manually estimate the weight. This method leaves a lot of potential for human error in reading the results of the scale, which could potentially appear different depending on where the reader of the scale is standing in relation to the dial.

The scale was 2.5lbs off. This was a minor limitation because we compensated this error by subtracting the beginning weight of the bucket (empty bucket) from the end weight of the bucket (full bucket) giving us the exact weight of the food inside. It is possible human error occurred while reading the scale. Because we would not look directly down at the scale to see the measurement, we had to look at the needle pointing to the precise tick on the scale at an angle. There were multiple people weighing and recording the data, so everyone may have pinpointed the needle at different intervals of the scale.

Finally, there is the potential that food weight may have been added or omitted from our survey. For example, melted ice from customer's beverages may have added to the total weight. While in the midst of the audit, we tried very hard to separate ice in the beverages out of our buckets. Some ice did escape our grasp and ended up in the buckets adding water weight. Also, some residual food scraps were not put into the buckets especially during the breakfast, lunch, and dinner rush. After recording the data from the previous hour, we would

dump the food and liquid from buckets down the garbage disposal and rinse the buckets out. Then we would the process over again. Some residual food and water may have been left over in the buckets when we emptied them after recording the data, as this process was often done very quickly because plates of uneaten food kept piling up. This may skew the data we collected. Similarly, we must consider the potential that food may omitted if a customer, for example, decided to throw their waste directly into the garbage as opposed to depositing it in the designated waste area.

Doing It Differently Next Time

Some things we would like to do differently for future waste audits is have a better scale that is more accurate and has a digital read out. This would make it much easier to read and record the data, as well as having a more consistent weight. This is especially true when there are multiple people weighing the buckets. A more accurate scale would allow for less variables such as the weight of the stand and the compensation of the 2.5lb inaccuracy of the dial.

Having more people to help with the food audit would be a must if the audit were to cover more than one day. The audit was an all-day affair and with only five people swapping out it gets very tiring. We believe a total of twelve people would be necessary to do an audit covering a minimum of two whole days. This would give volunteers adequate time to rest between shifts.

We liked how University of California Davis (UCD) also took into consideration napkin waste. When we did the audit, we threw all the napkins in the garbage disposal. Although this was not food waste, it still is a major contributor in total waste coming from dining hall cafeterias. We believe future waste audits should encompass the napkin aspect of waste in the cafeteria. UCD also came up with ideas on how to reduce the amount of napkin waste. They set up the napkin dispensers in certain locations in the cafeteria so customers don't overuse or are not as tempted to use napkins inappropriately. They also put food waste information on the napkin dispensers, giving customers an idea of what they are doing when trashing food items.

USD has samplers in the buffet line. This lets the customer try food items in a small portion instead of taking a whole plate of the potentially unappealing food item and throwing it away. This would reduce post-consumer waste. USD also has a well-developed informative program that teaches customers the negative actions of wasting food and napkins. We would like to implement something like this in WMU's dining hall cafeterias. A big source of wasting comes from the uninformed.

Best Practice Analysis of Waste Reduction in Western Michigan University Dining Services

In recent years Western Michigan University Dining Services have made a commitment to become a more sustainable facet of our institution. In 2011 WMU received a grade of B from the category of Food and Recycling from College Sustainability Report Card for its current efforts to green our campus dining services. Although we have made significant improvements with regards to waste and consumption reduction in our dining halls, our grade nonetheless decreased from an A in 2010 to a B in 2011. We would like to take this opportunity to discuss the current state of affairs of dining services with regard to waste reduction and conservation and highlight some of the best practices that Western has implemented in an effort to reduce our carbon footprint and the amount of waste that our campus cafeterias generate.

What We Have Done Right

Going Trayless

According to Judy Gipper (who runs dining services at WMU), our biggest and most influential change has been our switch to trayless cafeterias, which has become a national trend among college dining halls. Western's trayless initiative began in 2008 and has since been incorporated into all of our halls. Based on data from food waste audits conducted in 2008 and 2011, going trayless has helped to reduce food waste by up to 30% in our dining halls. Along with waste reduction, WMU's new trayless policy has helped us reap additional environmental benefits such as decreased water consumption as a result of no longer having to wash trays, the use of fewer cleaning products and less energy consumption to run dish machines. (Sustainability in Dining Services Website).

Purchasing Locally Grown and Processed Products

WMU has also made a commitment to purchasing locally grown and processed products to be served in our dining halls. Providing our students with local food results in countless benefits for our university and Michigan community at large; we are given the opportunity to better our economy and we reduce our carbon footprint by limiting the amount of miles that food travels before it reaches our university. According to the 2011 College Sustainability Report Card, in 2010 7% of Westerns food budget went towards the purchase of locally grown and processed food. WMU boasts local produce in almost all of the categories examined in the Green Report Card, including vegetables, fruits, milk, processed dairy products, grains and beans, meat, poultry, eggs, baked goods, maple syrup, beverages, and sauces and condiments.

Sustainable Disposal of Pre-Consumer Waste

Western has also implemented a system for sustainably disposing of pre-consumer waste in its dining halls. The program, called the Food Diversion Initiative, began in June, 2011 in the Bernhard Center Dining Service kitchen, and has since spread to four other dining halls on campus. This process calls for collection of pre-consumer fresh vegetable and fruit trimmings and waste, which are stored in bins onsite in walk-in coolers. The scraps are then given to Bear-foot Farms, a local farmer, for use to feed livestock, which the university then purchases when they are mature. The Michigan Department of Agriculture officials stated that Western Michigan University is the only university in the state that was making use of vegetable and fruit waste in this sustainable manner. This program creates many environmental benefits for the university, such as reduction in water and energy consumption through avoiding use of a garbage disposal to dispose of prep-waste. Also the program is a step in the right direction on the path to composting. Likewise, it allows the university to build relationships and partnerships with the Michigan community.

Recycled Napkin Dispensing

Recently WMU Dining Services has replaced table napkins with new Tork Xpress napkin dispensing systems, in an attempt to minimize the paper waste generated in our cafeterias. These new dispensers help WMU to reduce its environmental impact by using only 100% post-consumer recycled fiber napkins that are fabricated by a chlorine-free bleaching process that eliminates the release of damaging chlorine compounds into the environment when they are disposed. They help to reduce paper waste by only delivering one napkin at a time, thus making the customer work for the napkin and preventing customers from unnecessarily grabbing handfuls of napkins.

Portion Control / Plate Size / Sustainable Menu Planning

Many of WMU dining halls are self-serve, so that students can select their own portions, based on how hungry they are, so that they do not waste food. Students are encouraged to take what they think they really want to eat. They are able to choose just the right amount of food for their appetite, and they are always welcome to come back for additional portions if they are still hungry. The rationale behind this is based on the idea that students not given a predefined serving will take only the amount they want and throw less away.

Also, WMU has continued to use 9” plates in their dining halls, even as the standard plate size has gotten larger in commercial and noncommercial food service. A smaller plate encourages students to take smaller portions, thus generating less waste at the end of the meal.

Finally, dining services employees work to assure that their menu is consistent with student food preferences. At the end of the day they evaluate the food that remains uneaten, which is a good indicator of food that students did not enjoy. They use this information to craft recipes and food amounts for future meals, so that students enjoy the food that is cooked and don't end up taking things only to throw it out.

Energy-Efficient Appliance Upgrades / Sustainable Design in Bistro 3

WMU recently began reducing energy use through the renovation of Davis Dining Services into Bistro 3. This project included the installations of new dish machines and new refrigeration units that use significantly less energy than older equipment. The renovation also included the use of low energy fixtures and recycled finishes that combine sustainable design with durable materials to maximize long life cycle of the dining hall, minimize operation costs to the University, and reduce our energy use.

One of the driving missions for the David Dining Services renovation into Bistro 3 was to be able to provide fresh healthy choices for students that are prepared in front of the students, with an emphasis on cook-to-order options. These are prepared as requested by customers, which results in reduced waste and energy consumption.

Finally, Bistro 3 revitalized the way it disposes of the remains of student meals. They incorporated a water re-circulator and pulper into the dishroom, which allows for the removal of food from customer dishes without constantly running water and food scraps down the drain and into the sewer sanitation system (as is the customary practice in other WMU dining halls). With this new equipment, water is re-circulated to rinse the dishes and remove food scraps, which is then sent to the pulper that shreds the waste, which is collected and disposed in the garbage. This system has helped Bistro 3 to reduce its water consumption and energy use, and may prove to be an excellent step in the right direction towards incorporating a post-consumer composting system into WMU's dining halls.

