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An Environmental Sustainability Assessment of Taylor University

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AN ENVIRONMENTAL SUSTAINABILITY ASSESSMENT OF TAYLOR UNIVERSITY

by

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Abstract

This is a master's thesis project for the Department of Environmental Science at Taylor University in Upland, IN. It is focused on sustainability which requires considering the social, economic, and environmental impact of actions on future generations. The three main questions being addressed are: 1.) In what ways is Taylor University practicing environmental sustainability? 2.) What is the best way to judge the sustainability of Taylor? 3.) What should Taylor do to become more sustainable? This paper consists of a literature review, a description of the problem being addressed, a review of similar studies, and assessment methods, the actual campus sustainability assessment, and a conclusion. The assessment is divided into main sections of operations, administration, people, and finance. Most of the emphasis is on operations which includes nine main categories: carbon emissions, energy, transportation, water, waste, dining Services, built Environment, landscaping, and purchasing. The goals of this project are to provide data for benchmarking and to significantly improve the sustainability of Taylor through this first initial campus sustainability assessment and report.

Key words: sustainability, Taylor, university, campus, environmental, assessment

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This project would not have been as successful without those who assisted with the assessment. In the fall semester of 2008 one of Dr. Don Takehara's introductory chemistry class at Taylor did some of the initial legwork for a carbon emissions inventory. This was the focus of a thesis project performed by Derek Rosenberger. Then in the spring of 2008 Nathanael Davis, Jorjette Heid, and Adam Wolken teamed with me in forming a preliminary campus sustainability assessment as a semester project in Dr. Michael Guebert's Environmental

Planning course. Most recently, the lovely Kristin Goldman provided many hours of data entry research assistance.

Sustainability assessments, which require information about a broad range of university operations and management, are dependent on the cooperation of many individuals. The list of those who provided guidance, data, or their stories is much too long to include here. However, special recognition goes to Mr. Greg Eley, Taylor's Facilities Services Director, who went beyond verbal support for this assessment by answering many questions and providing much of the information in this assessment. He is already working hard to improve Taylor's sustainability, preempting several specific recommendations that I had planned. A list of all those who supplied information is located in Appendix F.

Finally, I want to thank God for creating such a wonderful world that is worthy of our respect and protection. His Word is the source of my passion for the environment and has supported me throughout this endeavor. I am also grateful to my friends and family for their support throughout my graduate studies.

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I. Executive Summary

This paper is the culmination of a master's thesis project for the Department of Environmental Science at Taylor University. Its primary focus is an environmental sustainability assessment of Taylor. It includes a description of sustainability and its significance, explanation of why Taylor should be concerned with sustainability, background information on sustainability assessments, results from the sustainability assessment of Taylor, and recommendations. The main sections of the assessment are administration, people, finance, and operations. The ultimate purpose of the assessment is to significantly improve the sustainability of Taylor by making sustainability a relevant concept in university planning and daily decision making. It provides a sustainability benchmark by which to measure future progress.

A. Sustainability Defined

Humans are consuming resources at a rate that increasingly exceeds the carrying capacity of the earth. The recent popularity of the idea of sustainability is a result of that realization. Sustainability or sustainable development is most often defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). It has three main dimensions; social, economic, and environmental sustainability; which are known as the "triple bottom line" (Elkington, 1997 cited McNamara, 2008; Velazquez et al., 2006).

B. Sustainability at Taylor

Sustainability should be an important topic at Taylor University for a number of reasons. Sustainability is an important area of study and operational goal in higher education because colleges and universities are microcosms of society, are large and long-lived, and have huge impacts on their

environment. Another justification is the moral obligation of educators to guide students in becoming constructive citizens willing and able to address society's modern environmental challenges. Some of the benefits of supporting sustainability dialog and initiatives on campus are to prepare students to live and work sustainably, to increase efficiency and decrease operational costs, and to reduce ecological footprints. Taylor's status as a Christian university also provides compelling reasons to be concerned with sustainability. These include the biblical mandates to care for God's creation, to be good stewards of resources, and to love one's future neighbors. With an understanding the importance and benefits of sustainability, it is possible to measure progress in applying sustainable practices. Realization of all three dimensions of sustainability can be determined using a campus sustainability assessment described below.

C. Developing and Implementing a Campus Sustainability Assessment

In order to improve campus sustainability it is helpful to have quality measures of current sustainability progress. Indicators are those measuring instruments used to gain objective knowledge about a specific aspect of sustainability, such as the percentage of waste diverted from the landfill. Indicators are grouped together to form audits or assessments; the first example of which was the campus sustainability assessment (CSA) conducted at UCLA in 1989. Some of the benefits of CSAs include enhancing a university's image, cutting its costs, teaching its students about environmental management, and developing environmental policies (1995 cited Velazquez, 2006). The main purpose of the CSA project presented in this paper is to determine in what ways Taylor University is currently practicing environmental sustainability. The creation of the CSA began with development of an assessment framework using a top-down approach to describe what impacts the sustainability of a university and the identification of indicators to measure those

features. That process relied heavily on what had been used in other successful assessments. The data for those 113 indicators were gathered from many university stakeholders. The results were compared to 18 comparable colleges and universities: Asbury University, Bethel University, Calvin College, Earlham College, George Fox University, Gordon College, Goshen College, Greenville College, Houghton College, Malone University, Messiah College, Northland College, Seattle Pacific University, The Evergreen State College, Trinity International University, Unity College, Westmont College, and Wheaton College.

D. Assessment Results

Using the triple bottom line, the CSA was organized into three sections: people, finance, and operations. General institutional information and administrative indicators are used initially to put the assessment in context. Taylor University is a small, residential, interdenominational Christian liberal arts university in Upland, Indiana. During the fall semester of 2009 there were 1,895 full-time students and 97 part-time students in attendance. 1589 students lived in university housing, with 1439 of these students living on-campus (Dayton, 2009). They are accompanied by the full-time equivalent (FTE) of 170 faculty members and 362 staff (IPEDS, 2010).

1. Administration

Taylor has a solid sustainability foundation that should allow for continued improvement. All three dimensions of sustainability are incorporated in the university's guiding statements with the related word "stewardship" included three times. Most of these instances refer to the education of students, including a paragraph on "Responsible Stewardship" as one of the eight characteristics that the general education curriculum is intended to develop in students. Taylor is an active member in the Association for the Advancement of Sustainability in Higher Education (AASHE), but has not yet signed the American College and University Presidents' Climate Commitment

(PCC). In comparison, of the eighteen benchmarking institutions, nine are AASHE members and seven are PCC signatories. Internally, Taylor has a Sustainability Committee and a Sustainability Coordinator, but both were new in 2010 and have not yet been able to achieve any major accomplishments such as implementing a Climate Action Plan.

2. Social Sustainability

Indicators of social sustainability focus on enrollment statistics, sustainability as a learning objective in the curriculum, and people's perceptions of the importance of sustainability. Taylor sustains its enrollment with an average freshman retention rate of 87.3% and an average six year graduation rate of 76.8% (IPEDS). Out of the eighteen benchmarking institutions cited above, Taylor has the third highest graduation rate after Wheaton College and Bethel University. No classes focused specifically on sustainability are offered at Taylor, but approximately 130 students enroll in introductory environmental science courses that satisfy general education requirements and address related issues. Bachelors and masters degrees in environmental science are also offered. One institutional survey question addresses the importance of "becoming involved in programs to clean up the environment." Only about 3% of freshmen have strongly positive responses, but that number increases to about 20% by their senior year. These gains are comparable to those at other private colleges, although Taylor students enter with a significant 10% lower rate of interest in the environment (Higher Education Research Institute, 2010).

3. Financial Sustainability

Taylor's financial sustainability is grounded by the $63,482,000 socially-responsible endowment, which is near the median of peer institutions. The operating budget for the 2008-2009 fiscal year was slightly less than the endowment at $57,521,907. Many other schools have been successful at setting up funds for sustainability projects, but Taylor has not yet done so.

