

Greening Indiana University Athletics



Final Report

Intern: Isaac Farley

Mentor: Chris Reynolds

30.April.2011

Table of Contents

Introduction	02
Methods	02
Progress	04
Recommendations	07
Contacts	10
Appendix	11
A. Notes from 2010 Football Season	11
B. Notes from 2010 – 2011 Basketball Season	15
C. Food Waste Audit 2010 – Training Tables	16
D. Duplex Printing Study 2011	21

Introduction

A well-executed sporting event utilizes a series of well-coordinated systems for transportation, administration, lighting, building efficiency, food procurement, and waste management. Thus, the “Greening IU Athletics” project has been a synergy between assessing the current practices within IU Athletics and implementing a pilot program to advance those practices. The basis for a solid foundation, on which to expand practices to conserve resources and reduce the carbon footprint of the department, was established through department-wide interviews, data analysis, and interviews with other collegiate athletic departments.

Educating the Athletics’ staff, the volunteers assisting with the initiative, and the community is crucial to the success of “greening” the department. While Indiana University Athletics has implemented “greener” practices (e.g., local produce in Athletic dining, occupancy sensors in newer buildings, recycled content of office paper, etc.), the department has challenges ahead if they intend on being the “greenest” athletic department in the Big Ten Conference. On a positive note, individuals within IU Athletics are receptive to issues relating to sustainability. As with any change, transition takes time. That said, the atmosphere within IU Athletics is conducive to sustainability-related progress.

Lastly, if Indiana University Athletics continues its push to be “greener,” IU has the potential to be a long-term model for the Big Ten. By drawing on the leadership of sustainability-minded collegiate programs - University of Florida, University of Colorado-Boulder, and the University of California-Davis - IU can gain a better understanding of the benefits of sustainable systems and tailor “green” practices that aid the department, the university, and the Bloomington community.

Methods

My internship began in November of 2009 with a meeting between my mentor, Chris Reynolds, the Senior Associate Athletic Director, and myself. In the initial meeting, Mr. Reynolds expressed the department’s desire to be “greener,” and to move forward by addressing “low-hanging fruit.” He stressed the role of the athletics department on campus. We both agreed that our first step should be to establish a foundation on which to build our green initiative. We had to gain a better understanding of current procedures and attitudes within the Indiana University Athletics department, the Big Ten Conference, and collegiate athletics as a whole prior to moving forward at IU. In order to construct this foundation a preliminary assessment of the department was completed.

I researched sustainability frameworks in the National Collegiate Athletic Association (NCAA), and located the Association for the Advancement of Sustainability in Higher Education's (AASHE) *2009 Collegiate Athletic Department Sustainability Survey Report*. Since Indiana University participated in the survey, I felt this was a natural starting point for my inquiry into current practices within the department. I interviewed staff members in the department to gain a better understanding of department-wide knowledge of sustainable systems, habits related to sustainability, and departmental plans to be “greener.”

We discussed the prospects of “green” sporting events, and agreed on a schedule to implement the department's ambitious goals. My mentor and I agreed to meet every other week, or as necessary, to monitor my progress and consider alternative courses of action.

During my research for the preliminary assessment, it became increasingly evident that completing a comprehensive assessment that adhered to my original timeline, a goal I originally set for completion by the end of the spring semester of 2010, was not attainable given the sheer magnitude of the department. While conducting interviews in the various departments within IU Athletics, a clearer picture of the individuals and motivations involved informed me of the challenges to and the attainability of my goals. Indeed, my work would be a careful balance between education, action, and research.



Figure 1. Greening Cream & Crimson initiative logo.

Progress

During my time as an intern, the Athletics department has made significant progress – the kind of progress that can be built upon. The project has been a learning experience for all involved. We have accomplished many firsts:

- A preliminary assessment of current practices in the department was completed in February 2010
- The first-ever Greening Cream & Crimson initiative was coined on February 09, 2010 (Figure 1)
- The first-ever Greening Cream & Crimson quarterly newsletter, initially planned as an internal sustainability-related educational piece (that now will be expanded and offered to the public) was introduced to the staff on April 16, 2010
- The Athletics Green Team, a diverse twenty-member group with representatives from each area within Athletics dedicated to advancing the green practices of the department, was assembled for their inaugural meeting on March 26, 2010
- Twitter, Facebook, and a Greening Cream and Crimson email address were launched in June 2010.
- As a part of this initiative, student-volunteers were trained for and carried out the first green football season in Indiana University history in 2010. Throughout the 2010 football season, over 200 volunteer shifts and 600 volunteer hours were logged. Bicycle valet, cellular phone recycling, and education of fans in the tailgate area were also piloted (Appendix A, Figure 2)



Figure 2. Volunteers sorting recycling at the first-ever green sporting event (April 17th – Memorial Stadium).

- Student-volunteers collected recycling at the halftime of 2010 – 2011 IU basketball games thereby educating fans about recycling and the Green Cream and Crimson initiative

- The first waste audit was conducted in November 2010 in the IU Training Tables, the administrative offices of Memorial Stadium's north end zone, and the student-athlete academic center (Appendix C, Figure 3)
- The first study of simplex versus duplex printing within IU Athletics Computing Services was conducted in the spring of 2011. Machine page counts, jam frequency, and energy consumed were monitored for seven weeks. Follow-up studies on ink consumption and thus money spent per page per machine are in the planning process. The major result of this study was the production of two guides to be used by IU Athletics in future printer tests (Appendix D, Figure 4)
- IU Athletics entered its first Environmental Protection Agency Game Day Challenge in October 2010 (IU versus Northwestern football game on October 30th). IU Athletics collected 6,800 pounds of commingled recycling; 1,200 pounds of cardboard; and 14,000 pounds of trash. As a result of the dedication and hard work of IU Athletics staff and student volunteers, IU placed second in per capita recycling in the Big Ten Conference ([EPA Game Day Challenge 2010](#)).
- Within iuhoosiers.com, a greening athletics link was created to educate the public about issues related to sustainability on campus and within the department.