What Still Needs to be Done

Tackling the Issue of Post-Consumer Waste

We see post-consumer waste diversion as Western's biggest dining services sustainability issue. Our lack of an efficient and eco-friendly means of disposing of post-consumer waste is a major contributor to our University's carbon footprint. The absence of a campus-wide composting program may ultimately prove to be a major factor preventing us from maintaining our position as a leader among sustainable universities. Waste diversion helps shrink the university's carbon footprint and aids the environment by reducing greenhouse gas emissions, and we believe that

Western needs to jump on the band wagon and begin actively investing more time, funds and research into composting potentials.

We feel that because of the incorporation of the pulper into Bistro 3's waste disposal system, Bistro 3 would prove to be an excellent location to implement a composting pilot project in. It would be easy for dining services employees to separate compostable plate scraps from non-compostable ones (i.e., animal products, etc.) as finished plates come into the back kitchen to be cleaned and disposed of. We did not have much difficulty doing this during our waste audit of Bistro 3, and we feel that a sorting process could be easily incorporated into the cleaning process. With such a system, only compostable materials would be sent into the pulper and ground up, and could be placed into receptacles to be picked up by volunteers and/or employees for composting at another location (either on or off campus, depending upon which route WMU decides to take). Clearly, much more research needs to be performed before a system like this could be implemented. However, we feel that Bistro 3 should seriously be considered as a location to begin such a composting project.

<u>Educating Students on Waste Reduction & Prevention / Increasing Awareness Among Students</u>

Education will prove to be a major contributor to the success of any dining services waste prevention/reduction program. WMU dining services should begin actively educating students about the amount of food waste they generate and soliciting ideas for change. Because there is such a disconnect between food consumption and food waste in American culture, it is necessary that student consumers become aware of the degree to which their food purchasing/consumption patterns greatly contribute to the waste that is generated in WMU's dining halls. WMU should provide students with data/statistics about the amount of food wasted in dining halls so that they can positively affect students' food and portion choices, thus creating the potential for less waste generation. This could be achieved through a variety of means, but we recommend the following routes be explored:

- WMU dining services should provide educational materials on waste prevention (e.g., posters and pamphlets) in dining halls. These could be in the form of "Food for Thought" posters located strategically throughout dining hall locations.
- WMU dining services should attempt to communicate to student consumers the connection between food waste and higher operating costs and, ultimately, higher food plan prices.
- WMU dining services should begin working closely with the campus waste prevention/recycling coordinator to implement and publicize food waste prevention programs.
- WMU dining service employees could consider meeting with students and soliciting their ideas on the reasons for food waste and ways to prevent it.

WMU dining services could encourage students to raise the awareness of peers through the campus newspaper, radio station, posters, or other exhibits about ways to prevent waste. An example of something like this recently took place at Oberlin College in Oberlin, Ohio, in which a group of students began working with administration and other staff to develop an awareness program aimed at reducing plate waste. One of their strategies, which has successfully reduced the quantity of excess food taken by students on their campus, is to weigh the amount of plate waste generated each week in their dining halls and publicize the results in the school newspaper and around campus. (Saphire, 9).

Other Potentials for Reducing Post-Consumer Food Waste

For non-self-serve locations, WMU dining services employees could consider offering food samples to students. This tactic has been successfully implemented at New York University, where food service employees are trained to dispense smaller portions and are also encouraged to offer students samples of food before they take it. They have found that this reduces the chance that students will take food that they may not like, thus reducing the amount of post-consumer waste generated per meal. (Saphire, 8).

Western could also consider conducting surveys of student food preferences in the hope that giving students a chance to contribute to menu planning will reduce the amount of food they discard.

WMU dining services could also begin exploring the possibility of incentive programs that reward less wasteful behavior. For example, At St. Mary's College in Notre Dame, Indiana, students can submit their own recipes to dining services. According to the director of food services at St. Mary's, this strategy has cut waste by 10 to 15%. (Saphire, 9). Another incentives-based example occurred at Drew University in Madison, New Jersey, where dining services serve nice steak dinners in cafeterias when students can demonstrate quantifiable reductions in plate waste over a given period of time. (Saphire, 9).

Finally, WMU could consider a more holistic approach to waste reduction that incorporates different facets of our university, working in collaboration with dining services employees. For example, Western could consider forming an environmental committee comprising food service staff, campus waste management staff, school administrators, and students to recommend and implement waste prevention initiatives.

Case Study of Best Practices of Other College Dining Services

Although WMU has already successfully implanted many practices within their dining halls that have reduced consumption and waste, we feel that much more can still be done. We would like to present a few examples of universities that have made stellar progress making their dining services more sustainable. These universities lead by example, having crafted creative, holistic and efficient practices to deal with waste in dining halls, and are recognized frontrunners in sustainability efforts by the environmental community.

We selected our universities for this case study by performing in-depth independent research and using information from the College Sustainability Report Card, which provides comprehensive sustainability report cards from universities throughout the nation and grades universities on their sustainability practices based on the information that they provide.

University Selection Process

In order to qualify as a candidate for our case study the university had to be: (1) recognized as a leader in sustainability by environmental organization, scholarly institutions, and/or national press (e.g., Princeton Review); (2) receive a grade of A in the category of Food and Recycling (the highest grade possible) from the College Sustainability Report Card; (3) have a higher percentage of local/sustainable food purchases than WMU; and (4) be similar in student population size to Western Michigan University. We felt that the fourth criterion was very necessary for this case study evaluation to show WMU that it is feasible to implement campus-wide sustainability solutions on a large-scale basis.

Categories for Evaluation:

For each of the universities we decided on, we evaluated their dining services program using four bench-mark categories:

1) Efforts to Sustainably Dispose of Pre-consumer waste
2) Efforts to Sustainably Dispose of Post-consumer waste
3) Local/Sustainable/Organic/Fair Trade Purchases
4) Waste reducing/consumption reducing initiatives

Selected Universities

After analyzing a number of prominent universities that fit our best practice criteria, we decided on Georgia Institute of Technology and University of California – Davis.

Georgia Institute of Technology

Georgia Institute of Technology (herein referred to as "Georgia Tech"), located in Atlanta Georgia, is one of the world's premier research universities. In 2010 they had a total enrollment of 20,620 students (13,650 undergraduate and 6,970 graduate). (Quick Facts: Admissions and Enrollment 2010).

As a university, they have made a commitment to forging the path towards sustainability, and their progress and efforts have been recognized by our nation's environmental community. In 2011, for the fourth consecutive year in a row, they were one of 16 schools included on Princeton's Review's Green Rating Honor Roll, which measures how environmentally friendly institutions are on a scale of 60 to 99. Princeton Review awarded Georgia Tech the highest possible score of 99 for their greening efforts. (Georgia Tech Receives Top Recognition from Princeton Review). Similarly, in 2011 they received an overall grade of –A from the College Sustainability Report Card, achieving an A (the highest ranking) for their Food and Recycling Initiatives. (Georgia Institute of Technology: Report Card 2011: Dining Survey).

A significant portion of their greening efforts have come from a revitalization of their campus dining services, which is dedicated to reducing both waste and consumption, and crafting sustainable solutions for dealing with waste. Although they have a slightly smaller population than WMU[9], their green dining services initiatives show them to be a leader in best practices. Georgia Tech's multifaceted approach to sustainability includes energy- and water-saving initiatives, intensive composting and recycling programs and the introduction of more local and organic produce. Their overall goal is to achieve a 26% energy-usage reduction and zero-waste in dining halls by August, 2015. Over the next five years, these sustainability programs are projected to generate a cost saving of $807,200 for the University. Of that total, $624,000 is to be realized from preventive maintenance and employee behavioral changes, along with $142,500 in current equipment updates and $40,700 from water-conservation initiatives. After five years, the annual cost saving is expected to help fund future sustainability programs. (Georgia Tech Dining Services Recognized for Sustainability Efforts).