4. Operational Sustainability

All aspects of the day-to-day functioning of a university, from washing dishes to purchasing paper, impact its sustainability. The summation of these activities can have a substantial impact on the local and global environment. The categories of operations are carbon emissions, energy, water, transportation, purchasing, waste, dining, built environment, and landscaping.

a. Carbon Emissions

The climate impact from greenhouse gas (GHG) emissions is one of the most important categories of indicators of the sustainability of any institution. In 2009 Taylor was responsible for the release of the equivalent of 17,711 metric tons (MT) or over 19 million pounds of carbon dioxide. That is 9.6 MT per student, 35.4 MT per employee, 19.4 MT per thousand indoor square feet, or 0.31 MT per thousand dollars of operating budget. The off-site generation of electricity, nearly all of which comes from the combustion of coal, results in 54% of these emissions. The heating of buildings and water using natural gas results in another 12%. Other significant contributors are study-abroad and Lighthouse mission trip travel (22%), employee commuting (4%), university fleet use (1%), and faculty air travel (1%). This total amount of emissions could be offset by taking 3,386 passenger cars off the road for a year; powering, heating, and cooling 1,507 homes; or not burning 92 railcars full of coal (US EPA, 2010a). Among other baccalaureate colleges that have undertaken a GHG inventory Taylor is 6% above the average for emissions per student and 27% above for emissions per square feet. Yet, compared to six other Indiana universities that use a similar electricity fuel source Taylor scores slightly below the average. It is also interesting that study-abroad trips at Taylor generate over three times the average emissions of all air travel at other baccalaureate universities.

b. Water and Energy

Water, natural gas, and electricity represent over two-thirds of Taylor's carbon footprint and a substantial $1,650,000 of its annual operating budget. Potable water and waste water treatment are provided by the town of Upland which sources its water supply from three wells about a mile from campus. Taylor's water usage dropped by 29% between 2004 and 2007. Since then, usage has remained nearly constant, but the price has increased dramatically. Natural gas is used primarily in heating buildings, which is highly dependent on weather and the amount of area being heated. There are no trends in natural gas usage in the last decade, but electricity use increased consistently until dropping off somewhat in 2008. Yet, the total cost of electricity is still rising. These utilities are essential to the university's operation, but also provide many opportunities for conservation and improvement through efficiency. A way that the Facilities Services department is making improvement is by creating purchasing standards that require that all new water fixtures are low-flow and that new classrooms and restrooms have motion-detecting switches. The Information Technology department is also working to reduce electricity demand by purchasing Energy Star labeled computers and printers. However, conserving energy and water requires both efficient fixtures and conservative use, but there has not yet been enough emphasis on student and employee behavior change to reduce such usage.

c. Transportation

Transportation is another important component of university operations that affect the environmental sustainability of the university because most of it depends on petroleum-based fossil fuels. Unfortunately, transportation is difficult to measure because of its many different modes and purposes. The typical emphasis on tracking financial, but not distance or fuel, data also complicates these efforts. Taylor maintains a fleet of 83 vehicles, of which the 65 road vehicles traveled over 583,000 miles in 2009. Faculty also drove 31,402 and flew 196,493 miles for professional

development. International student travel for off-campus programs had an even larger footprint of over 5,000,000 air miles in the 2008-2009 academic year! This level of international travel is much higher than the national average due to Taylor's emphasis on "global engagement." Another important type of transportation is employee commuting to campus. This is relatively easy to improve for over half of Taylor's employees who live in the town of Upland by carpooling, walking, or biking. Survey results show that approximately 79% of employees come to campus every day, 77% do so by car, 12% by walking, 5% by biking, and 2% by carpooling (CHE 100 and Rosenberger, 2008).

d. Purchasing and Waste

The amount of waste generated is a great indicator of the sustainability of an institution because much of it comes from nonrenewable sources and ends up in a polluting landfill. In 2009 Taylor sent 384 tons of solid waste to the landfill. Only 20% of the total solid waste was diverted from the landfill including 76 tons of paper, 16 tons of metal, and 0.3 tons of plastic. Indicators of sustainable purchasing go hand-in-hand with waste. An important way that Taylor employees are working to diminish this amount of waste is by reducing the quantity of paper products used on campus. Through several printing and mailing reduction efforts the university Print Shop was able to reduce the amount of paper used by 43% (12 tons) between 2004 and 2009. Nearly all of the paper still purchased carries a sustainable forestry certification, with 26% meeting the stringent requirements of the Forest Stewardship Council (FSC). The university also plans to replace nearly all paper towel dispensers on campus with high speed hand driers. Currently 20.5 tons of paper towels are being used and discarded every year.

e. Dining

Dining halls are a hub of consumption on college campuses, not only of food but also utilities. Taylor's Dining Commons (DC) consumes the most water of any campus building, the second most electricity, and more than twice as much natural gas as any other building. Fortunately, some improvements are being made, with the most success occurring in reducing water usage by over 50% from 2004 to 2010. The DC and Grille both provide vegetarian options, but no certified organic meals. Taylor should emulate the more than one hundred schools that provide local, organic food while educating students by operating a campus garden (Valluri, 2010). Unfortunately, not all of the food served in dining halls is consumed. At Taylor this results in the DC also being the largest campus generator of trash with 95 tons hauled off in 2009. Creative Dining Services, which operates Taylor's dining services, has a promotional sustainability program called "Grow." Taylor's minimal participation results in the supply of some specific foods meeting the following categories: "earth friendly, go local, hormone-free dairy, natural protein and sustainable seafood" (Creative Dining Services, 2010). The main hurdle to further improving the sustainability of food service at Taylor is the silence of the student body on these issues.

f. Built Environment

The most exciting topic within the built environment is new construction. This is because Taylor recently broke ground on a 137,000 square-foot, $41.4 million science building. The Euler Science Complex was designed to meet the silver level of Leadership in Energy and Environmental Design (LEED) certification. A neat feature of this building is that a portion of its power will come from nearby wind turbines and solar panels. This project also marks the first building-wide attempt to improve indoor air quality by using products that will not emit volatile organic compounds. This building will add to the 29% of the 285 acre campus that is covered by impervious surfaces.

Besides buildings, this also includes roads, sidewalks, and parking lots that must be cleared every winter by the plowing of snow and the spreading of a staggering 30 tons of ice melt.

g. Landscaping

The final category of operational sustainability is landscaping. Sixty percent of the campus is covered in lawns which are maintained with the use of irrigation, fertilizer, herbicides, and pesticides which are applied when the grounds supervisor determines they are necessary. In addition to the main campus, Taylor has a 145 acre arboretum which is mostly forested, a 20 acre prairie restoration project, and 680 acres of land that were acquired in 2007. This new land holds many possibilities for Taylor community members to improve their environmental sustainability with projects such as planting trees on old fields to sequester carbon or starting a community garden to provide local, organic food.

E. Conclusions

In summary, Taylor is within the mid-range of comparable benchmarking schools on most of the quantifiable indicators used in this CSA assessment. This is an exciting time for advances in sustainability in Upland because of the possibilities offered by the completion of this, the first CSA, and by the hiring of a fulltime sustainability coordinator. Although Taylor is stable economically and socially, our societal model that depends on consumption and resource extraction make it very important for Taylor University to enthusiastically pursue sustainability.

F. Recommendations

When considering recommendations it is important to remember that the best way for Taylor to create positive change in the world is through what it teaches its students, while also

recognizing that sustainable behavior is sometimes best taught by example. The following are some of the main recommendations from this assessment:

1.) Hire a Sustainability Coordinator (this occurred while the assessment was taking place).
2.) Write and implement an energy policy which will include expectations in such areas as indoor temperature, computer use, and appliance efficiency.
3.) Demonstrate the financial benefits of sustainable improvements by performing equipment upgrades to improve efficiencies.
4.) The university recycling programs should be rejuvenated and a year-end donation program should be added.
5.) Celebrate existing sustainability efforts by communicating them with the Taylor community to generate momentum.
6.) Having completed a GHG inventory and CSA, Taylor University is now positioned to take a next formal step by asking President Habecker to sign the Presidents' Climate Commitment and commission a climate action plan.

G. Recommended Reading

The following is a condensed list of recommended readings on the topics discussed above selected from the literature cited section of the full report.

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Yli-Viikari, A. (2009), "Confusing messages of sustainability indicators", *Local Environment*, Vol. 14 No. 10, pp. 891-903.

II. Introduction

More than ever before, modern humanity faces challenges that threaten its uninterrupted existence. Many of these issues stem from the relationship of humans to our environment. All informed citizens at least know about some of the dangers that are ahead of us, such as species extinction, dwindling natural resources, water scarcity, and accumulation of waste, pollution, degradation of ecosystems, land use issues, and global climate change. All of these issues have personal, political, and economic consequences (Orr, 2005).

These problems are increasingly being addressed by citizens, organizations, industry, institutions, and governments. The threat of global climate change has especially brought diverse groups together to forge and implement mitigation strategies. In developed nations such as the United States, the shift from these issues being the focus of speculation, apathy, or distant concern to being at the center of a scientific and political international conversation occurred over only the past few years (NWF 2008). Although we are still far from developing and implementing full environmental, social, and economic solutions to most of the worst problems, new paradigms and technologies are being developed to help us solve them.