Figure 3. Students of Kristin Cook's Q200 class assist in waste audit (November 2010)

While the IU Athletics Department is excited about expansion of their “green” practices, in the beginning there was some understandable hesitancy. As previously stated, change takes time. With each success, whether it is in an individual staff member’s understanding of the three core components of sustainability or the concept of carbon neutrality, the fans involvement in game-day recycling, or the

Table 1. The “How to Test a Printer” outline as determined by the duplex printing group’s research.

How to Test a Printer
1. Assemble an objective team willing to monitor the device and give the team the authority to effectively monitor the machine for a pre-approved length of time
2. Schedule time to learn the various functions of the printer - Ideally when users are not present – This may be at the end of the business day or over holidays in, say, a Student Technology Center (STC)
3. At the beginning of the test: a) Print usage pages; b) Install Kill-a-Watt energy meters; c) Print error logs; d) Design jam reporting sheets, so users can report jams – the more detailed the better; e) Train users and/or technicians to report jams, read energy meters, and print usage pages
4. Notify users of the test and set clear schedules for consistently monitoring machines – Again, an ideal time to take readings is when users are not present
5. Communicate objective goals of test in an unthreatening manner. Make concessions were necessary. (e.g., “We know this may mean an increased work-load in the short term, but our goal is to improve user experience and gain an understanding of our true costs)
6. Take peripheral readings – Not all studies measure toner/ink, but some should, so Step 3 should be repeated when new cartridges/drums are installed. When the toner/drums are replaced Step 3 should again be repeated. Then, the results should be analyzed for true costs and paper coverage (by ink/toner). This will provide true cost per page totals.
7. Analyze the results
8. Share results and request feedback from end users and partner departments

campus partnerships that are being fostered because of this initiative, the vision of a “greener” Athletics department becomes reality.

During the summer of 2010, in preparation for the upcoming football season, various guides were created to internally assist office functions and externally for fans on game day. A comprehensive recycling guide was designed after meetings with custodial staffs in Memorial Stadium and Assembly Hall. The previous campus recycling guide was utilized as a reference point. Additionally, recycling guides for the concession tops were created and prompts to be displayed above both trash and recycling bins were designed. Greening Cream and Crimson banners were created for the benefit of fans and volunteers.

Bob Gilmore and his staff of committed employees are now collecting office recycling in Memorial Stadium, Cook Hall, Weathers Golf, and Mellencamp Pavilion in individual

offices. Assembly Hall, staffed by building services, is still utilizing a centralized recycling model.

The department is currently measuring its interest in participating in future Energy Challenges. The Physical Plant has offered to pay for meters, which do not exist in IU Athletics' facilities outside of Memorial Stadium's north end zone, if IU Athletics will pay for the installation of the meters. Negotiations are still underway. IU Athletics simply cannot enter campus Energy Challenges without energy meters.

During the 2010 football season, Athletic dining expanded its pilot of "greenware" to suites, the Henke Hall of Champions, and in all catering done through Roy Lubovsky and company. Utensils, plates, and cups used in these areas were all corn-based products. From now on, in these areas, if event planners or individuals care to utilize plastics they will be charged a service fee to do so. IU Athletics is now exploring the idea of expanding this pilot to all concession stands within IU Athletics.

Also in the 2010 football season, the department incentivized recycling at the six home games by allowing those fans choosing to recycle an opportunity to win tickets to the next game. At each game the department awarded at least eight tickets to recyclers. I believe this incentive improved recycling/sustainability efforts within and around Memorial Stadium, and the continuation of the program will only build these efforts. Lastly, Coca-Cola delivered an additional 50-60 bins the week prior to the 2010 home-opener for use inside the stadium. The total number of bins donated by Coca-Cola is now over 100 and the bins are now in place in Memorial Stadium, Assembly Hall, and Armstrong Stadium.

In-game PSAs were designed and recorded for the 2010 football season to raise awareness about sustainability-related programs within IU Athletics. Four coaches within the department participated.

Recommendations

With any first-time event there are bound to be areas in need of improvement. Many associated with the full-season football and basketball pilots have been addressed – greening cream and crimson banners, recycling signage, and incentivized recycling. But, more can be done. Promoting alternative methods of transportation should be explored. This can include future partnerships with bicycle clubs in Bloomington. I've discussed promoting car pooling on game day, and investigating the possibility of satellite tailgating and parking.

Volunteers are provided with a detailed guide prior to the event, and clearer directions should be outlined at the beginning of their shifts. Shifts were shortened to three hours (down from four in the spring of 2010) and during the basketball season these shifts were shortened to 150 minutes based on volunteer feedback.

In 2010, fans were eligible for an IU prize package when they brought three recyclable items (or an out-of-date phone) to our volunteer booths. Ideally, registration would be conducted electronically. Unfortunately, a digital method for acquiring information has yet to be designed within Athletics, and because of time constraints within Computer Services was not be possible prior to the 2010 football season, although they should be revisited in the future. I believe a digital registration would greatly benefit the program. Digitizing would eliminate paper waste and allow us to easily survey fans – thus measuring the success of our game-day efforts.

Expanding green efforts to other sports should be explored. Realistically, it would be very difficult for an intern to manage more than football (and, honestly managing football is a large task for one intern). Therefore, I think it would be advantageous to further strengthen IU Athletics relationship with Greeks go Green to formulate an official competition where Greek houses adopt various sports to “green.” Other possibilities likely exist (Alumni Association), however this may be the easiest to implement. An additional idea worth investigating involves creating a student group on campus that works closely with the IU Athletics intern on sustainability-related projects.

Green tailgating competitions have been explored and should be considered in the future. Like the EPA Game Day Challenge, I believe friendly competitions could go a long way to improve community awareness and engagement. Establishing a framework (possibly similar to green events guide and scoring) for judging participants would be beneficial to the competition’s success.

For areas unrelated to game-day events, thorough interviews with each member of the Green Team should be conducted to gain a better understanding of departmental priorities related to sustainability. Many have been completed, but a few remain. In the spirit of communication and education, a sustainability workshop may prove beneficial for the staff within Athletics (summer months would be most conducive for such an event). I believe that sustainability champions, like Bob Gilmore, should be included in the workshops.