Georgia Tech: Efforts to Sustainably Dispose of Pre- and Post-Consumer Waste

In August, 2009 the university began with an ambitious goal to reduce their dining services waste to near zero. Since then, they have undergone extensive efforts to achieve their goals, resulting in their two dining halls becoming 98% waste neutral through a combination of pre- and post-consumer composting, recycling, and a trayless program. This is a stellar example

[9] In 2010 WMU had a total student population of 25,045, consisting of 19,966 undergraduate and 5,079 graduate students. (WMU Fast Facts).

of a best practice institution, as they were able to achieve such vast reductions in waste and consumption in such a short amount of time.

A significant portion of their waste reduction has come from the implementation of a closed loop, university-wide composting system, which has helped to reduce organic waste in resident dining halls and some retail locations to near zero. Currently, all Georgia Tech dining locations have full pre- and post-consumer composting, and they have composted more than 305 tons of food waste since implementing these operations in 2009. This program is sponsored and run by cooperation of Georgia Tech's Students Organizing for Sustainability (S.O.S.), Dining Services and the Office of Environmental Stewardship, which have contracted with GreenCo Environmental, an off-site composting company. All food waste will be composted, instead of put into a landfill, and returned to campus to be used as fertilizer. Their composting program has allowed them to divert an average of 40,625 lbs of waste monthly from landfills, greatly reducing their environmental impact as a university. It has likewise helped both of their resident dining halls to reduce their waste by 98% since the program started in 2009.

The composting program focuses on three main phases/areas: (1) preparation of facilities; (2) training and implementation; and (3) program maintenance. In its initial stages, during the preparation of facility stage dining services employees first found ways of eliminating non-compostable items from the dining halls to reduce contamination of compostable material. For example, they got rid of ketchup packets and straw. They then began to switch to compostable and/or reusable products/options when available and cost effective, such as moving from plastic coffee stirrers to wooden ones, removing Styrofoam cups from dining halls, and implementing a reusable mug program. Finally, they setup recycling programs for all other materials, such as plastic, glass and aluminum. Next, they began the training and implementation phase, in which GreenCo employees came to Georgia Tech dining services and trained employees about what materials are compostable, discussed the logistics for compost bin locations for the most efficient means of using them, and discussed effective ways of labeling compost bins so each employee knows exactly what goes into each bin and what part of the operation each bin is coming from.

The cost of implementing composting on Georgia Tech's campus was negligible since the elimination of some non-compostable disposable goods, such as ketchup packets and plastic coffee stirrers, could save money. Transitioning from to-go cups to reusable mugs created an annual cost saving of $1,500. The expenditure for the compost service was cost-neutral, as the vast majority of dumpsters could be removed, reducing trash-hauling costs significantly.

Georgia Tech: Local/Sustainable/Organic/Fair Trade Purchases

Georgia Tech Dining Services has made a commitment to integrating local[10], organic and sustainable food into many of the dishes served on campus every day. Approximately 40% of their food budget is spent on such products, contributing to a significant reduction in their carbon footprint as a university. In 2010 they had a total annual food budget of $6,500,000. Of this, $2,000,000 was spent on purchasing food that was grown or raised locally, and $2,330,00 was spent on purchasing food that was processed locally. Georgia Tech makes local purchases for every food category listed on the College Sustainability Report Card, including: vegetables, fruits, milk, processed dairy products, grain and beans, meat, poultry, eggs, seafood, baked goods, granola/cereal, maple syrup, honey, beverages, and sauces, spreads, etc. More than $114,000 has gone to local and organic food purchases since August 2009, including a salad bar in the Student Center Food Court stocking 80% local or organic ingredients.

They also purchase cage-free eggs (5%), confinement-free pork (2%), and vegetarian-fed beef and chicken (3% and 9%, respectively). Likewise, 100% of their seafood purchases meet the Montery Bay Aquarium Seafood Watch guidelines and/or Marine Stewardship Council Blue Ecolabel standards.

They have also integrated fair trade purchases into their budget. They only serve fair trade coffee on campus, and also serve fair trade tea and various other fruits (mangos, macadamia nuts, papayas).

Georgia Tech: Waste Reducing/Consumption Reducing Initiatives

<u>Going Trayless</u>

In 2007 Georgia Tech removed trays from both of their student dining halls. Since implementation of the trayless policy they have achieved a saving of 3,000 gallons of water per day, reduction in food consumption (and thus waste generated), and savings in energy and chemical use as well. (GT Dining Sustainability Efforts). This has generated them a cost savings of $4,500 per year in water alone.

<u>Increased Communication Between Dining Services and Campus Sustainability Organizations</u>

Georgia Tech has been able to achieve many of its sustainability goals by forming an alliance between their Dining Services program and Students Organizing Sustainability (S.O.S.), which is a student group on campus dedicated to promoting the awareness and

[10] The College Sustainability Report Card defines "local food" as food that has been grown, raised, produced, or processed within 150 miles of the campus.

implementation of environmentally and economically sustainable practices on our campus and in the local Atlanta community. (GT Dining Sustainability Efforts).

Georgia tech encourages communication and cooperation between sustainable-minded facets of the student body and dining services employees. This holistic approach to waste/consumption reduction issues has fostered an environment where student can become actively involved in dining services and are given a forum to voice their opinions and concerns and ultimately help make real, sustainable changes. In 2007 a group of students with a passion for conservation and food sustainability practices initiated meetings with Georgia Tech dining services Dining in order to express their views about current dining practices and work to decrease the environmental impact of student dining at Georgia Tech. This has since evolved into a group called the Sustainable Dining Committee which works in cooperation with dining services to craft action oriented solutions for improving the sustainability of campus dining at Georgia Tech. (Sustainable Dining Committee Website).

Similarly, beginning in February, 2011, students began meeting with Georgia Tech kitchen employees once a week at employee meetings to discuss basic sustainability concepts and help to foster the best equipment usage habits. Since then, this has formed into an Energy Conservation Crew made up of students which works to increase energy efficiency in Georgia Tech kitchens by helping perform dining energy audits and weekly employee trainings, which encourage responsible, safe, sustainable and efficient equipment management. (Sustainable Dining Committee Website).

Georgia Tech dining services has also seen the creation of a Waste Squad formed by Georgia Tech students. In 2011 the Waste Squad implemented a “Weigh Your Waste” program, which allows patrons in dining locations the opportunity to see how much post-consumer food goes to waste every day.

Revamping Napkin Dispensers

Georgia Tech dining services only uses napkins made of recycled paper products. Energy is saved because less power is used to recycle paper products than to create them from virgin material. Recently, Georgia Tech has reduced its paper consumption by changing the way it dispenses napkins. They began putting napkins in dispensers that only dispense a single napkin at a time, verse in an open basket. The goal was to discourage people from taking more napkins than necessary by making them work to get the napkins out. They have found that this simple switch has reduced paper waste by up to 40% in some locations, and has saved an average of 70.61 trees per year. (GT Dining Sustainability Efforts).

Grounds for Growth – Recycling Used Coffee Grounds

Georgia Tech has further reduced the waste generated in their dining halls by recycling used coffee grounds. They have implemented a program called Grounds for Growth, wherein they reduce water waste by giving away used coffee grounds for mulching in gardens.

Turning Used Cooking Oil into Biofuel

Georgia Tech dining services employees collect used cooking oil from all of the campus kitchen and then filter the used oil, making it cleaner and purer. The used oil is then transported off campus to be converted to biodiesel fuel, which is then returned to the university to be used on campus. This program collects approximately 2,600 gallons of used cooking oil to be manufactured into biodiesel annually. (Georgia Tech GreenBuzz).

Focus On Student Involvement & Employee Sustainability Education

Georgia Tech has taken a comprehensive and thorough approach to integrating sustainable practices into their waste management and dining services curriculum and procedures. A major focus of their sustainable dining initiatives has been geared toward educating employees on sustainability and waste reduction practices. For example, all managers with Georgia Tech Dining Services are required to take four courses on sustainability, including Sustainability 101 and 201 courses offered by Sodexo, a provider of integrated food and facilities management services, that is working to make the university a leader in campus food sustainability through conservation initiatives, intensive composting and recycling programs, sustainable service solutions and the introduction of more local and organic produce. Likewise, sustainability education is part of orientation for all front line employees. (Sodexo Helps Clients Earn Sustainability Distinction)

Donation of Leftover Food

Georgia Tech dining services have diverted leftover food from landfills by donating them locally to the Atlanta Food Bank. This has helped them to foster stronger relationships with the Atlanta community, allowing the university to help those in need while participating in sustainable actions. This program is the result of a cooperative effort between staff from the university's waste management facilities and student volunteers. Recently, more than 4,500 pounds of food were donated as a result of Georgia Tech's Office of Solid Waste Management and Recycling's Student Move-out Program.