III. Literature Review

A. Sustainability

One pragmatic and philosophical shift is toward sustainability. Almost everyone agrees that sustainability is a good thing, although not all can define it (Allen and Hoekstra, 1992 cited Bell and Morse, 2008, p. 3). By 1991 the related phrase "sustainable development" was already a slogan for activists, the favorite maxim of NGOs, and the theme of many conferences (Lele cited Bell and Morse, 2008, p. 3).

It can be argued that some of the popularity of the terms "sustainability" and "sustainable development" are direct results of their lack of firm definitions (Bell and Morse, 2008, p. 12). This allows the word usage to be whatever best supports one's current position. Author Michael Pollan goes as far as to say, "The word 'sustainability' has gotten such a workout lately that the whole concept is in danger of floating away on a sea of inoffensiveness" (2007 cited Breen, 2007). On the other hand, some argue that "strait-jacketing" such a complex concept with a firm universal definition would not be beneficial (Bell and Morse, 2008, p. 11). For better or for worse, most universities employing the term never define it for their situation, and in the literature it goes undefined in over 90% of documented articles (Velazquez et al., 2006).

The term "sustainable development," the precursor to the generalized "sustainability," was first used in the 1970s (Barlett and Chase, 2004, p. 6). It was formed from the loose joining of six fields of thought: holistic biosphere, environmental resources, ecological carrying-capacity, critique of technology, no or slow growth, and eco-development (Kidd, 1992 cited Bell and Morse, 2008, p. 6). The most cited definition is: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). Other similar definitions are more applicable to non-developmental situations, "the long-term availability of the means required for the long-term achievement of goals" (VanPelt et al., 1990 cited Bell and Morse, 2008, p. 85). In industry this can be applied to assuring continued access to capital for developing future products for sale, in education it can be the training of new instructors to continue teaching students, or at a national level it can refer to conservation of natural resources to improve the standard of living of future citizens. To put it as simply as possible, sustainability means "not cheating on your kids" (Bell and Morse, 2008, p. 10).

Although generally not included in definitions, sustainability includes three main dimensions, originally developed by Elkington as the "triple bottom line" (1997 cited McNamara,

2008; Velazquez et al., 2006). The three mutually dependent dimensions are social, economic, and environmental sustainability; sometimes simplified further to the three P's: people, profit, and the planet (McNamara, 2008, p. 22). Others state it slightly differently by writing, "Sustainability is characterized by economic growth based on social justness and efficiency in the use of natural resources" (Alshuwaikhat and Abubakar, 2008). All three elements are always necessary, but it is often most useful to focus on those that have been historically most neglected. For example, businesses that are adept at long-range fiscal planning are now being asked by shareholders and customers to also address social and environmental sustainability evident in resource use, pollution, and workplace health. In the developed world, since environmental concerns are usually the most ignored, much current emphasis is on shifting societal processes toward environmental sustainability. As a result, a common perception is that sustainability is strong if it focuses on environmental and ecological concerns, but it is weak if it relies only on economic cost-benefit analysis (Bell and Morse, 2008, pp. 13-4). This perception is similar to, but not the same as the true economic definitions of strong and weak sustainability. Strong sustainability requires that natural capital stocks do not decline. Weak sustainability requires that future generations are given the opportunity to have the same level of well-being by maintaining a constant or increasing capital stock that includes natural and man-made goods and services. For example, ceasing copper mining to maintain reserves for future generations is strongly sustainable, but continuing to extract copper for use in electronic devices that will increase current and future quality of life meets the weak sustainability criterion (Tietenberg and Lewis, 2009, p. 103-4).

Social sustainability is important because actions will not be supported if they are not beneficial to society. Individuals must be motivated not only to start, but to continue practices for them to be truly sustainable. Justice, especially environmental justice, is an important concept in sustainability because it focuses attention on the equitable distribution of costs and benefits so that

no group has reason to oppose the actions. Another reason this is such an important component of sustainability is that future societies also must be prepared to economically manage the environment. Instead of focusing solely on saving the environment and the economy for future generations, emphasis must be placed on fostering the knowledge of sustainability in the social institutions that will shape future generations (Redclift, 1996).

1. Faith and Sustainability

As a Christian university of evangelical faith, Taylor has unique reasons to be concerned with sustainability. From the time of Adam to the modern day, the people of God have been encouraged to care for creation.

The biblical justifications for environmental stewardship, or "creation care," are strong and diverse. In the beginning God created the world and ascribed value to it by saying that it was "very good" (Genesis 1:31). The earth belongs to Him alone (Job 41:11b), but we are commanded to be stewards of it by working and taking care of it (Genesis 2:15). Since the Fall, God has been in the process of redeeming creation (Romans 8:19-22). He requests our participation in this work (Chronicles 7:13-4), but unfortunately the Bible contains many examples of our destruction instead of participation (Ezekiel 34:17-8) (Blessed Earth, 2009a).

Environmental sustainability is also supported by Christ's teaching in the New Testament. Jesus says that the second greatest commandment is to "love your neighbor as yourself" (Matthew 22:39). It is not a stretch to include future generations in His already broad definition of "neighbor." With that in mind, in addition to continuing to love and serve neighbors by meeting their immediate physical and spiritual needs, Christians should protect natural resources for future generations. Christians are also instructed to "speak up for those who cannot speak for

themselves," which once again includes future generations (Proverbs 31:8a). Preserving the environment also gives more people the opportunity to be awed by God's general revelation which is evident in the beauty of creation (Psalm 19:1-4).

Many post-biblical Church leaders also made important contributions to Christian thought on the environment. Two major themes are the importance of the general revelation of creation and the moral implications of creation care. In the early fifth century St. Augustine wrote,

> Some people, in order to discover God, read books. But there is a great book: the very appearance of created things. Look above you! Look below you! Read it. God, whom you want to discover, never wrote that book with ink. Instead He set before your eyes the things that He had made. Can you ask for a louder voice than that? (cited Blessed Earth, 2009b, p.2)

Then, over a millennium later, Martin Luther describes how the Gospel is incorporated into creation, "God writes the Gospel, not in the Bible alone, but also on trees, and in the flowers and clouds and stars" (cited Blessed Earth, 2009b, p.4). And John Calvin agrees on the mastery of God's handiwork in creation, "The creation is quite like a spacious and splendid house, provided and filled with the most exquisite and the most abundant furnishings. Everything in it tells us of God" (cited Blessed Earth, 2009b, p.4). The importance of a right view of other creatures is also mentioned by Francis of Assisi "If you have men who will exclude any of God's creatures from the shelter of compassion and pity, you will have men who will deal likewise with their fellow men" (cited Blessed Earth, 2009b, p.3).

Calvin once again shares wise words, this time on the use of natural resources, "Let everyone regard himself as the steward of God in all things which he possesses. Then he will neither conduct himself dissolutely, nor corrupt by abuse those things which God requires to be preserved" (cited Blessed Earth, 2009b, p.4).

In the sixteenth century the *Book of Common Prayer* includes this prayer acknowledging stewardship responsibilities "We give you thanks, most gracious God, for the beauty of the earth

and sky and sea… We praise you for these good gifts and pray that we may safeguard them for our posterity…" (cited Blessed Earth, 2009b, p.5). John Wesley shares this concern for creation in his teachings,

> I believe in my heart that faith in Jesus Christ can and will lead us beyond an exclusive concern for the well-being of other human beings to the broader concern for the well-being of the birds in our backyards, the fish in our rivers, and every living creature on the face of the earth (cited Blessed Earth, 2009b, p.6).

Francis Schaeffer brings this idea into the twentieth century by commenting on the connection between human relationships with creation and the Creator God, "If I am going to be in the right relationship with God, I should treat the things he has made in the same way he treats them" (cited Blessed Earth, 2009b, p.10). Finally, Billy Graham, in his 1983 book *Approaching Hoofbeats,* weighs in on the state of the world, "The growing possibility of our destroying ourselves and the world with our own neglect and excess is tragic and very real" (1985 cited Lowe, 2009, p. 23).

2. Sustainability in Higher Education

> As the world comes face-to-face with the harsh and urgent implications of a rapidly deteriorating planetary environment, higher educational institutions are being asked to become leaders and role models in the adoption and communication of sustainable practices. (McNamara, 2008)

Higher education is one of the areas where a shift toward sustainability is needed most. Sustainability in higher education is a common-enough concept in the literature to warrant its own acronym, SHE (Beringer, 2006 and 2007; McNamara, 2008). This section will address the importance of SHE, how sustainability and higher education are related, a brief history of SHE, and some of the attendant benefits.