Since education is crucial to the success of this initiative, continued examples from other universities will provide much-needed benchmarks whereby IU Athletics can tailor green departmental practices.

Continually updating web content on the iuhoosiers.com site is imperative to the initiative. Similarly, PSAs should be re-developed every year. Also, marketing efforts should be expanded to game-day programs sold at Memorial Stadium and Assembly Hall. Future signage in Athletics' facilities should be more prominent.

Locating a commercial composting operation will be crucial to the move away from plastics. Eventually, IU Athletics can embrace waste-free sporting events, but the ability to compost the "green" containers must be in place prior to making a stadium-wide shift. The first step in this process is learning how much waste is produced in the department. A great first step was the waste audit. This audit should be repeated across the department.

Utilizing other sustainability interns within educational outreach (e.g., sustainability newsletters) has been an excellent mechanism, but engaging members of the green team must be a future goal, so a greater number of individuals within Athletics claim ownership of the program. A Google document was created so Athletics' staff could continually provide sustainability-related recommendations. This document should be promoted in all future newsletters and internal marketing campaigns.

Continuing computing studies with the Computing Services department within IU Athletics so a greater understanding of the true costs being paid per page printed will assist in future decisions related to printer- and ink-related contracts. As a part of this research, alternative inks (i.e., Solid Ink Technology) should be considered.

Contacts

Last, First Name	Department	Office Phone	Mobile Phone	E-mail
Building Services		855.8728		
Campbell, John	Building Services			
Crabb, Chuck	Facilities Dir	855.2127	320.3174	ccrabb
Emerick, Brent	Golf/Turf	855.7543	360.4443	bemerick
Fallwell, Tom		855.0017		
Facilities Services		855.3121		
Howard, Ron	Hoosier Disposal		219.6287	RHoward@republicservices.com, howardr@repsrv.com
Jarvis, Jimmy	Maintenance	855.3993	876.5571	jmjarvis
Reynolds, Chris	Mentor	855.1966	345.2981	rcreynol
Thompson, Nick	Marketing		616.560.2638	
Lubovsky, Roy	Athletic Dining	856.7117	812.929.7627	rlubovsk
Grubb, Cindy	Computer Services			cgrubb
Kraft, Pat	Marketing	856.1401		pkraft
White, Mattie	Student Services	812.855.2415		whitemr
Poppy, Wendy	Sports Medicine			wpoppy
Rickerby, Ian	Compliance	856.6074	219.9465	irickerb
Beyers, Donna	Tennis			dbeyers
Wise, Cheryl	Mail Room			chwise
Mart, Tom	Alumni Association			
Sherman, Matt	U. of Florida			mbsherman@ufl.edu
Ruskin, Paul	Penn. State	814.863.9620		
Royer, Jennifer	NCAA	317.917.6117		
Ramos, Bill	Pool	855.9524		
Newport, Dave	U. of Colorado	303.492.8308		
Kaden, Jeff	Engineering Services			jkaden
Akers, Steve	Envtl Operations			spakers
Gudmundson, Mitch	Football Equipment	855.1966		
Lane, David	Building Services		272.6661	
Norton, Bruce	Delphi Signs	334.7777		delphisigns@sbcglobal.net
Gilmore, Bob	Athletics, Janitorial	812.583.7900		rhgilmor
Chastain, Troy	Computer Services	812.855.2185		tachasta
Maddox, Jason	Coca-Cola	317.381.6812	317.607.5568	jasmaddox@na.ko.com
Joe Goss	Printing Services	855.6072		maxi@indiana.edu
Jacob Bower-Bir	Sustainability			jbowerbi

Appendix**A. Notes from 2010 Football Season****Vs. Towson****02.September.2010**

45 Volunteers registered. An estimated 35 show for the game.

Beautiful day. Ask for bicycle racks (from Jimmy Jarvis) outside of gate E2. They are placed with the four tables and eight chairs near entry E2 on the other side of the stadium. The standard clear bags do not fit the Coca-Cola bins well. Continually fall when even the smallest item is placed inside them. Coca-Cola provided special bags that fit the bins, but the bags were stolen before the first game. Arrived around 1.30pm for 7.30pm kickoff. Many tailgaters present in the tailgating fields well before we arrived. My credentials were not printed until 3pm, so it created much confusion with getting into the tailgating areas and our presence in the tailgating fields. None of the paid workers knew we were working the fields. Roll-off containers not in the same location as were agreed upon. Filled the lone roll-off container on the southside of 17th Street (Red Lot).

Greek area absolute chaos. Students drinking and disposing of all their trash on ground. Not enough trash receptacles or recycling options for those who would be interested.

Bloomington residents follow the tailgate by removing the aluminum from the disposed products on the ground and in the trash. Residents use rakes to accumulate piles of waste to sift through.

Volunteers asked to collect recyclables from ground. We collectively fill a 30-yard roll off.

A great deal of walking between the stadium and tailgating area. Very difficult to be in more than one place at a time. Setup outside gate E2 with valet. We valet 7 bikes. Setup inside the stadium outside entry 13 on the northwest side of the stadium.

The recycling bins' tops are not big enough for the 32 oz. cups used in our concessions stands. Frequently, four cups will plug all four openings making it impossible to fit anything else in the cans.

Vs. Akron**25.October.2010**

37 Volunteers registered. An estimated 30 show for the game.

Beautiful day

Beautiful day. Arrive at 1.30pm. Kickoff at 7pm. A great deal more tailgaters at this game, since it is a Saturday game. Roll-off containers not placed in the same location for this game. Invest 30 minutes finding it. Assumed it would be in the same location. Volunteers having a difficult time finding the booth, because of the change in location. Must be stationed next to the roll off to make it easier on Volunteers to transport recyclables. Stationed near the corner of 17th and Indiana south and west of the IU Credit Union. A more relaxed environment when compared with our previous location just south of the Greek area. Since the Towson game, we've decided that we don't want our Volunteers to be picking up items from the ground. It is degrading and ultimately signals to fans that we're willing to continue to pick up after their irresponsible behavior. As a result, we collect fewer items this game, but I am happy how we do it. Many fans are excited to learn we're at the game. The area within a 200 yard radius surrounding our tent is spotless after the game. Many interested fans approach our tent to inquire about our services, the free wares we're offering, etc.