Reducing Waste By Reducing Packaging – Biodegradable Containers

Recently Georgia Tech realized that many of their dining services customers are "carry-out" customers and need containers to carry their food. However, carry-out containers

generate a lot of waste. In an attempt to mitigate this problem, Georgia Tech changed all of its soup cups, lids and other various other cups to biodegradable items, which decompose naturally in landfills, and can be easily composted. Likewise, they have removed all stryofoam cups from dining locations, and have reduced the use of packaging and Styrofoam takeout containers by 85%.

Water and Energy Conservation Through Upgrading Kitchen Equipment

Georgia Tech has confronted water and energy waste issues with large-scale, intensive action in its dining halls. Since 2007 they have made a commitment to reduce water usage in their dining locations by upgrading kitchen equipment that uses the most water, namely, their warewashers. Recently, they replaced two of their most heavily used dishwashing units with new Hobart FT900 Warewashers with Opti-Rinse™ technology. Compared to warewashers without Opti-Rinse, these new units reduce the amount of water used to sanitize dishware by more than 60%, saving approximately $23,800 in water and energy bills annually. They have also installed tamper-proof, low-flow faucet heads that aerate the water and decrease its use by 40% in all campus kitchens. This $300 investment created a cost saving of $3,640 a year, with a payback period of less than five weeks.

Comprehensive Energy Audits in Dining Services

Georgia Tech's dining facilities are currently undergoing a comprehensive energy audit designed to reduce future operation costs, energy usage and the university's carbon footprint. To date, Georgia Tech, through its contract with Sodexo, has invested $25,000 in comprehensive equipment audits and plans to invest an additional $75,000 in the next year. Continuing costs include maintaining the software that allows for equipment tracking, performing preventive maintenance, making strategic equipment updates and educating employees. Over the next five years, this program is expected to require an annual investment of $160,000.

Although the cost of this large-scale equipment audit program is high, the payback period is only approximately seven years. Based on current energy prices, Georgia Tech Dining Services expects to save more than $124,800 per year in utility costs by the completion of the project. After the first seven years, the annual utility saving is expected to directly contribute to the bottom line and help to provide capital for further equipment updates.

University of California – Davis

The University of California Davis (referred to here-on as UC Davis) is on the fore front of waste management and of "green" universities. They have roughly 32,000 students, 25,000 of which are undergraduates. They have 3 residence halls on campus that house between 4200 and 4800 students each year.

UC Davis has been nationally recognized many times for its devotion towards striving towards sustainability. In 2011 UC Davis received an A- overall on the Green Report Card and an A under the Food and recycling category. Also, in 2010 they were ranked 4th in the "Government Green Fleet Awards" and was the only university listed among the top 20 in the nation. Other awards and acknowledgements that UC Davis has received consist of ranking first from 2005-2009 in "U.S. Institutions: Most Prolific in Environment/Ecology", being among the top 10 universities by Greenopia, and ranking 8th in the Sierra Club's "Cool Schools" survey in 2011.[11]

UC Davis Pre-Consumer Waste

In order to achieve their goal of zero-waste by 2020, UC Davis has taken the measures necessary to have a working pre-consumer and post-consumer waste collection system. Pre-consumer waste is collected at all three cafeterias during each meal. The waste is sorted and collected by Dining Service employees and is then sent to the Zamora Composting Facility, owned and operated by Sodexo. The waste is then turned into compost and is then distributed to local farmers and vintners.

UC Davis Post-Consumer Waste

Post-Consumer waste reduction has been a major focus over the last several years at UC Davis. Though the overall diversion of waste from the cafeterias is 90% consistent food audits are conducted in order find ways to better the diversion percentage. Like the post-consumer waste, pre-consumer waste is taken by Sodexo and turned into pulp. This pulp is then allowed to sit and decompose for 90 days until it is ready. It is also sold to local farmers and vintners, therefore helping to close the food cycle loop.

UC Davis: Food Waste Audits

The most recent food audit done at the university occurred Fall of 2011 and was done over the course of three days during the three hour lunch period. Students were asked to sort their waste, when finished eating, into four separate categories. These included: edible food waste, inedible food waste, liquid waste, and napkin waste. A total of 386 pounds of edible

[11] UC Davis scored a perfect 10/10 in the category of waste management.

food waste was collected during the audit and equated to around 2.08 oz per guest. Thanks to their yearly audits, they observed a few trends that occurred. From Fall 2010 people wasted .14 oz of edible food waste on average. This was the only improved category though as the amounts of the other three categories rose, the most significant being napkins.

Many great ideas have been formed and put into action since Davis has begun doing their food waste audits. Ideas and recommendations from the these waste audits include having students try a sample of the food before they decide if they want some, reducing the size of bowls used for the Mongolian grill, providing pre-plate entrees in different portion sizes, plating entrees with and without the sides, educating guests on taking only the number of napkins you need, placing education materials on the napkin dispensers, and locating napkins only at a couple of different spots around the dining room.

Though many ideas have been put forth, their focus has primarily stayed on educating diners about their food waste habits and receiving feedback from students. Throughout each food audit the dining services staff set up a display for diners to see. The display consists of the most wasteful dishes of the day (i.e. entire meals left), posters[12] with the final weight of waste each day, facts about their food waste (i.e. equating weight into terms of water, fossil fuels, CO^2, and how long it could have lasted a nuclear family), pictures of the waste audit, and questions were also posted to gain student feedback. The questions consisted of "What can Dining Services do to prevent food waste?", "Each person on average wastes 1 lb of food waste each day in the U.S. What can you do to reduce food waste?", "Americans waste 27% of food produced in the U.S., why do you think that is?". By actively participating in the waste audit students not only learned about their waste habits and its effects, but also valuable feedback was gained about changes students would like to see that could help to lessen the amount of food wasted. These student ideas get taken into consideration and are sometimes applied and integrated alongside practices put into place by Davis Dining Services.

UC Davis: Local/Sustainable/Organic/Fair Trade Purchases

UC Davis Dining Services make it a top priority to purchase food that has been locally or sustainably grown/raised and categorizes its purchases with a three-tier system[13]. During the 2009-2010 year CAL Davis spent nearly $5.6 million on food alone and of that $1.1 million was grown or raised locally, just over 1/5th of their food budget. Locally processed foods were also a hefty chunk of the food budget, at $2.2 million spent.

[12] See figure 1 on page 40 for an example

[13] The Three tiers consist of primary (50 mile radius from campus); secondary (100 mile radius from campus); and tertiary (250 mile radius from campus).

The two main sources for supplying UC Davis with local foods are purchases from farmers markets and through other local distributors. Products purchased from these local distributors include: vegetables, fruit, dairy, grain, poultry products, cereal, and condiments. To help obtain these local products UC Davis has been closely working with Next Generation Foods[14] to supply high quality sustainable goods, mainly dressings and condiments. UC Davis also has an extensive student farm that supplies olive oil and tomatoes to Dining Services.

Other "green" food products are available as well and include certifications such as fair-trade, USDA Organic, Humane Animal Treatment, and Food Alliance. The fair trade products include coffee, tea, and chocolate. Organic products include fruits, soy milk, and tomato paste. Finally some products that are humane and Food Alliance certified are beef, pork, and eggs.

UC Davis: Waste Reducing/Consumption Reducing Initiatives

Zero-Waste Stadium

In 2007 UC Davis started the very first zero-waste stadium in the nation. All foods and drinks provided by concessions must be packaged in compostable or recyclable materials. Through waste reduction policies such as this, UC Davis was able to achieve a waste diversion rate of 89.9% at a football game on October 23, 2010. This feat gained national recognition and the allowed UC Davis to win the Wastewise Game Day Challenge and be named champion by the EPA[15].

Residence Hall Composting

The Cuarto residence hall is home to a pilot study currently going on called the Bucket Program. The Bucket program allows residents to collect compostable materials in their rooms and drop it off regularly at the dining hall. The program is meant to help students who already have knowledge of composting while making it easy enough for beginning composters to learn.