SHE is a growing area of study because modern colleges and universities are large and long-lived social institutions, have huge impacts on their environments, represent many aspects of society, and wield great influence on many people. Faculty, staff, and students commute to

campus in automobiles that emit greenhouse gases into the atmosphere. Rainfall on a campus' built environment runs off into local streams as polluted storm-water (Savanick et al., 2008). Even small colleges are often a geographic area's largest single groundwater user and wastewater generator. Universities also generate high concentrations of solid waste. In the Northeastern United States alone, 35 colleges or universities have contributed hazardous waste to what have become Superfund sites. Many more indirect impacts are caused by the consumption of goods like paper and food (Creighton, 1998, pp. 4-5).

All of the impacts mentioned above are even more significant when multiplied by the number of higher education institutions. In the United States alone, 14.5 million students attend colleges and universities every year (Barlett and Chase, 2004, p. 5). The longevity, which implies institutional sustainability, of at least a few of these institutions is impressive. Of the 70 European institutions that have survived the entire 500 year period since the Reformation, 66 of them were universities (Kerr cited Calhoun et al., 2005). In the United States, nine current institutions of higher education were in existence before the Revolutionary War (Monroe, 1921). Not only has "the Academy" been around for a long time, it has also accumulated a great deal of wealth. The total annual budget of all colleges and universities in the United States is higher than that of all but 25 countries (Second Nature cited Calhoun et al., 2005). Yet, the size of higher education multiplies the potential benefits as well as harms. Institutions of higher education are influential because of their local ties, global connections, educational focus, and students' proclivity for change.

Two of the unique characteristics of higher education are its spatial and temporal transcendence. Temporally, higher education provides a setting for the transfer of knowledge and wisdom from aged professors to young students. History departments look back while programs like urban planning train students to look forward (M'Gonigle and Starke, 2006). Spatially,

individual universities enroll students from all around the world, educate them on study abroad trips, and then send them out again when they graduate. Research collaboration is important in connecting spatially diverse institutions into a global network. The influence of higher education even goes beyond its campuses and into local communities through the web of connections that support both entities (Barlett and Chase, 2004).

Students at universities around the world have a history of stimulating large changes through political discourse and action. From the 1848 revolutions in Austria and Germany to the global student demonstrations in the 1960s, college and university students are known for demanding and creating change. Although campuses for the last thirty years have been relatively politically inactive, students are beginning to fervently support concepts like sustainable campuses and the green revolution.

The idea of the sustainable campus offers a new opportunity for institutions of higher education "to be not just a site for making protests, but a place for creating precedents" (M'Gonigle and Starke, 2006, pp. 7-9). Rather than simply allowing students to push for changes on campus, schools should be proactive by incorporating sustainability in the curriculum (Collett and Karakashian, 1996). In fact, the most common argument for SHE in the literature draws on the moral obligation of educators to guide students toward becoming constructive citizens capable of meeting society's modern environmental challenges (McNamara, 2008, p. 24). In 2003 the National Council for Science and the Environment agreed by stating that United States educational institutions are "uniquely positioned" to participate in solving the challenges of sustainability with innovative teaching (cited McNamara, 2008, p. 1). The weight of this undertaking is emphasized by the fact that 30% of the world's scientists and the majority of diplomatic leaders are educated in the United States (NWF, 2008). Greening the curriculum is one way that higher education can become sustainable, but there are many others.

Colleges and universities are essentially microcosms of many of society's systems (Creighton, 1998). Because the operations of colleges and universities parallel those found in homes, restaurants, and offices they provide a unique proving ground for a wide assortment of sustainability initiatives. University campuses can serve as a staging area for both researchers and activists to test and promote sustainable ideas, processes, and products for a sustainable society. Velazquez and others comprehensively define a sustainable university as:

> A higher educational institution, as a whole or as a part, that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles (2006).

Their emphasis on actions instead of achievements, minimization instead of elimination, and transition instead of transformation, serves as a good reminder that sustainability is a process and not just a problem to be solved (Barlett and Chase, 2004, p. 7).

In higher education this process is generally seen as having three major categories: management, academics, and operations (NWF, 2008). McNamara recently identified in the literature what seem to be some of the agreed-upon fundamentals of sustainability. They are: environmental literacy, environmental citizenship, creating future leaders of sustainability, and demonstrating sustainable operations and facilities (2008, pp. 25-29). He goes on to quote Calder and Clugston's list of essential elements for SHE: curriculum; research; faculty and staff development and rewards; operations; student organizations; outreach and service; and institution mission, structure, and planning (2003). Finally, the definition of SHE can be narrowed by excluding Environmental Management Systems (EMS). The focus of an EMS is compliance with environmental laws by limiting hazards, whereas sustainability is more about everyday improvements such as limiting and diverting the solid waste stream. Now that the emphasis on

SHE has been justified and defined through the literature, it will be of use to examine how it developed through an abbreviated chronology.

3. Historical Development of Sustainability in Higher Education

The Stockholm Declaration of 1972 made the first significant reference to SHE. Then, 18 years later in 1990, over 31 university administrators from 15 countries signed the Talloires Declaration – an action plan for incorporating environmental literacy and sustainability in all aspects of the university (it has now been signed by 360 university presidents and chancellors from 40). Then again in 1993, 400 universities from 47 countries participated in developing the similar Swansea Declaration (Alshuwaikhat and Abubakar, 2008). Other significant declarations include the Halifax Declaration in 1991, the CRE-Copernicus Charter in 1994, and the Thessaloniki Declaration in 1997 (Bardati, 2006). From 1999-2006 various authors considered SHE a subset of sustainability science, a subset of higher education, or an ideological evolution of environmental education (Beringer, 2007). Then in 2007, it was granted the status of "inchoate field" or even a distinct body of knowledge relying on trans-disciplinary expertise in the literature (Corcoran and Wals, 2004 cited Beringer).

The United States government has also played a role in encouraging SHE. In 2000, the Environmental Protection Agency (EPA) released an enforcement alert stating that colleges and universities would soon be held to the same standards as industry (Alshuwaikhat and Abubakar, 2007). Although not specifically relating to sustainability, this is a good indication that higher education had a reputation of environmental degradation, not sustainable use. After several failed attempts, the Higher Education Sustainability Act (HESA) was signed into law as a part of the Higher Education Opportunity Act of 2008 (HR 4137). This act was intended to create a grant

program and convene a national summit on SHE (AASHE, 2009), but it went unfunded until June, 2010 (Elder, 2010).

These government initiatives may help to bring North American institutions up to speed with their European counterparts in the areas of sustainability curriculum, research and scholarship, and communication. On the other hand, North American colleges and universities are considered exemplary at instituting operational improvements and getting students involved outside of the classroom. As an example, a study of 15 North American universities active in SHE found that all of them were working to improve waste and recycling. All but one were also working to make their energy use, transportation, and building more sustainable (Beringer, 2007). Accompanying this is an exponential rise in the number of staff positions focused on sustainability since the mid-2000s (Breen, 2007; Beringer, 2007).

Investing in new salaries for SHE jobs appears to have many primary and secondary benefits. To start with, goals of reducing ecological footprints, increasing efficiency to decrease costs, and stimulating sustainable thought in students are being met all over the world. It has even been shown that utilizing campus sustainability projects as an academic resource is similar to the techniques of situated-learning and place-based education, both of which are proven to be effective teaching strategies (Savnick et al., 2008). It is important not to neglect some of the secondary benefits, which undoubtedly play a large role in the implementation of sustainability projects. The most-mentioned secondary benefits to colleges and universities are attracting media coverage, gaining financial support, and impressing prospective students (Breen, 2007). In 2008, SHE was a popular article topic in top North American newspapers with the New York Times printing nine related articles and The Washington Post with a front-page article. That same year witnessed $430 million given to colleges and universities in the form of grants and gifts for SHE initiatives (AASHE, 2009). Finally, the results of at least six large national surveys indicated that prospective college

students now base their college choice at least partially on their perception of how "green" schools are (Dautremont, 2009).