A great deal of walking between the stadium and tailgating area. We valet 5 bicycles.

Recycling signs placed around the stadium for the first game are missing this week. Some are still in place, but it appears that some have been removed. Bins are no longer co-located nor are they located below their signs. Volunteers move them back, and I request they not be moved again.

Fans express an interest in being rewarded for their recycling efforts with IU football cups. Volunteers inside the stadium are asked to collect cups so we can reuse at future events to incentivize recycling efforts.

vs. Michigan**02.October.2010**

28 Volunteers registered. 15-20 show for the game.

Prior to the game I request that the roll off containers be placed in the same location for all future games. We agree on placing the containers near the corner of 17th and

Indiana, because the atmosphere isn't as intimidating for volunteers. And, it is much easier to find.

Cold, rainy day. Kickoff is scheduled for 3.30pm. Arrive 10.30am.

Sell-out crowd. Crazy atmosphere. Volunteers don't showing up because of the weather. Cellular phone not working well because of the number of people in the stadium. Have 8 messages from volunteers at the end of the day. Three trustworthy captains located at bike valet, tailgating area, and inside stadium. I serve as a go-between. Working much better. 3 bicycles valeted.

Volunteers circulate the tailgating area with clear bags for recycling and black bags for trash.

Department agrees to provide the initiative with golf carts (gators) for the final three home games.

vs. Arkansas State

16.October.2010

54 volunteers registered. 65 show for the game.

Arrived at 8.30am. Kickoff at 12pm. Tailgaters on site before us.

Beautiful day. Because this game has been scheduled for months, we were able to recruit volunteers for months, and thus have a great turnout. Three student groups work the game – SDA, Women's Ultimate Frisbee Team, and the Rowing Team. All are great volunteers! Because we have a plethora of volunteers, we place the bins outside the gates so that when fans enter the game, they can dispose of their recyclables (fans prohibited from bringing outside beverages into the game). We utilize a bicycle rack provided by Chad Roder from Pedal Power to collect recyclables from bins around the outside of the stadium. Most of the recycling containers have little contamination when placed outside the gates (and co-located with trash).

The two carts come in handy. Volunteers are able to move through the tailgating fields to collect the bags that fans have left behind. Adds to our visibility. Is much easier to move between locations with a cart. Much appreciated.

As a result of the increased number of Volunteers, we were able to move through the stands, launch the initiative to collect recyclables at the gates, and were able to keep up with the bins inside the stadium.

Jimmy and his staff have solved the toppers issue. The cups now fit within the bin tops. Seems to alleviate the contamination issue.

vs. Northwestern
30.October.2010

EPA Game Day Challenge Day - 20 Volunteers Registered. An estimated 25 show for the game.

Arrive at 8am, Kickoff at noon

Not as easy to recruit volunteers for this game compared with the Arkansas State game, since the kickoff was announced about ten days prior to the game. Still, we used our 25 volunteers well. Hoosier Disposal added several recycling containers to the tailgating fields – this greatly improved our recycling numbers for the day.

Carts still working well for the volunteers in the tailgate area. We've seen fans from previous games who stop by the GCC tent to thank us for all our hard work – helps that we're next to the Kilroy's tent. With the push for the Game Day Challenge competition, volunteers are more active and stay longer today.

In the end, we collect 6,800 pounds of mixed recycling, 1,200 pounds of cardboard, and 14,000 pounds of trash. The Sunday morning crew sorts recyclables from trash – the first time this has been done (a task conducted by Boy Scouts at Ohio University). Valeted 5 bikes today.

vs. Iowa
06.November.2010

6 volunteers registered, 9 show on game day. Sunny and cold.

Again, the low volunteer turnout was due to the late scheduling of this game. Seemed like the atmosphere at this game was nothing compared to other games. As I sat outside the stadium it was hard for me to tell there was a game going on only a couple hundred yards from me. Fan turnout in the tailgating fields and inside the stadium were low. Volunteers benefitted from again installing bins in the food areas directly outside the stadium. Co-locating bins outside the stadium is working well – both at the gates and in the alumni and fan areas. Very little contamination.

2 bikes valeted.

B. Notes from 2010 – 2011 Basketball Season

The 2010 – 2011 basketball season was an exercise in troubleshooting and re-tooling our efforts to best fit Assembly Hall, its fans, and its needs. Throughout the season, we set up Greening Cream and Crimson informational booths in the north entrance to educate fans about the new programs offered in IU Athletics and across campus. We activated volunteers at a handful of games during the season.

At the beginning of the season, we attempted to recruit volunteers to work halftimes in the stands. Based on volunteer turnout (low) and fan response (mixed), we decided to scale back our efforts in the stands. Many fans appreciated volunteer presence, but the atmosphere in Assembly Hall is much different than within Memorial Stadium – fans are much more serious and a select few expressed animosity towards the GCC volunteers, which the volunteers handled with professionalism and maturity. So, we decided to set up the informational booth at all home games and activate volunteers at the Purdue and Iowa game in the second half of the season.

For the Purdue game, thirteen volunteers registered and eight showed up for the game. Halftime efforts went well and volunteers were satisfied with the reaction. At our final volunteer event, the Iowa Game, sixteen volunteers registered and eleven volunteers worked the event. This was easily our most successful event of the season – all went smoothly and some fans thanked us for our support – saying they'd seen us during the season.

Volunteer recruitment is challenging because most games are on weeknights and compete with other student commitments. That, and the scheduling is unpredictable, unlike Saturday football games. Improved marketing of volunteer events will aid in turnout (we used the sustainability listserv, City of Bloomington Volunteer Network, Student Athlete Association, Volunteers in Sustainability listserv, SPEA listserv, Kelley undergrad listserv, and our own volunteer contact list). Establishing a student organization that serves at each game (perhaps on a rotating schedule) may help volunteer turnout.