"Aggieware"

Aggieware is the reusable tableware program at UC Davis and was implemented in the fall of 2010. Each RA is given a set of Aggieware and when used can take the dirty dishes back to the dining hall and will be provided with a new kit. The program helps to eliminate the buying, using, and disposal of paper products for programs outside of the dining hall. Aside from saving paper, there are also increased funds for purchasing and supporting local sustainable food options.

[14] Next Generation Foods markets and distributes local, sustainable, high quality grown foods to the area of Northern California. Their main goal is to increase transparency and traceability of the local food system, promote foods from local family farms, and to shorten the supply chain for businesses.

[15] 2010 was the first year that UC Davis participated in the Wastewise Game Day Challenge

Trayless Cafeterias

In the spring of 2008 UC Davis began a pilot study of trayless dining and by summer the same year all residence halls switched to being trayless. UC Davis set the standard for the other campuses of the University of California. Since 2008 of the 10 total campuses, another 5 have implemented trayless dining.

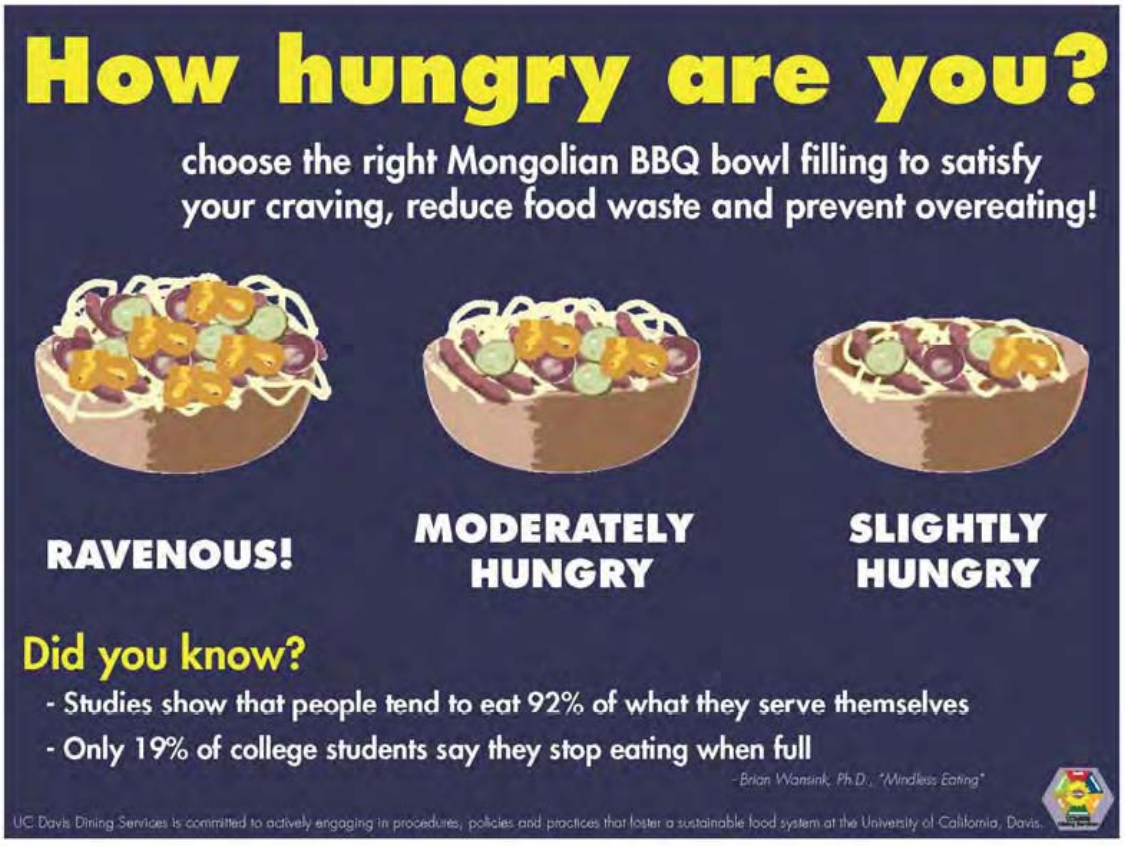


Figure 1: A poster at a UC Davis cafeteria. It gives facts about eating habits, helps students choose the right amount of food, and promotes smaller portion sizes.http://dining.ucdavis.edu/documents/MongolianBBQWasteAuditSP2011-Post-TransitionReport.pdf

Contracting With Lean Path as a Potential Solution for Reducing Pre-Consumer Food Waste
– A Best Practice Evaluation –

While analyzing the best food waste reduction ideas for campus dining halls around the United States, we performed an in-depth analysis of the University of California - Davis and Georgia Tech University. These universities gave us great insight into how to keep WMU moving towards zero waste and lower greenhouse gas levels. A common theme that we noticed among the universities in our case study was contracting with outside companies that specialize in waste reduction techniques, and using the services that these companies offer to help achieve campus food waste reduction goals. Upon performing our own research into such companies, we came across LeanPath. LeanPath is a technology company that provides food waste tracking systems to hospitality, foodservice, universities, and restraint industries. They offer comprehensive waste tracking technology packages that helps foodservice operators reduce food waste, save food dollars and operate more sustainable facilities. This section of our paper provides a LeanPath proposal and gives a detailed layout of what contracting with LeanPath could do for WMU in terms of reducing food waste, and what benefits will come with the use of the system.

LeanPath is the maker of the ValuWaste System, which tracks pre-consumer waste from kitchens and seeks to reduce waste at the source, instead of trying to figure out how to dispose of waste once it has already been produced. This tracking allows kitchen staff to establish a baseline of food waste, diagnose the issues contributing to unnecessary food waste production, raise employee awareness, create accountability, and monitor and benchmark progress. LeanPath's definition of pre-consumer waste is, "food waste discarded by staff within the control of the food service operator. This includes all waste in the back of the house including overproduction, trim waste, expiration, spoilage, overcooked items, contaminated items, and dropped items. It also includes all waste in the front of the house that has remained under the control and custody of the food service operator, including items on cafeteria stations such as salad bars, steam wells, self-serve deli stations, misordered product (e.g. erroneous grill orders never served), and expired grab & go items. Leftover catering items would be pre-consumer waste if they remain on the catering line and have not been received by an individual customer. If an item has been sold or served to a customer and is then discarded it is no longer pre-consumer waste" (LeanPath, 2012).

LeanPath has developed this system in response to rising food costs over the years. Whole sale food prices have rose 17% in the last five years with a projected 6% increase in the near future. While prices are increasing, food reduction is a must and LeanPath proposes to have the solution. With their system, pre-consumer waste can be cut down by 30-50%, as well

as 4-10% savings in food purchasing. This speaks volumes considering WMU spent $3,959,037 in 2009-2010 (GreenReportCard, 2011). So, not only will this save the university money, it will significantly cut down on waste.

The ValuWaste System can reduce pre-consumer waste by having kitchen employees weigh and document food that is expired, spoiled, overcooked, contaminated, dropped, overproduced, and trim waste. The first step to the process is weighing all the collected food so it can be recorded by the ValueWaste System software before it is thrown out. Step two is entering in the employee's name that is responsible for discarding the waste. All of the employees will have their names in the data base of the computer and must login to their name for the process to begin.

Step three is to select a broad category of food that is being thrown out (soup, bakery item, compound salad, dairy, beef, etc.). Step four is to select the reasoning for wasting the food (burned/overcooked, cater overproduction, contaminated, dropped/spilled, expired, etc.). Step five is to select the container in which the food is in. The system gives many options such as coffee shuttle and full hotel pan (1') to full hotel pan (6''), plus many more. Step six shows how much the food waste weighed and approximately how much money was spent on the food being discarded. The user then has an option to weigh more food or go on to the next step, which is tracking where the food waste came from, (deli, grill, salad bar, etc.) and what time of day (breakfast, lunch, dinner). After this, the user selects the specific type of food wasted. If the user were to throw out soup, which is a broad category, he or she would be asked to select the type of soup, say clam chowder. The next step asks the user what is to be done with the food (trashed, composted, and donated).