Overall, the topics of sustainability and SHE are rapidly developing and spreading, with an estimated doubling of the numbers of books and articles written after the year 2000 compared to the 1990s (McNamara, 2008, pp. 20). This is part of the "rising green tide of campus programs and initiatives" (Breen, 2007). Another interesting indicator of this is that a google.com search for "sustainability in higher education" produced 176,000 results in March, 2008 and 9,910,000 in December, 2009 – a 56-fold increase (Breen, 2007). North American campus sustainability is now mainstream, consequently colleges and universities must pursue it to remain competitive (Beringer, 2007). Another indication that many schools are involved in improving sustainability and even more incoming students are concerned about this issue is that many college rankings and guides now report on a school's sustainability initiatives and progress (S. Dayton, personal communication, March 24, 2010). This is usually accomplished by measuring numerous specific indicators such as the average amount of trash generated by each student.

B. Sustainability Indicators

"What gets measured gets done." This old adage applies to sustainability; if it is an important concept, it should be measured and implemented (Hitchcock and Willard, 2008). Measuring instruments that are used in sustainability are called indicators. Many indicators can be grouped together to form audits and assessments. Indicators are used to gain objective knowledge about whether an object of study, in this case institutional sustainability, is getting better or worse (Lawrence, 1997 cited Bell and Morse, 2008, p. 5). There are two main purposes of indicators: 1) to assist in strategic planning by identifying trends and evaluating policy and 2) to influence people's thoughts and behaviors by providing better information on which to base decisions (Yli-

Viikari, 2009). Similar to the two main methods of assessing ecosystem health (indicator species and species diversity), sustainability assessments use this same methodology by measuring a few important topics or by recording the breadth of sustainability initiatives. The growing use and development of Sustainability Indicators (SIs) can be used even as a meta-indicator of interest in sustainability and the direction that the field is going (Bell and Morse, 2008, p. 5). The popularity and widespread use of indicators and assessments is demonstrated by approximately 75% of large corporations having written some form of sustainability report (Hitchcock and Willard, 2008, p. xix).

The five main categories of indicator use are:

Instrumental Indicator: Used when a known linear relationship exists between indicators and outcomes of subsequent decisions.

Conceptual Indicator: To enlighten the reader's understanding of the topic.

Tactical Indicator: Can be used as a stalling technique, a substitute for taking real action, or to divert or deflect criticism.

Symbolic Indicator: Acts as a ritualistic assurance of a known result, so the significance of the indicator lies in its use.

Political Indicator: To support pre-determined positions (Hezri and Dovers, 2006 cited Yli-Viikari, 2009).

This list demonstrates that although SIs are very useful, the real motivation behind their use may not always be easy to determine.

Motivation aside, indicators do provide valuable information that is useful in decision making. For example, beginning with the publication of *Agenda 21*, one of the main reasons that the United Nations (UN) emphasizes SIs is that they make processes more transparent and accountable (Yli-Viikari, 2009). Two other benefits of SI are 1) that they can produce quantitative

figures that are more useful in decision making than simple rhetorical environmental concerns, and 2) that they allow for, and measure, shifts in emphasis such as from environmental to socio-economic issues (Yli-Viikari, 2009).

Despite this diversity of uses and the many benefits, SIs are not without drawbacks. The development and evaluation of indicators solely at the administrative level may limit their ability to be practically implemented in lower echelons of a company or society unless specific efforts are made to avoid this (Yli-Viikari, 2009). At any level, SI reports are unlikely to inherently induce major behavioral changes because they lack the requirements for cognitive shifts. However, when these assessments are integrated in management processes or personal discussions they can produce the desired cognitive appreciation and behavior change (Yli-Viikari, 2009). Using internal indicators as the basis for rewards or consequences instead of pure education is discouraged in order to avoid people or organizations "playing" the system by focusing on the indicators instead of the real goal being measured (Hitchcock and Willard, 2008). SIs are inherently restricted to measuring already recognized problems, which also limits their ability to spur extreme change (Yli-Viikari, 2009). Bell and Morse's criticisms focus on the simplicity of reductionism and quantification of SIs whereas sustainability is an inherently complex, even changing concept (2008). It is important to put these criticisms in context by noting that they all come from articles and books that ultimately promote the use of SIs. Recognizing and overcoming these limitations are important in developing and using beneficial SIs.

C. Campus sustainability Assessment

Just as SHE is a subset of sustainable development, Campus Sustainability Assessments (CSAs) are higher education's version of corporate indicators. CSAs are to the academy what corporate sustainability reports are to industry. The practice of performing campus environmental

and sustainability assessments began with a 1989 study produced as a cooperative master's thesis paper by six students in Urban Planning at UCLA (Bardati, 2006). The seminal report, "In our backyard: environmental issues at the University of California at Los Angeles (UCLA): proposals for change, and the institution's potential as a model," demonstrated that their university generated significant environmental impacts and generally lacked environmental initiative (Gottlieb, 1998). Its impact extended far beyond Los Angeles – it is generally regarded as a seminal document helping to inspire auditing in SHE (Bardati, 2006 and Gottlieb, 1998).

Today, CSAs are performed all over the world by utilizing a variety of indices for a variety of purposes. They range in scope from an ambitious undertaking at Concordia University spanning 18 months and requiring $25,000 dollars, two staff, and 100 students, to reoccurring applications of shorter metrics like the one used at Yale University (Beringer, 2006). They evaluate social, financial, and environmental performance using reliable and relevant indicators as the most important element (Velazquez, 2006). Beringer found that sustainability audits are the foundation for evaluating progress, are important for transparency, critical in communication with stakeholders, and overall contribute to best practices in campus sustainability management (2007). One of the primary purposes of CSAs is advocating change on campus by making sustainability a relevant and useful concept in decision making and planning. Another is to improve inter-campus communication on SHE issues (Beringer, 2006). Despite CSAs being in use for nearly two decades, the development of indicators for use in higher education is sparse when compared to industry or government use, but correcting that has become a major priority in the field (Velazquez, 2006). (More CSAs and frameworks for their cross-campus application are discussed in section IV.A.3. on page 38)

A topic that seems to be the focus of debate is naming conventions. In the literature, the following terms can be used to describe nearly the same thing: campus sustainability assessment,

sustainability audit, environmental audit, metrics, indicators, and sustainability reports (Creighton, 1998; Bardati, 2006; Velazquez, 2006; Beringer, 2006). Over the past 10 years, it seems that the main label for projects focusing on assessing environmental sustainability has shifted from environmental audits to sustainability assessments. Velazquez says that environmental audits, not sustainability audits, are most often conducted on campuses because their emphasis is on environmental considerations over social or economic benefits (2006). However, an observed shift toward a greater use of "sustainability" over "environment" may be because, in industry, environmental audits are generally inspections aimed at compliance with environmental laws, which is usually only a small part of the overall breadth of campus sustainability initiatives. The naming and methodology of CSAs vary, but most follow some basic steps. An eight-step process for environmental auditing applied to campuses includes initiation, determination, review, planning and design, resource allocation, execution, reporting, and follow-up with corrective action (Savely et al., 2007).

Regardless of their label, CSAs have many benefits and are increasingly popular. *The Blueprint for a Green Campus* lists benefits that match some of the main purposes of SHE including enhancing university image, cutting cost, teaching students about environmental management, and developing environmental policies (1995 cited Velazquez, 2006). Improving the actual sustainability of a university through a CSA is often achieved in part by publishing the results alongside specific identified achievements and future goals (Beringer, 2007). Beringer includes the moral argument that CSAs are "the right thing to do" as a part of SHE (2006). In 2006 a literature search and survey found that about 23% of colleges and universities performed regular CSAs (Velazquez). In that same year, 3 of the top 15 mid-sized schools pursuing sustainability performed a CSA (Beringer, 2007). A large international attempt to collect more quantitative data on SHE is currently taking place (Rauch and Newman, 2009).

III. Problem Statement

A. Problem Definition

The complete audience for this CSA is the Taylor community. The nature of institutional sustainability at a university which is inherently focused on people spreads the responsibility to all community members. However, those in positions of authority are best-equipped to create change and institute more sustainable policies. At Taylor, some of these people and groups are the university President Dr. Eugene Habecker, Provost Dr. Steve Bedi, Vice President of University Advancement Dr. Ben Sells, Vice President of Business and Finance Mr. Ron Sutherland, Facilities Services Director Mr. Greg Eley, the University Councils for Planning and Assessment, the University Cabinet, and the Board of Trustees. If this CSA is to spur change and play a role in the global sustainability revolution it cannot simply reinforce bureaucratic power relationships without also promoting sustainability at the divergent grass-roots level (Edwards, 2005; Breen, 2007). So it is perhaps equally important that the final CSA report is written in such as way as to be accessible to freshmen students, non-science faculty members, and anyone else who has an interest in the future of Taylor University.