C. Food Waste Audit – Training Tables (Kristin Cook's class's Q200 Report)

For this Inquiry 2 Project, we investigated composting in the Indiana University Athletic Department. We wanted to discover how much food and other compostable waste was being thrown away at Training Tables (the dining hall specifically for athletes). From this information we hoped to understand just how many pounds of trash could

be composted (possibly making predictions for the department as a whole) and use this information to present the idea of investing in a commercial composting machine for Indiana University's Athletic Department.

Composting is something that can be significant to everyone. It has many environmental and economic benefits. According to the US Environmental Protection Agency, composting enriches soil, remediates contaminated soil, prevents pollution, and reduces the need for water, fertilizer, and pesticides (Environmental Benefits, 2008). It helps to regenerate poor soil and treat VOCs in the environment. Composting diverts materials from landfills that can cause runoff. It also helps economically because it naturally benefits the soil and serves as a low-cost alternative to landfills and artificial soil amendments. These things in turn help to create healthier food and a better environment as a whole that would benefit anyone who breathes the air, eats food, or drinks water. Basically, there are hundreds of pounds of food and other compostable materials thrown into landfills every day.

Americans alone throw away about 21 million grocery bags full of unused food waste every year (Green, 2010). IU's Athletic Department is no exception. Whether it is game day at Assembly Hall or Memorial Stadium or dinner time at Training Tables (the focus of our study), hundreds of pounds of leftover food, napkins, and certain compostable packaging are put in the dumpster. If the Athletic Department invested in composting, it could potentially save money and help environmentally benefit IU's campus or other parts of Indiana.

To collect our data we performed a food waste audit. This means that we sorted through trash in two large dumpsters from Training Tables (the dining hall for athletes). We performed this investigation at 6pm on November 18 at Memorial Stadium with Isaac Farley. We spread a plastic tarp out on the ground to do this sorting. The waste was put into four categories: recyclables, non-meat compostables, meat compostables, and trash. Non-meat compostables included non-meat food items and certain compostable napkins, containers, and cups. Meat compostables were any food items containing any sort of meat. Recyclables included non-contaminated plastics and trash was everything else that did not fit one of these categories. After all this garbage was sorted, each category was weighed. To do that, Isaac weighed himself on a digital scale. Then he weighed himself holding each bag of waste and we subtracted his weight from that number to get the weight of the materials.

At the end of this investigation we found that there were 92.4 pounds of trash, 17.1 pounds of recyclables, 153.5 pounds of non-meat compostables, and 131.8 pounds of meat compostables. Overall, we collected a total of 394.8 pounds.

Our parameters were pretty much chosen for us by Isaac. Coming into the project, Isaac already had the investigation planned out for us so he chose the sample for us. He used the Training Tables dining hall to do this experiment because it is a contained area of the Athletic Department rather than simply sampling random dumpsters from all over the department. There are charts expressing our findings in a bar graph and pie chart form at the end of this document (Table 1 and Figure 1).

Looking at this graph, you can see that well over half of the waste could potentially be composted. We found that a good majority of the waste would not have to be thrown away if it were being composted.

From the data, there is one main inference we can draw. That is, that a composting machine for the Indiana University Athletic Department could be very beneficial. 285.3 of the 394.8 pounds of waste collected could be composted. This would mean 285.3 pounds more towards creating fertilizer to better the soil and 285.3 pounds less in landfills, therefore reducing runoff that contaminates our water. This is a high number that if it was put in a more useful place could really help benefit the environment. It was only from one days waste at one dining hall. Theoretically, a composting program could be an even greater opportunity when you consider the Indiana Athletic Department as a whole. If there was a composting machine for the whole department, it could receive waste from departmental office buildings, Assembly Hall, Memorial Stadium, other athletic complexes such as volleyball, baseball, or soccer, and tailgates. Especially at football and basketball games and during tailgate, there is an enormous amount of waste produced, much of which could potentially be composted. The 285.3 pounds of compostable material could sore to the thousands with the whole department involved.

While all this data seems quite impressive and appears to provide solid facts to back up a proposal for a composting machine, there are some drawbacks. First of all, this experiment would likely need to be repeated several times. It is possible that the 394.8 pounds of waste from Training Tables was not an average number. It could have been an exceptionally high or low waste day. The only way to find this out would be to do this investigation a few more times and find an average number. The idea of a composting machine is something that has to be backed up with a lot of accurate, supportive data because of the cost. An industrial sized composting machine could cost close to a million dollars. It would be more expensive if the department purchased a machine that composted meat. We figured that if the Athletic Department investing any money into something like this, they might as well get the best of the best and one that can compost as much as possible.

There is really not a lot of published research to which we can compare our data. Composting on a large scale is a relatively new idea that is only starting to be implemented for large amounts of trash. Home composting is something that is much more popular because of its low cost. An entire composting system and composting machine for a large university is still rather expensive. Most universities do not have such a program. The University of Vermont, however, collects approximately 4.96 tons of compostable waste every week (Composting Food Waste, 2008). Their situation is different from the proposed idea for IU in that there is already a composting plant near the university to which this waste is sent. They did not need to invest in a machine themselves. Our data cannot directly be compared to this because this project is still in the very early developmental stages and is not yet something actually implemented on campus, but it could give us a good idea of the potential figures we could be seeing.

We did have one interesting observation that was not directly related to our research question. We were astounded at the amount of packaged, unopened food that was thrown away. There were hundreds of packets of unopened meat and entire cakes. While this was not a focus of our study, we do not have a specific weight of how much this was, but from simple visual observation, it may imply that the dining hall is over-buying food and much of it goes to waste every day.

On a larger scale, this basically means that there is great potential to getting a composting machine and that it could be very beneficial. With more investigations involving food waste audits and observing what is thrown away, I think that Isaac and the rest of the sustainability team could have very good ground for proposing a composting machine for the athletic department. If data from more research turned out as predicted, then there is no way to deny that a composting program would be beneficial except on the basis of cost. There is a solid argument, however, that the benefits received from composting outweigh the cost of a machine. Composting could help improve local soil, keep waste out of landfills, reduce water and fertilizer costs, prevent pollution, and treat harmful VOCs.