After all of this, the data is recorded into the ValuWaste Advantage software. This is where all the documentation of the waste pays off. The software tracks all the food waste over a period of time and shows what kinds of foods are being wasted most frequently, and also makes reports loaded with visuals and different types of graphs that show trends in the data. Every month or so the chefs and cooks of the kitchen will have a team meeting and go over the data so they can make the necessary changes in their prepping and cooking techniques to further reduce the amount of pre-consumer waste in the future. Over the months of using this product, the accurate changes in behavior of the kitchen staff will directly show up in the reduction of food waste and money spent on the wasted food.

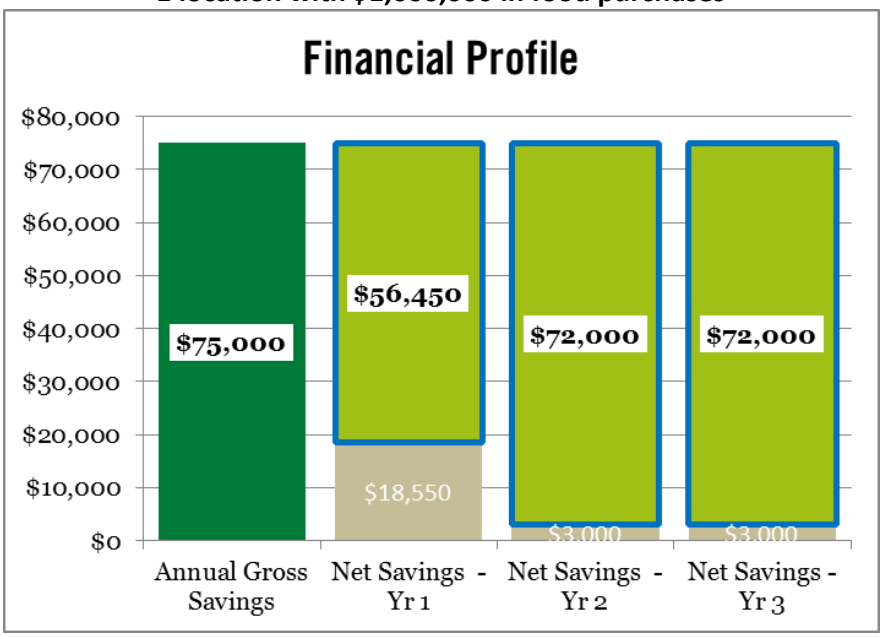
LeanPath offers various packages that institutions can purchase to achieve their food waste reduction goals. If the platinum package is purchased (six stations for each dining hall kitchen at WMU,) two days of on sight training will occur as well as a one-on-one training session with WMU's head chefs and a qualified LeanPath employee for twelve months. This

ensures WMU's kitchen staff will be well qualified to use the equipment, as well as being able to teach new employees how to use and follow the ValuWaste system.

If the silver package is purchased (one station for a dining hall kitchen at WMU,) then there will only be distance training and six months of one-on-one training with WMU's head chef and a qualified LeanPath instructor. The training in this package is not as extensive, but there is also only one station. This may be a good route to go because of the price. It would also be easier to implement one station at first so kitchen employees can accommodate the new system.

The benefits of this system far outweigh the cost of implementing the system. While speaking with Audrey Copeland, the Business Development Manager at LeanPath Inc., she ran a couple of estimates showing how much their product will cost, and also how much their product could potentially save WMU.

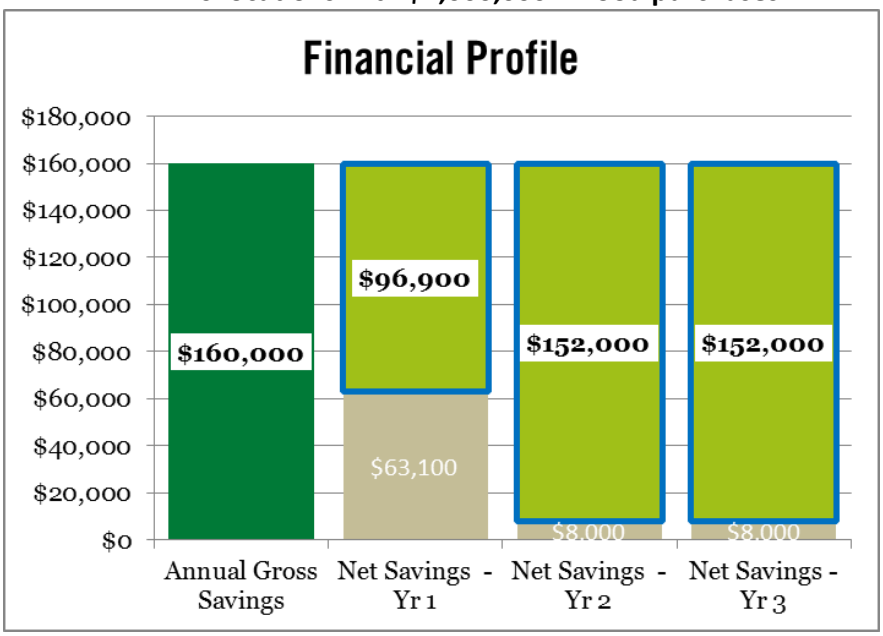
1 location with $1,000,000 in food purchases



Net savings of $95,450 over three years (4%)

The first estimate she ran was implementing the LeanPath system in ONE of WMU's dining halls. The capital investment for this is $15,550 with an additional reoccurring software maintenance and support fee of $3,000, totaling $18,550. With an estimated food purchasing cost of $1,000,000 for WMU's largest dining hall, and a 4% reduction in food purchasing with LeanPath's system, WMU could save $95,450 over three years' time.

6 locations with $4,000,000 in food purchases



Net savings of $400,900 over three years (4%)

The second estimate Ms. Copeland ran was for all SIX of WMU dining halls. The capital investment for this is $55,100 with an additional reoccurring software maintenance and support fee of $8,000, totaling $63,100. With an estimated food purchasing cost of $4,000,000 for all of WMU's dining halls, and a 4% reduction in food purchasing with LeanPath's system, WMU could save $400,900.

The 4% reduction in food purchasing is on the conservative, low end of LeanPath's math. The high end would be 10% reduction in food purchasing and this would give us a much higher rate of return on the ValuWaste tracking system. The system is tried and true. Numerous universities are successfully using this product, such as Michigan Tech University, Georgia State University, University of Seattle, and University of California – all of which are reaping the benefits of increased sustainability, decreased food waste production, and increased savings on food purchasing and waste disposal, as well as decreased in the universities' carbon footprints. All have come up with amazing results, so why should Western Michigan University be any different? Consequently, we propose that WMU should perform more research into potentially contracting with LeanPath as an option for reducing prep-waste in our campus dining halls.

Recommendations

First and foremost, we recommend that more in-depth and comprehensive waste audits be performed in all WMU dining halls over a series of multiple days so as to accurately gauge the amount of waste that is actually being generated. We recommend that these audits include both pre-consumer/prep-waste, post-consumer waste, and waste left over in dining hall trays at the end of the day. Also, further research needs to be performed into Judy Gipper's hypothesis that make-to-order/cook-to-order dining halls produce less waste than the traditional buffet style cafeterias.

We believe that Western Michigan University should develop and nurture a university-wide culture of sustainability with a focus on waste reduction. University administrators should take leadership in establishing the importance of reducing waste. Furthermore, the university should focus on educating our student body about this importance by expanding information, communication, and publicity about waste reduction and recycling, including both how and why to participate.

Based on our case studies of universities with outstanding sustainable dining services practices we have found that Georgia Institute of Technology and University of California – Davis have been able to achieve such amazing results by integrating their dining services operations with the entire university. The most efficient solutions to waste reduction/waste management practices in dining halls are achieved through a holistic approach that encourages students and faculty outside of dining services to become involved in the process of crafting sustainable solutions. We believe that real progress can be made when members of the university community outside of dining services have a forum to share their insights, opinions and knowledge about sustainable ideas. We feel that it is absolutely necessary for Western Michigan University to increase collaboration between Dining Services, the Office of Sustainability and Waste Management services to foster a more holistic approach to waste reduction in our campus dining halls, and to encourage sustainable-minded students to become involved in helping to educate dining services employees on sustainability issues. This will help to further foster a culture of sustainability among WMU's student body, and allow students to become more connected to the food we consume and the processes by which our food waste is disposed of.