The broader university community of students, their parents, alumni, trustees, local community members, financial supporters, and faculty and staff members all are stakeholders, and therefore each must be part of the university's transition to sustainability (Barlett and Chase, 2004, p. 14; McNamara, 2008). Although generalizing the desires of such a large group is difficult, a safe bet is that most of them would like to begin this transition toward sustainability with the simplest and most beneficial changes first. The objective of the university leaders, as it relates to this project, is to institute policies that will support the university and its missions in the most economically, socially, and environmentally sustainable way.

There are several possible methods for obtaining these ends. University leaders could take the ad hoc approach by evaluating and/or implementing any opportunities for improvement that they happen to come across. They also could follow easily- observable SHE trends. However, this would still require research, would put the university perpetually one step behind, and could result in inappropriate solutions. For example, reducing student automobile use by providing busses may be appropriate at a large institution such as Ball State University, but is not at a small school like Taylor.

The use of indicators in sustainability assessments are simple yet effective tools that can assist in the management of this complex issue (Yli-Viikari, 2009). So, if some form of CSA is determined to be the best method for gaining the required information and promoting improvement, there are multiple ways that it could be performed. A consulting company could do an environmental audit, more students could be encouraged to work on it as class projects, or a dedicated graduate student could do it as a thesis project. The two student options would be much cheaper, but a class project would take several semesters. The final option is simply to leave the problem unsolved by not performing any sort of sustainability assessment.

If a CSA is selected, developing proper indicators is still an important yet formidable task, regardless of who performs it. The indicators used can make the difference between a lot of work for nothing, and a sustainability report that is used by all members of a university to enact many positive changes. Hitchcock and Willard compare a properly developed set of indicators to an annual physical exam (2008). It can provide a broad snapshot of current health, identify areas that require improvement, and recommend more detailed tests in areas of concern.

This debate comes at a time when Taylor is already taking some steps to become a more sustainable institution. The concept of stewardship is present in Taylor's core values. One of the values, "biblically anchored," looks at sustainability through the lens of God's decree to take care of

and work the land. One of the university purposes also emphasizes stewardship: "Christian faith should lead to servant leadership, stewardship, and world outreach." This is being enacted through the planning of a new LEED-Silver- certified science building that will be completed in 2011. President Habecker has mentioned the importance of, and Taylor's commitment to, sustainability several times since he took office in 2005. Students have been taught specifically about environmental stewardship in the environmental science major for nearly thirty years and in the unique masters of environmental science program for seven years. Five of these students have spent portions of the summers of 2009 and 2010 assisting the facilities services department with preparations for an EPA audit. In 2007 the Council on Sustainability (COST) at Taylor was formed to:

> Assist the administration and in overseeing the University Sustainability program by involving the administration, faculty, staff, students and other key stakeholders to ensure that the institution is fulfilling its desire to effectively manage its environmental stewardship responsibilities through appropriate recommendation of goals, targets, programs, policies, structures and processes.

Taylor students have been also been involved in promoting sustainability. Taylor's student club, Stewards of Creation (SOC), has sought to glorify God through the care and protection of His earth since 1996. Two of the longest running SOC activities are the Adopt-a-Highway and Adopt-a-River: great opportunities for students to serve their local community. SOC members also developed and help run the Annual Student Support in Salvaging Trash (ASSIST) program to channel unwanted items from students to local community groups at the end of the school year. One of the great ways that students exhibit stewardship is by serving in world outreach through a biannual mission trip to Guatemala. The students prepare extensively through courses in hydrogeology and international ministry before applying their knowledge for a month of service. The focus of the mission work is delivering water and sanitation through construction of wells and rainwater cisterns, home water filters, and composting latrines. In addition, health and hygiene

training focuses on sustainability (environmental, social, and economic) by implementing appropriate technology and serving alongside a host agency, Mission Impact, which is present in the villages long before and after the Taylor team. Recently, students created a Grant County "GreenMap" of local green sites and services and conducted a pilot environmental assessment of a local church.

The context of deciding how best to pursue sustainability is addressed more in the preceding literature review and the following "Relationship to Other Studies" section.

B. Statement of Question, Objective, and Hypothesis

The overarching question guiding this project is: In what ways is Taylor University currently practicing environmental sustainability? Two secondary questions that precede and follow it are: What is the best way to judge the sustainability of Taylor? And, what should Taylor do to become more sustainable? The objective of this thesis project is to answer those questions in a thorough and informative, yet easily understood way. Answering the main question in a format that is easily accessible to the full diversity of Taylor community members should contribute to improving the sustainability of the university. Yet, since nothing exists in isolation, another objective is to facilitate the comparison of Taylor's sustainability practices to those of its peer institutions. The ultimate goal underlying this thesis project is to significantly improve the sustainability of Taylor.

The success or failure of this project can be evaluated in a number of ways. The CSA will be accompanied by recommendations for implementation on campus. If these recommendations are followed it will show that they were appropriate in scope and respected. Since the purpose of the recommendations is to improve the sustainability of Taylor, their implementation also implies that the ultimate goal will be met. Another one of the best indicators of success is the replication of

the assessment. If it is regularly repeated that means that the indicators developed were judged to be worthwhile. It also means that at least one of the recommendations (to repeat the assessment regularly) was implemented.

The results will include both quantitative and qualitative information. The quantitative data will be made available so that it can be cross-checked for recording and calculating accuracy. The qualitative information will be developed in collaboration with various university stakeholders, so their approval will help to validate it. The scope of the assessment will be all aspects of sustainability, with the most emphasis on environmental sustainability, on the Upland campus.

C. Relationship to Other Studies

1. Previous Taylor Sustainability Studies

During the past year, Taylor students created two reports relating to sustainability and an energy audit report was prepared for the university. The first report, "Taylor University Carbon Emissions Inventory," was facilitated as part of a master's thesis project for Derek Rosenberger, a Master of Arts in Higher Education candidate. It was written by groups of students in one of Dr. Don Takehara's introductory chemistry courses in the fall semester of 2008. The second report, "Campus Sustainability Assessment," was written by three graduate students, Kevin Crosby, Nathanael Davis, and Adam Wolken and an undergraduate, Jorjette Heid for the Applied Geology and Environmental Planning course spring semester 2009. The main recommendations of this report are included in Table 1. It represents a preliminary effort at a partial CSA focusing on dining, grounds, transportation, waste, and water (Crosby et al., 2009).

Table 1: Main recommendations from the 2009 Environmental Planning course project (Crosby et al., 2009).

Priority	Recommendations
1).	An official comprehensive sustainability audit should be completed with the resources and authority to examine all pertinent university information.
2).	More data should be recorded for all of the areas of operations mentioned in this report.
3).	A unified and university supported year-end donation program should be implemented.
4).	Taylor University Dining Services (TUDS) should search for and purchase locally available food products. Staff should be encouraged to carpool.
5).	TUDS should investigate the inclusion of more certified organic food products into their regular service.
6).	A bicycle sharing program should be implemented.
7).	A thorough examination of water and electricity usage within it's the TUDS facilities should be completed.
8).	TUDS should start composting food waste.
9).	Recycling data should be tabulated and kept updated as an assessment tool of new recycling initiatives.

The third and final report, "Energy Conservation Audit Report for Taylor University," was prepared for the university's facilities services contractor, Sodexo, by The Loyalton Group in April, 2009. Its main feature is a summary table of recommended energy cost-save projects included as Table 2 below (The Loyalton Group, 2009).

Table 2: Recommendations from the "*Energy Conservation Audit Report*" (The Loyalton Group, 2009).