There were a few limitations with this experiment, the first being time. To be able to complete this investigation on time, we had to have our data collected before Thanksgiving break. By the time we were actually able to receive approval to perform the experiment, we could only do one food waste audit. Our data can likely give us a rough estimate for how much we could be composting, but multiple trials always make the data more accurate. Another limitation is that we only took a sample of the trash. We obviously could not go through every dumpster in all of Indiana's Athletic

Department; that just is not practical. Our dumpster can help us to make predictions, but we would have to assume similar results from other dumpsters. A third limitation is human error. There were a few instances while sorting through the trash in which we really could not separate the different items. For example, we did not sort the grains of rice from some of the chicken and therefore it was put in the “meat compostables” pile.

In future studies, some of the limitations could be addressed. The biggest drawback of this investigation was the time. Had we been conducting this experiment over a much longer period, many of these limitations would improve. Theoretically food waste audits could be conducted in multiple places throughout the Athletic Department and more than one audit in each place. Overall, if this was conducted over a longer period of time, we could gather more data that could help us get more accurate numbers of waste that would help to back up our reasoning for a composting machine a little bit better.

Table 1. Waste collected in Training Tables in 24-hour period (November 2010).

Total Waste Collected from Athletic Dining Hall in Pounds

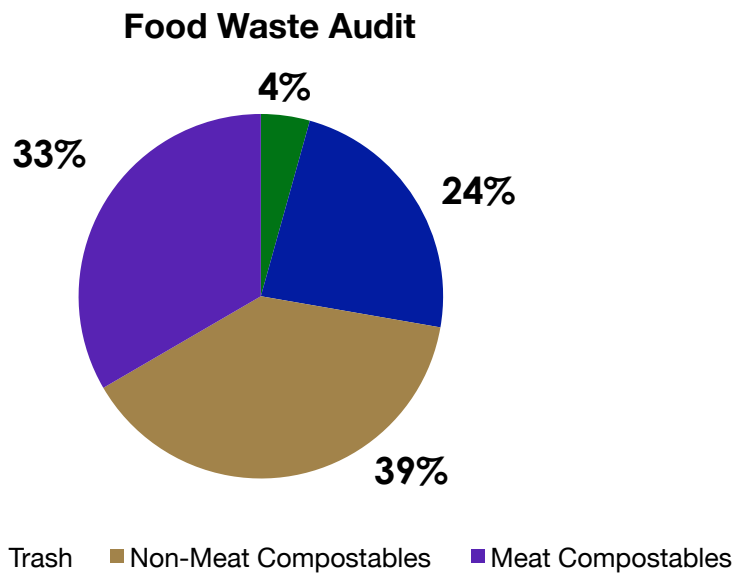
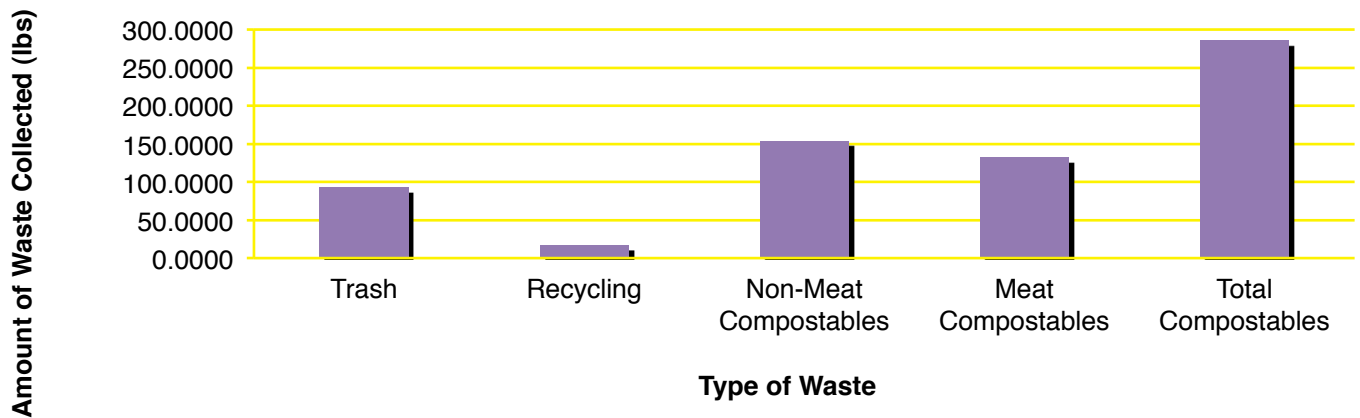


Figure 2. Ratio of Waste collected in Training Tables dining hall (November 2010)

Works Cited

- The University of Vermont. (2008). Composting Food Waste. Retrieved November 29, 2010, from <http://www.uvm.edu/~recycle/?Page=Composting/Composting.html>
- US Environmental Protection Agency. (2008). Environmental Benefits of Composting. Retrieved November 24, 2010, from <http://www.epa.gov/osw/conserve/rrr/composting/benefits.htm>
- Green, R. (2010). Astonishing Facts About Compost, Waste, and Landfills. Retrieved November 24, 2010, from <http://www.greensustainabilitycoach.com/astonishing-facts-about-compost-waste-landfills.php>

D. IU Athletics Printing Study 2011

Introduction

The purpose of this section of the report is to provide information on spring semester 2011 study conducted on printers in the IU Athletics' Computing Services department and the food waste audit conducted in November 2010.

Methodology

Early in our process, we made contact with Troy Chastain (IU Athletics), Bill Creech (Xerox), and Susan Coleman Morse (University Information Technology Services (UITS)) about studying machines housed in Assembly Hall. Within Assembly Hall, we were interested in comparing the energy consumed, jam frequency, and paper used over a four-week period by printers set to a simplex default versus a duplex default¹.