Next, we strongly suggest that Western aggressively explore the potential for creating a campus-wide post-consumer waste composting system. Post-consumer composting seems to be the trend among universities that are going green and WMU has to keep up if they want to continue to be a leading University in sustainability efforts. We feel that Bistro 3 should be strongly considered as a prime location to implement such a composting system, given that it already has infrastructure that could come in handy to a composting initiative (i.e., the pulper

and water-recirculation system) and it specializes in the service of more healthy, raw and green dining options. We believe that further research should be conducted into this potential.

Next, although we realize that implementing a post-consumer waste composting system is likely a ways down the road for Western, we recommend that WMU's dining halls begin to anticipate it eventually happening and make changes to their practices to accommodate such a program in the future. If we begin making small scale changes now, the transition to a post-consumer composting program in the dining halls will be much smother. For example, we could begin using only biodegradable containers in our dining halls. We could begin omitting sources of compost contamination, such as straw and condiment packets. We could begin educating our dining services employees and our students on the benefits of composting and on the potential of seeing it happen in our cafeterias in the future. Likewise, we could begin incorporating sustainability education into our dining services employee training protocol, possibly working in collaboration with the Office of Sustainability or other similar campus organizations.

Next, we recommend educating student consumers of WMU dining services about the vast amount of waste that is generated from their meals. We recommend placing permanent signage – such as "Food for Thought" posters – in strategic locations in dining halls as a reminder not to waste food. These could inform students about the waste cycle, reasons to reduce waste and consumption, and ways in which they can reduce waste in their own lives

Finally, we recommend that WMU explore other potentials for obtaining a greater percentage of total food that is locally, sustainably and organically produced. We recommend that dining services make a commitment to continue increasing our percentage of total food budget that is spent on these products annually. Although dining services claims to be committed to supporting our local economy and providing students with local and sustainable options, we actually saw a decrease in the percentage of our food budget spent on local purchases from 2009 (wherein we spent 11%) to 2010 (wherein we only spent 7%). Likewise, we recommend that WMU consider purchasing seafood that meets the Montery Bay Aquarium Seafood Watch guidelines and/or Marine Stewardship Council Blue Ecolabel standards.

Conclusions

In conclusion, we feel that waste generation in our campus dining halls is a serious issue that needs to be proactively addressed by Western Michigan University, at all levels of our institution. After completing our project, it is apparent that reducing food waste is not only a significant issue at WMU but also nationally. Food waste problems can only be expected to be exacerbated within the near future. This is in part due to a growing U.S. population as well as increasing food security issues tied to global climate change. With increasing amounts of food waste in the United States, a considerable strain could be put upon resources, such as fresh water and land, as well as the environment as whole. Factors such as these make it an important point to begin planning on how to deal with food waste campus wide.

Western Michigan University is just starting to take a stab at dealing with issues of food waste on campus and in turn has a large amount of room for growth. Practices such as LeanPath could be implanted in order to reduce pre and post- consumer waste in the cafeterias. By conducting food audits the university would gain information on the waste habits of students. This could be used not only for projects implemented in the future but also to educate those who are currently attending WMU about their waste habits, their effects, and ways to not waste as much. By focusing attention on food waste and creating a plan to deal with it, WMU could become a model throughout the nation in regards to food waste and how it is dealt with it in a sustainable manor.

References

"Aggieware." *UC Davis Student Housing*. UC Davis, 2007. Web. 07 Apr. 2012. <http://www.housing.ucdavis.edu/sustainability/aggieware.asp>.

“Basic Information About Food Waste.” Wastes – Resource Conservation – Common Wastes & Materials – Organic Materials. US Environmental Protection Agency. N.d. Last accessed April 8, 2012 at URL: <http://www.epa.gov/osw/conserve/materials/organics/food/fd-basic.htm>

Campbell, Sarah. “Options for a Composting Program at Western Michigan University: A Case Study.” Western Michigan University. 2007. Last accessed 1/30/12 at URL: <http://www.wmich.edu/sustainability/pdf/student_research/options_for_composting.pdf>

"Campus Progress: Awards and Ratings." *Sustainable 2nd Century*. UC Davis, 2010. Web. 06 Apr. 2012. <http://sustainability.ucdavis.edu/progress/commitment/awards.html>.

Crisman, Phoebe. *Local Food and Food Waste: Runk Dining Hall Waste Audit*. University of Virginia. 2011. Last accessed April 7, 2012 at URL: http://www.arch.virginia.edu/globalsustainability/Reports/Fall%202011%20Reports/Food_RunkWaste-BurchamSingSaba.pdf

Dabholkar, Guarov. *White Paper on Campus Solid Waste*. Michigan State University. March 14, 2006. Last accessed April 7, 2012 at URL: http://s3.amazonaws.com/zanran_storage/www.ecofoot.msu.edu/ContentPages/4816213.pdf

“Dining Services Increases Stake in Sustainabiliy”. Georgia Institute of Technology News Room. June 15, 2009. Last accessed April 8, 2012 at URL: <http://www.gatech.edu/newsroom/release.html?nid=41241>

“Environmental Impact of US Food Waste”. Society of St. Andrew. N.d. Last accessed April 8, 2012 at URL: http://www.endhunger.org/food_waste.htm

“Foods”. GreenBuzz. Georgia Institute of Technology. N.d. Last accessed April 8, 2012 at URL: <http://www.gatech.edu/greenbuzz/programs/foods>

“Food Diversion Initiative Video Transcript”. WMU Dining Services. Western Michigan University. N.d. Last accessed April 9, 2012 at URL: <http://www.wmich.edu/dining/green/transcript.html>

“Food Waste”. Wastes – Resource Conservation – Common Wastes & Materials – Organic Materials. US Environmental Protection Agency. March 7, 2012. Last accessed April 8, 2012 at URL: http://www.epa.gov/osw/conserve/materials/organics/food/index.htm

“Georgia Institute of Technology: Report Card 2011: Dining Survey”. The College Sustainability Report Card. July 21, 2010. Last accessed April 8, 2012 at URL: <http://www.greenreportcard.org/report-card-2011/schools/georgia-institute-of-technology/surveys/dining-survey>

“Georgia Tech Dining Services”. Hobart Center for Food Service Sustainability. N.d. Last accessed April 16, 2012 at URL:

<http://www.hobartcorp.com/uploadedFiles/News,_Events,_Additional_Resources,_etc/News_Articles/Georgia_Tech_HCFS_Case_Study.pdf>

"Greenco and Georgia Tech: A Rich Relationship". Georgia Institute of Technology. N.d. Last accessed April 8, 2012 at URL: http://www.gatechdining.com/documents/sustain/Composting%20Poster.pdf

Grovenstein, Lisa. "Georgia Tech Dining Services Recognized for Sustainability Efforts". Georgia Institute of Technology News Room. December 10, 2010. Last accessed April 8, 2012 at URL: <http://www.gatech.edu/newsroom/release.html?nid=63130>

"GT Dining Sustainability Efforts". Georgia Institute of Technology. N.d. Last accessed April 8, 2012 at URL: <http://www.gatechdining.com/documents/Sustainability%20List2.pdf>

Kosof, Sarah. *Love Food, Hate Waste Resident Dining Commons Food Waste Report*. Rep. UC Davis Dining Services, Nov.-Dec. 2011. Web. 6 Apr. 2012. <http://dining.ucdavis.edu/documents/LoveFoodHateWasteWasteAuditFA11Report.pdf>.

Kosof, Sarah, and Danielle Lee. *Love Food, Hate Waste Food Waste Report*. Rep. UC Davis Dining Services, Apr. 2011. Web. 06 Apr. 2012. <http://dining.ucdavis.edu/documents/FoodWasteActivityApril2011FINALREPORT.pdf>.

Kosof, Sarah, and Danielle Lee. *Love Food, Hate Waste Food Waste Report*. Rep. UC Davis Dining Services, Nov. 2010. Web. 06 Apr. 2012. <http://dining.ucdavis.edu/documents/FoodWasteActivityNovember2010_000.pdf>.

Lee, Danielle, Kyle Peiper, and Michael LaShure. *Love Food, Hate Waste Food Waste Activity Report*. Rep. UC Davis Dining Services, Nov.-Dec. 2009. Web. 6 Apr. 2012. <http://dining.ucdavis.edu/documents/FoodWasteActivity-Nov.09.pdf>.