Recommended Low/No Cost Energy/Water Projects & Paybacks					
Project Name	**Estimated Annual Savings**	**Estimated Cost**	**Estimated Known Rebate**	**Payback Years w/Known Rebates**	**Priority**
Energy Conservation Committee	$15,000	$1,500	$0	0.1	1
Faculty, Staff & Student Awareness	with above	with above	with above	with above	with above
PC Energy Star (2820 PCs)	$30,000	$0	$0	0.0	1
Vending Misers (17 soda)	$2,770	$3,833	$0	1.4	1
Dishwasher 0.07 GPM Pre-rinse Spray Nozzle	$3,000	$320	$0	0.1	1
Walk-in Cooler/Freezer Air Curtains(5)	$1,000	$3,000	$0	3.0	2
Sub Total/Average Low/No Cost Projects	*$51,770*	*$8,653*	*$0*	*0.2*	
Recommended Capital Energy/Water Projects & Paybacks					
Project Name	**Estimated Annual Savings**	**Estimated Cost**	**Estimated Known Rebate**	**Payback Years w/Known Rebates**	**Priority**
Upgrade, Commission and Expand BAS	$120,000	$205,000	$0	1.7	1
Lighting Upgrade Projects ≤ 5 Year Payback	$117,014	$104,238	$0	0.9	1
Gas Water Heater Replacements	$48,713	$108,000	$0	2.2	1
Intellidyne Water Heater Control	$13,343	$9,600	$0	0.7	1
Light Stat Office Controllers	$4,376	$3,300	$0	0.8	1
Telkonet Dorm Room Controllers	$7,100	$34,440	$0	4.9	2
Install 18 Motor VSDs (8 Buildings)	$25,846	$116,900	$0	4.5	2
Kitchen Exhaust Hood MELINK System	$6,457	$35,514	$0	5.5	2
Lighting Upgrade Projects > 5 Year Payback	$13,631	$96,565	$0	7.1	2
Sub Total/Average	*$356,480*	*$713,557*	*$0*	*2.0*	
Grand Total All Recommended Projects	**$408,250**	**$722,210**	**$0**	**1.8**	
Projects Recommended for Engineering Evaluation/Maintenance					
Project Name	**Comment**				
Helena - Replace (3) Cooling Units	Detailed Engineering Analysis Required				
Hermanson- Zone Dampers & New Boiler	Detailed Engineering Analysis Required				
Odle Gym Heating Revisions	Detailed Engineering Analysis Required				
Field House Heating Revisions	Detailed Engineering Analysis Required				
Rediger-Ductwork and replace Glass in Lobby	Detailed Engineering Analysis Required				
Post Office/Print Shop-New HVAC	Detailed Engineering Analysis Required				
Olson & Wingatz Halls	Install Steam Thermostatic Control Valves				

2. Example Campus Sustainability Assessment Theses and class reports

Three class reports and sixteen theses on topics similar to this proposal have been identified. Four of the papers are sustainability assessments, three focus on assessing just one component of campus sustainability (electricity, lighting, and building), and two are greenhouse gas

inventories. The focus and scope of much of this work is comparable to the thesis project and paper being proposed. A complete list of the sixteen theses papers is below. The authors name precedes the paper title in quotations. The full CSAs are followed with "***CSA**."

h. Class Reports

1.) Kimberly Comstock, Steve Hescock, Kelly McCaffrey, Karin Olefsky, and Lisa Wormke "The Triple Bottom Line: Building the Case for Green Building at UW" (Comstock *et al.*, 2004)

2.) Environmental Studies Program "The Feasibility of Sustainability Reporting at Dartmouth College" (Environmental Studies Program, 2003)

3.) Susan Scheck "Sustainability in Higher Education" (Scheck, 2007)

i. Theses

1.) Marcy J. Bauer "A Campus Environmental Sustainability Assessment for Miami University" (Bauer, 2005) ***CSA**

2.) Lindsay Cole "Assessing Sustainability on Canadian University Campuses: Development of a Campus Sustainability Assessment Framework" (Cole, 2003)

3.) Jason Michael Delambre "A Sense of Power: an Energy Analysis of the University of Cincinnati's West Campus" (Delambre, 2007)

4.) Kathryn Eimers "Sustaining Campus Sustainability: Factors Leading to Success of Environmental Sustainability Initiatives in Higher Education" (Eimers, 2008)

5.) Nika Berte Hasegawa "Creating a Green Community: Understanding Student Environmental Behaviors for Increased Campus Participation at Northwestern University" (Hasegawa, 2008)

6.) Michael Henson, Merlina Missimer, and Stephen Muzzy "The Campus Sustainability Movement: A Strategic Perspective" (Henson *et al.*, 2007)

7.) Jahan Kariyeva "Lighting Efficiency Feasibility Study of Three Ohio University Buildings" (Kariyeva, 2006)

8.) Linda Kogan "Measuring Institutional Sustainability: The Ecological Footprint of the University of Colorado at Colorado Springs" (Kogan, 2004) ***CSA**

9.) Richard Keirs McDonald III (Trey) "Towards Regenerative Development: A Methodology for University Campuses to Become More Sustainable, With a Focus on the University of South Florida" (McDonald, 2008)

10.) Suzanne M. Peyser "Feasibility of Green Building at WPI" (Peyser, 2008)

11.) John F. Pumilio "Carbon Neutrality by 2020: The Evergreen State College's Comprehensive Greenhouse Gas Inventory" (Pumilio, 2007)

12.) Sandra I. Rodriguez, Matthew S. Roman, Samantha C. Sturhahn, and Elizabeth H. Terry "Sustainability Assessment and Reporting for the University of Michigan's Ann Arbor Campus" (Rodriguez *et al.*, 2002) ***CSA**

13.) Christian Ryan-Downing "Sustainability of Western Kentucky University: An Examination of Campus Environmental Policies, Performance, and Potential for Change" (Ryan-Downing, 2007) ***CSA**

14.) Daniel Abeyta Salazar "Measuring What Matters: a Greenhouse Gas Inventory of California State University, Chico" (Salazar, 2007)

15.) Becky J. Townsend "Environmental Sustainability 'Inreach': How the Campus Community Informs Itself About Environmental Issues" (Townsend, 2005)

16.) Luba Zhaurova "U.S. Higher Education and Global Climate Change: An Exploration of Institutional Factors That Affect Greenhouse Gas Emissions" (Zhaurova, 2008)

IV. Research Methods

A. Organization

1. Methods Overview

The first major step was to develop a set of indicators specific to Taylor yet consistent with CSAs at other schools. This was completed by searching the literature and existing CSAs for best practices and also defining what distinctive elements of Taylor require review. The second main activity was conducting the assessment by observation and data collection. This undertaking was difficult mostly due to the huge variety of information needed. Since issues of sustainability often transcend the traditional "silos" of academia (Barlett, 2004, p. 11), gathering information for indicators often requires contacting many different departments. The information gathered was benchmarked against data and case studies from other campuses when possible. These comparisons also help in the third step of making recommendations for improving sustainability within each category of the assessment. The fourth and final step was to compile all of the information gathered into a summary of the sustainability of Taylor and a list of prioritized recommendations. Making recommendations may be the simplest part of the process, but it may also be the most important because its goal is to radically change unsustainable behavior and policies at Taylor. The recommendations were created by observing gaps or weaknesses in the assessment combined with best practices defined in the literature.

This academic thesis paper includes a literature review, assessment development explanation, detailed and comprehensive assessment results, and conclusions. However, the final goal, beyond the scope of this thesis project, is to produce three independent reports. All the information required to generate these documents is included in this thesis, it must simply be extracted and reformatted.

2. Future Reports

The first report will justify the need for a CSA of Taylor, chronicle the development of the Taylor-specific indicators and assessment framework, and explain the data gathering process. It will serve as a reference for those interested in the concept of sustainability and for the development of future CSAs.

The second report is the main CSA report to be available to the entire Taylor community. This document will be shorter and more visually refined than the assessment included in the results section of this paper. CSAs reported in a dense academic form are not as widely read as more succinct counterparts with more emphasis on case studies and examples to support the data. This is why it is important to develop a comprehensive yet concise set of indicators. The executive summary at the beginning of this paper provides a starting point for that report. Christian Ryan-Downing's Western Kentucky University thesis project is a good example of this. After graduation she took the information from her thesis paper and put it in a shorter and more colorful report that was distributed to campus administrators (Ryan-Downing, 2007).

The third and final report will include comparisons to and positive examples from other schools and recommendations for improvement for Taylor. Many sustainability reports include recommendations in them, but those that provide recommendations separately seem to be more versatile tools. These recommendations depend on benchmarking of efforts at other comparable institutions and the results of the CSA report, which in turn relies on the indicator development report.

3. Recording Methods

Since many of the articles reviewed in this paper come from the International Journal of Sustainability in Higher Education (IJSHE), its version of the Harvard citation style has been used.

Page numbers are included for specific ideas in books and other longer works, but not for journal articles.

Good procedural recording and reporting practices were followed. All steps of the project have been documented as well as possible so that indicators can be justified, practices can be repeated for future CSAs, and data can be checked. Examples of the major data sets gathered or provided for indicators are included in the appendices at the end of this document. All project documentation including research, most of the documents cited, notes, meeting minutes, email correspondence, interview notes, original data files provided, calculations, presentations, Greening of the Campus conference materials, documentation from previous CSA projects, and all of the documents produced for this thesis project were well organized in electronic folders submitted on a data DVD along with the final draft of this thesis paper.