With the assistance of Troy Chastain, we first identified three printers to study over an eight-week period. We decided to monitor only three machines due to complications involved in getting entire departments to participate in an eight-week study during busy athletic seasons. Also, and more importantly, only a portion of printers within IU Athletics have the capability to print duplex. Collectively we identified three printers to monitor – one in the compliance office, concessions, and marketing. The supervisors in the areas where these printers were located were contacted early in the process to

¹ Combined eight-week study, four defaulted to simplex, four defaulted to duplex

explain the importance and logistics of the study, and to gauge their willingness to participate. All kindly agreed to participate in the study, and thus have their printing totals, energy consumption, and jam frequency monitored for eight weeks and also have the participating printer default settings (from simplex to duplex) altered for four-weeks in March.

After further inspection, the printers in compliance and marketing did not have the duplexer installed, so we were unable to include them in the study. Instead, we monitored the concessions' printer and two printers located in Computing Services. All users were notified in advance of the pending study and encouraged to contact Troy Chastain or me, if they had further questions or concerns.

Kill-a-Watt energy meters were installed on the three machines (an HP Color LaserJet CP 6015 in Computer Services used as a central printing point for several departments, an HP LaserJet 4350 in Computer Services used for Computer Services printing only and an HP LaserJet 2300 in Concessions) on February 4, 2011. Usage pages, providing information on printing totals of each machine at installation of the Kill-a-Watt Meters, were collected, and Kill-a-Watt meters were installed and the staff in each office was given a brief tutorial on how the energy meter was used.

After the first four-week period, we returned to the participating machines on March 4, 2011, interviewed the users, and collected a usage page and energy reading on each machine. Then, with the aid of Troy Chastain, the printers' default settings were altered from simplex to duplex. Users were reminded in person that the printers would default to duplex for the following four weeks. To be thorough, the department, as a whole, was sent a reminder via email. The energy meter was reset to zero for the second-half of the study. The usage page was filed along with each machine's energy reading.

At this time, we learned that the HP LaserJet 4350 machine had been replaced abruptly due to machine error and energy, jam, and paper consumption readings had not been recorded prior to replacement. Thus, we removed the energy meter from the replacement and instead included it in a printer study in IU Chemistry.²

Three weeks later, on March 25th, the final two Kill-a-Watt meters were removed from the HP 6015 and HP 2300 printers, so that we could include the energy meters on IU

² Primarily because there was a shortage of energy meters on campus at this time and also because we did not have the time to restart the study on a different printer

Chemistry printers.³ At the time of the removal, we again interviewed users, recorded readings from the energy meters, and printed usage pages from each machine. Troy Chastain then provided us with error logs (jam frequency) for the HP 6015 for our study period. The HP 2300 does not have the capability of printing an error log, so we used the interviews of end users as our proxy for error logs (jam frequency) on this machine. Since the second-half of the study only ran for three weeks, the results have been adjusted to reflect a per day (in the case of jam frequency) or kilowatt-hours (KwH) consumed (in the case of energy consumed) total, so that we can more easily compare the first (simplex default) twenty-eight-day totals with the second (duplex default) twenty-one-day totals.

Results and Discussion

The results of the seven-week study in IU Athletics indicate that user behavior is an important variable to consider in studies measuring printing. The printers were measured at a simplex default (the standard default within IU Athletics and at IUB) throughout the month of February. During this time of year, the department prints a great deal of materials for the close of the basketball season, and users indicated that we could expect to see greater all-around printing totals in February than we could in March. The users in each department were correct (Tables 3 and 4).

Furthermore, as more pages are printed, the electricity consumed per page decreases. Based on the results of the HP 2300 machine, the printer consumed nearly as much electricity per day when it was printing 48.7 pages per day as it did when printing nearly half that total (28.8 pages per day). This indicates that printing is not the major determinant of electricity consumption in this department. Based on interviews, the HP 2300 is not powered down at the end of business days. Additionally, the HP2300 had no jams over the seven-week study and printed zero duplexed pages. Users explained that they could not remember the last time they had printed a document that exceeded one-page in length. Nearly all of Concessions' printing is one-page invoices. Over the life of the printer's 101,369.7 pages printed, only four have been duplex.

Similarly, within Computing Services, we found that during the first-half of the study the HP 6015 printed nearly five times the amount of pages when compared with the second-half of the study (Table 4). Unlike the HP 2300, the HP 6015 is powered down at the end of each business-day, yet the machine does see a drop in kilowatt-hours consumed per page when set to simplex largely because the vast majority of

³ Again, we decided to remove the Kill-a-Watt Meters in Athletics due to the shortage of energy meters on campus, and because the IU Chemistry study had become a priority

electricity dedicated to the machine keeps it powered on throughout the working day. An increase of an average of 456.9 pages printed per day over the two study times is only responsible for a 0.41 Kw/h consumed per day increase. This again suggests that the majority of the energy dedicated to this machine is in keeping it powered throughout the business-day.

We observed an increase in jam frequency when the printer was set to duplex default, but interestingly, the number of duplex pages printed per day during the simplex portion of the study was over 150 times the average number printed per day when the machine was set to duplex, suggesting that duplex printing may not be the cause of jams in the second-half of the study.

Table 1. Comparison of paper consumed, electricity used, and jam frequency of an **HP 2300** (housed in the Concessions department of IU Athletics) when printer defaulted to simplex versus when defaulted to duplex.

Default Setting	Pages Printed per Day	Duplex Pages Printed per Day (% of total)	Kilowatt / Hours Consumed per Day	Kilowatt / Hours Consumed per Page	Jams per Day	Jams per Page
Simplex	48.7	0 (0%)	0.25 Kw/h	0.00519	0	0
Duplex	28.8	0 (0%)	0.24 Kw/h	0.00839	0	0

The research team also observed an increase in jams with additional printing, but the frequency of those jams was still less than one jam for every 1,700 pages printed for the first-half of the study, and one jam for every 650 pages printed for the second-half of the study. Overall only thirteen errors (jams) were recorded over the seven-week study.