Lee, Danielle. *Mongolian BBQ Waste Audit*. Rep. UC Davis Dining Services, Apr.-May 2011. Web. 06 Apr. 2012. <http://dining.ucdavis.edu/documents/MongolianBBQWasteAuditSP2011-Post-TransitionReport.pdf>.

"Locally Grown and Processed." *UC Davis Dining Services*. Sodexo. Web. 06 Apr. 2012. <http://dining.ucdavis.edu/sus-locally.html>.

Nagel, Matt. "Georgia Tech Receives Top Recognition from Princeton Review". Georgia Institute of Technology News Room. August 2, 2011. Last accessed April 8, 2012 at URL: <http://www.gatech.edu/newsroom/release.html?nid=69135>

Nichols, Krystin. "WMU Continues to Improve Campus Sustainability". Western Herald. Jan. 9, 2011. Last accessed April 16, 2012 at URL: < http://www.westernherald.com/news/wmu-continues-to-improve-campus-sustainability/>

"Quick Facts: Admissions and Enrollment 2010". Georgia Institute of Technology. N.d. Last accessed April 8, 2012 at URL: < http://factbook.gatech.edu/content/admissions-enrollment>

“Recycling Food Waste:101”. Campus Composting Series. BioCycle. Dec. 2010. Last accessed April 16, 2012 at URL: http://www.berea.edu/anr/events/documents/FoodWasteDec.pdf

"Residence Halls General Information." *UC Davis Student Housing: Residence Halls*. UC Davis. Web. 6 Apr. 2012. <http://www.housing.ucdavis.edu/prospective/general_info_reshalls.asp>.

Saphire, David. “Getting An “A” in Lunch: Smart Strategies to Reduce Waste in Campus Dining”. INFORM. 1998. Last accessed Apr. 12, 2012 at URL: <http://informinc.org/reportpdfs/wp/GettinganA.pdf>

“Sodexo Helps Clients Earn Sustainability Distinction”. RedOrbit. June 4, 2010. Last accessed April 8, 2012 at URL: <http://www.redorbit.com/news/business/1874790/sodexo_helps_clients_earn_sustainability_distinction/>

Summary of Sustainable Food Initiatives Webpage. Sustainability at Georgia Tech Office of Environmental Stewardship. Georgia Institute of Technology. 2007. Last accessed April 8, 2012 at URL: <http://www.stewardship.gatech.edu/food.php>

"Sustainable Agriculture." *UC Davis Dining Services*. UC Davis. Web. 07 Apr. 2012. <http://dining.ucdavis.edu/sus-agriculture.html>.

Sustainable Dining Committee Website. Georgia Tech Dining Services. Georgia Institute of Technology. N.d. Last accessed on April 8, 2012 at URL: <http://www.gatechdining.com/sustainability_committee.html>

Sustainability Dining Services Website. Western Michigan University Dining Services. N.d. Last accessed April 8, 2012 at URL: <http://www.wmich.edu/dining/green/>

"The Bucket Program." *UC Davis Student Housing:*. UC Davis, 2007. Web. 06 Apr. 2012. <http://www.housing.ucdavis.edu/sustainability/thebucket.asp>.

"UC Davis Dining Services Sustainability." *Dining Services*. UC Davis. Web. 6 Apr. 2012. <http://dining.ucdavis.edu/sustainability.html>.

“University of California - Davis: Report Card 2011: Dining Survey”. The College Sustainability Report Card. August 6, 2010. Last accessed April 8, 2012 at URL: <http://www.greenreportcard.org/report-card-2011/schools/university-of-california-davis/surveys/dining-survey>

“University of Florida - Gainesville: Report Card 2011: Dining Survey”. The College Sustainability Report Card. July 20, 2010. Last accessed April 8, 2012 at URL: <http://www.greenreportcard.org/report-card-2011/schools/university-of-florida-gainesville>

“Waste Management: Dining Services Composting Program”. Best Management Practices for Colleges and Universities. Environmental Protection Agency. 2007. Last accessed April 12, 2012 at URL: <http://www.epa.gov/region1/assistance/univ/pdfs/bmps/BatesReformat1-8-07.pdf>

"Waste Reduction and Elimination." *Dining Services*. UC Davis. Web. 6 Apr. 2012. <http://dining.ucdavis.edu/sus-recycling.html>.

"Welcome." *Next Generation Foods*. Next Generation Foods. Web. 06 Apr. 2012. <http://www.nextgenfoods.com/>.

"We're National Champs for Aggie Stadium Recycling." *Sustainable 2nd Century*. UC Davis, 2010. Web. 06 Apr. 2012. <http://sustainability.ucdavis.edu/news/2010/december/wastewise.html>.

“Western Michigan University: Report Card 2011: Dining Survey”. The College Sustainability Report Card. September 2, 2010. Last accessed April 8, 2012 at URL: <http://www.greenreportcard.org/report-card-2011/schools/western-michigan-university/surveys/dining-survey>

“WMU Fast Facts”. Western Michigan University. N.d. Last accessed April 8, 2012 at URL: <http://www.wmich.edu/about/facts>

Appendix 1

Current Contact List for Group Participants

Name	Phone Number	Phone Number
Kylie Merrow	**269-998-3517**	**Kylie.e.merrow@wmich.edu**
Philip Penzien	**248-504-1097**	**Philip.l.penzien@wmich.edu**
Trevor Dubats	**586-764-8469**	**Trevor.j.dubats@wmich.edu**

Appendix 2

External Contact List

Name	Phone Number	Phone Number
Kate Binder	N/A	k3binder@gmail.com
Audrey Copeland	503-504-9714	acopeland@leanpath.com
Judy Gipper	(269) 387-4844	judy.gipper@wmich.edu
Harold Glasser	(269) 387-2713	harold.glasser@wmich.edu
Matt Hollander	(269) 387-0941	matthew.f.hollander@wmich.edu
Carolyn Noack	(269) 387-8165	carolyn.noack@wmich.edu
John W Lee	N/A	john.w.lee@wmich.edu
Dean Simionescu	N/A	dean.t.simionescu@wmich.edu

**Please refer to the "Methodology & Discussion of the Evolution of Our Project Direction" section of this paper beginning on page 7 for details of how and when each of the above listed persons was contacted, and for what purpose.

Appendix 3

Food Service Bistro 3: Total Meals Served by Time

Food Service Bistro 3 Total Meals Served by Time Tuesday , 3/20/12				
Time **Start - End**	**Transaction Counts**			
	BOARD	**DINING**	**PURCH**	**TOTAL**
7:00 am - 7:59 am	54	0	0	**54**
8:00 am - 8:59 am	93	0	0	**93**
9:00 am - 9:59 am	79	1	0	**80**
10:00 am - 10:59 am	110	0	2	**112**
11:00 am - 11:59 am	178	0	5	**183**
12:00 pm - 12:59 pm	195	3	12	**210**
1:00 pm - 1:59 pm	141	1	4	**146**
2:00 pm - 2:59 pm	103	1	2	**106**
3:00 pm - 3:59 pm	124	0	6	**130**
4:00 pm - 4:59 pm	184	0	3	**187**
5:00 pm - 5:59 pm	292	2	7	**301**
6:00 pm - 6:59 pm	232	3	6	**241**
7:00 pm - 7:59 pm	147	0	4	**151**
Totals	1932	11	51	**1,194**

Appendix 4

Photo Archive of Bistro 3 Waste Audit on March 20, 2012

(Volunteer Caitlin Prior holding a half-eaten burger during the lunch rush at Bistro 3.)

(Waste audit manager Trevor Dubats and volunteer Caitlin Prior separating waste as it comes into the dish room.)

(Food waste audit bucket #2. Comprised of carbohydrates such as pasta, bread, and mixed foods containing vegetables, fruits, dairy and meats with a majority of it being carbohydrate based. Liquids such as soda pop were also added to this bucket.)

(Food waste audit bucket #3. Comprised of meat and dairy products such as eggs, turkey, and milk.)

(Food waste audit bucket #1. Comprised of organic foods such as fruits and vegetables.)

(Full, uneaten, made-to-order pasta dishes discarded by customers at Bistro 3.)


(Action photos of Trevor Dubats collecting food off of customers plates during the dinner rush at Bistro 3.)

(Food pulp that is unclogged from the pulper. The pulper is frequently jammed up with napkins and food waste from dishes.)

(Uneaten pizza and pasta collected from customer's dishes before being thrown away.)