Based on discussions with technicians across campus,⁴ the general consensus is printer performance wanes as the number of pages printed and age increases. That is, generally speaking, the older the machine, the more maintenance must be performed on it. Age is merely one of the many variables that must be considered when attempting to gauge whether duplex printing is more efficient, and thus preferable to simplex printing. Furthermore, it was impossible for us to determine causation in this study. Error logs do not explicitly inform the research team whether the failure was caused by a duplex feed.

⁴ Troy Chastain, IU Athletics; Mathew Decker, UITS; Scott Harrington, IU Chemistry

Table 2. Comparison of paper consumed, electricity used, and jam frequency of an **HP 6015** (housed in the Computing Services department and used a central printing station for multiple departments) when printer defaulted to simplex versus when defaulted to duplex.

Default Setting	Pages Printed per Day	Duplex Pages Printed per Day (% of total)	Kilowatt / Hours Consumed per Day	Kilowatt / Hours Consumed per Page	Jams per Day	Jams per Page
Simplex	582.2	182.3 (31.3%)	1.92 Kw/h	0.00330	0.32	0.00052
Duplex	125.3	1.2 (0.9%)	1.51 Kw/h	0.01209	0.19	0.00152

Other, more thorough studies performed by other institutions (e.g., University of Michigan) suggest that newer technology performs duplex printing with increased efficiency and speed (one complaint of older machines). If departments are willing to test new default printing settings, and if errors or jams occur with similar frequency, there is reason to believe that duplex settings may result in reduced paper consumption, a mitigated carbon footprint, and a real cost savings for IUB and its many departments.

Recommendations

We recommend that the department conduct a cost analysis (Table 3) of the IU Athletics' printers with respect to ink/toner consumption to determine the cost per page currently being incurred for each printer.⁵

One of the more important issues we learned from conducting this research is the central role a formal test structure could play in future studies. We believe the formalized structure would benefit from exemplary research team / end user relationships and vice versa. Both the research team and end users have information that benefits the other, and thus an open, trusting partnership is the cornerstone for successful projects.

We also understand that such a collaborative environment may appear threatening to some individuals or entire departments. An agreed understanding that change is challenging for all involved parties will aid the investigative partnership. But, at no time, should individuals' preconceived notions dissuade their desire for objective results. Cultivating a relationship of this nature takes time, which is not always at a premium at

⁵ This study will actually begin May 2011

IUB, so we again realize there are limitations to our recommendations. With this in mind, we present an eight-step general formal printing test structure (with examples from our own research) for collaboration on campus followed by a more specific test model for future use.

These steps may seem time intensive to those who have never performed such tests, but in actuality the design of the tables likely took about the same amount of time as performing many of the steps. Conducting a thorough and strong print study should not be timely or overly complicated, instead it should be considered a collaborative effort to gain information that will aid departmental decision-making.

Conclusion

One way departments like IU Athletics can improve is by communicating and sharing information. Throughout the process we were continually reminded of the need for departments to reach out to one another. We believe that formalized test structures and general sustainability-related prompts or savings tips housed and distributed by Athletics' Computing Services and UITS could go a long way to reducing costs through smart, "green" practices.

Table 3. The "General Formal Printing Test Structure" outline as determined by the duplex printing group's research.

General Formal Printing Test Structure	
1. Conduct thorough background research:	In this project we read previous studies conducted at IUB, met with sustainable computing leaders on campus, and read reports from other institutions
2. Identify end users or departments on campus who may be receptive to and/or benefit from the study being conducted:	We sought collaboration with IU Athletics, because we felt our findings may improve decision-making on expenditures, thus alleviating departmental costs.
3. Meet with identified end users and departments:	clearly explain the study and its goal
4. Set-up clear schedules for the project with consistent, intermediary check-ins	
5. Know what you are doing and ensure that those with whom you are collaborating know what you are doing:	This begins with Step 1 and is reinforced throughout, but researchers should have a clear understanding what they are measuring and how to get the data they require. This should also be communicated to end users and partner departments. Each individual's role in the project should be explained and each individual should be reminded that they are a crucial element in the project
6. Be consistent and check all readings twice:	Similar to Step 4, but this is specific to the study itself. In Athletics, install or read the Kill-a-Watt energy meter and gather a usage page from each printer - giving us detailed data on pages printed-to-date. Follow this by printing a detailed error logs over the time period being studied
7. Engage end users and department members:	Discussions or interviews with staff members throughout the process provide key details to the research being conducted. By listening, we learned about the many variables that must be considered during our study
8. Share results and request feedback from end users and partner departments:	Results from the study have been shared with Computing Services, and are being used to design an ink/toner cost analysis study beginning in May 2011 (Table 4)

Table 4. The "How to Test a Printer" outline as determined by the duplex printing group's research.

How to Test a Printer

- 1. Assemble an objective team willing to monitor the device and give the team the authority to effectively monitor the machine for a pre-approved length of time**
 - 2. Schedule time to learn the various functions of the printer - Ideally when users are not present – This may be at the end of the business day or over holidays in, say, a Student Technology Center (STC)**
 - 3. At the beginning of the test: a) Print usage pages; b) Install Kill-a-Watt energy meters; c) Print error logs; d) Design jam reporting sheets, so users can report jams – the more detailed the better; e) Train users and/or technicians to report jams, read energy meters, and print usage pages**
 - 4. Notify users of the test and set clear schedules for consistently monitoring machines – Again, an ideal time to take readings is when users are not present**
 - 5. Communicate objective goals of test in an unthreatening manner. Make concessions were necessary. (e.g., "We know this may mean an increased work-load in the short term, but our goal is to improve user experience and gain an understanding of our true costs)**
 - 6. Take peripheral readings – Not all studies measure toner/ink, but some should, so Step 3 should be repeated when new cartridges/drums are installed. When the toner/drums are replaced Step 3 should again be repeated. Then, the results should be analyzed for true costs and paper coverage (by ink/toner). This will provide true cost per page totals.**
 - 7. Analyze the results**
 - 8. Share results and request feedback from end users and partner departments**
-