B. Assessment Development

After reviewing the literature, the first step in creating a CSA is determining criteria for successful indicators and reports. There are two main directions from which to go about the indicator selection process. Although not usually explicitly stated, these seem to be the approaches taken by other CSAs and assessment tools. First, the bottom-up approach selects individual indicators that meet certain criteria such as measurability, ability to change, and clear correlation with sustainability. These indicators can then be grouped into categories for easier display and explanation. The second approach is the top-down method that starts at the highest conceptual level of describing what impacts the sustainability of a university. This approach is used here because it assures that the assessment is evaluating concepts important to the University and not just what happens to be convenient to measure.

As explained earlier, the perpetuation of the ability of a university to meet its goals is dependent on social, economic, and environmental factors (VanPelt et al., 1990 cited Bell and Morse, 2008, p. 85; Velazquez et al., 2006). Continuing to move down from highly conceptual to detailed, the next step is to narrow in on the general types of interactions between a university and its environment that impact the sustainability of the institution and the community that it serves. These general modes of interaction are then expanded into more detailed interactions. At this point specific indicators can be selected to explain the condition and efforts of the university in each of these sub-categories.

This process is completed by considering distinctive elements of Taylor, brainstorming, reviewing recommendations in the literature, evaluating admissions surveys, and observing successful CSAs from other schools.

1. Distinctive Characteristics of Taylor

There are several aspects of Taylor that require unique assessment because they are different from other schools that have been reviewed. Taylor is a liberal arts university, which means that students are not narrowly limited to one field of study. This is accompanied by a commitment to educating students and benefiting the community through a General Education curriculum. As an institution Taylor is seriously committed to evangelical Christianity to the point that creating disciples of Jesus Christ may be considered equally as important as training scholars. This is evident in the mission statement which emphasizes faith along with learning or knowledge: "The mission of Taylor University is to develop servant leaders marked with a passion to minister Christ's redemptive love and truth to a world in need" (Taylor University, 2009a). Graduate programs in both environmental science and higher education assure both student and faculty

expertise in the areas of assessment and sustainability. Finally, Taylor is located in a mostly rural setting and has been blessed with an abundance of "undeveloped" land near the main campus.

2. Brainstorming

Brainstorming a list of sustainability factors, categories, sub-categories, and indicators was an important part of the assessment development process. The list was created without referencing any assessments or other resources. Albeit, the author's past work on a preliminary CSA, the literature review for this paper, and experience with campus environmental initiatives certainly influenced the creation of this list. The brainstormed list can be found in Appendix G. Once these uninfluenced thoughts were down on paper, the next step was to review recommendations in the literature.

3. Existing Assessment Tool Review

Indicators and CSAs are discussed above in sections III.A.2-III.C (pages 17-28), so the focus here is utilizing articles and reports that specifically recommend CSA categories and/or indicators. Seven reports or multi-university assessments were identified. Each of them is organized differently, but there are many commonalities. The general outlines of each of the frameworks are included in

Table 3.A-G below. They are described below in order of increasing usefulness.

The New Jersey Higher Education Partnership for Sustainability (NJHEPS) is a consortium of 48 higher education institutions from New Jersey (NJHEPS, 2010a). They developed the *Campus Sustainability Selected Indicators Snapshot* to assess the sustainability of their member schools. Each category has 8-18 questions requiring yes or no answers and explanations. These questions are intended to help the assessor come up with a score of 1-7 for three sub-categories in each of the ten categories. These scores are all combined into category scores and a final overall sustainability score for the campus. This assessment tool is notable because of its simplicity of use. However, it quickly becomes apparent that questions such as, "How would you rate the overall use efficiency of this vehicle inventory? Excellent, good, fair, or poor?" are so subjective that they would be of little use in doing any sort of comparison (NJHEPS, 2010b). Nevertheless, performing such as assessment is still likely to assist in selecting areas most in need of improvement, which is the stated goal of the snapshot guide (NJHEPS, 2010b).

The Sustainable Endowments Institute (CEI) runs the College Sustainability Report Card program at greenreportcard.org as a means of helping universities share information to improve sustainability policies (Sustainable Endowments Institute, 2010). Their categories and indicators are distinct from many of the others because they are part of a detailed credit system designed to rate schools' overall sustainability performance with a single grade.

The Campus Consortium for Environmental Excellence (C2E2) is a group of 26 schools working together to improve environmental performance in higher education (Balf, 2009). As a part of this pursuit they produced a list of environmental performance indicators (EPIs) to help other schools perform internal assessments and make improvements (C2E2, 2002). This list of categorized indicators comes from the experience of these prestigious schools, many of which have

a strong history of sustainability and environmental assessments. More information on C2E2 can be found in Appendix H.

The Association of University Leaders for a Sustainable Future (ULSF) is the Secretariat for signatories of the Talloires Declaration, which is an action plan for incorporating sustainability at universities (ULSF, 2008a). The ULSF produced the Sustainability Assessment Questionnaire (SAQ) to educate users about the dimensions of sustainability in higher education, to give a snapshot of current efforts on a campus, and to encourage discussion on future improvements. It is a short, qualitative tool very similar to the NJHEPS snapshot (ULSF, 2008b).

The Association for the Advancement of Sustainability in Higher Education (AASHE) *Sustainability Tracking, Assessment, and Rating System* (STARS) is quickly becoming the national leader in campus sustainability assessments and rating. After a pilot study was completed, STARS 1.0 was launched in January, 2010 with 155 schools already registered to participate by the end of June (AASHE, 2010a). STARS is likely the most thoroughly researched and developed CSA tool in existence. In a master's thesis paper focused on evaluating STARS, Kyle Murphy concluded that it met all five of the ideals that he had for a sustainability assessment tool. His main complaint is that because the questions do not line up well with existing campus work or knowledge, it may be too time consuming. However, this is not a problem that is unique to STARS (Murphy, 2009). Although STARS does a good job of fulfilling its purpose, its universality limits its ability to emphasize issues that are especially important at any one particular school. Its emphasis on rating is useful for both comparisons with other institutions and within a university through time, but it can detract from the ability of the assessment to focus on specific areas or initiatives.

Good Company is a for-profit consulting firm that specializes in measuring, managing, and marketing social and environmental performance. In 2004 they wrote the *Sustainable Pathways Toolkit for Universities and Colleges: Indicators for Campuses* (SPTUC) and still provide it to universities

for free upon request (Good Company, 2010). It is a comprehensive guide to developing a CSA framework. It starts with definitions of sustainability, justifies a list of recommended indicators, gives detailed advice on issues such as normalization of statistics, and finishes with some examples. A entire page is dedicated to each of the 15 primary and 10 supplementary indicators including sections on intent, benchmarks (what to actually measure), strategies (practical advice on how to get the information), links to other resources, and an explanation of the impact that this indicator has on campus sustainability (Skov, 2004). Users of this toolkit are not required to trust the expertise of its authors, but are given all of the information that they need to make their own informed decisions.

The *Campus Sustainability Assessment Review Project* (CSARP) was created by Andrew Nixon and his advisor Dr. Harold Glasser for an undergraduate honor's thesis project at Western Michigan University (Nixon, 2002). They suggest that to meet the goal of gaining an understanding of university commitment to sustainability two questions must be asked and answered in a CSA. First, what impact does the university have on society and the environment? Second, what is being done to deal with these impacts (Nixon, 2002)? This not only guides the whole assessment, but also explains that every indicator really includes two questions. The first deals with the current status of the impact and the second with changes and planned initiatives.

One advantage of the CSARP is its comprehensiveness. It involved the creation of a database of 679 CSAs out of a total of 778 CSAs discovered at that time. Of these only 155 were considered comprehensive assessments, the rest focused on just one or a few categories (Nixon, 2002). The most common assessment categories were energy (included in 45% of all identified CSAs), solid waste (42%), land (31%), and water (28%). Since there is a consensus that these four categories are important, they must be included in Taylor's CSA so that it may be compared to others. In the years prior to 2001 the average number of categories included in comprehensive

CSAs was about 8. Over that same time period one quarter of the assessments relied solely on externally-developed and pre-existing frameworks, however this number was steadily rising and had already reached 67% in 2001 (Nixon, 2002).

The method that they used to develop their framework recommendations was nearly identical to the approach for this project. Nixon started by surveying the literature to identify existing assessment tools and CSAs that represented best practices. The indicators from these sources were then combined and whittled down to an appropriate sized list found in Table 3.A. He mentions that during this process he ran into the problem of indicators such as CO_2 footprint and composing fitting in multiple categories, one of which must be ultimately selected.

Table 3: Referenced sustainability assessment tools (citations are in the text).

A. Nixon-WMU - CSARP

1	Institutional Characteristics
2	CSA Characteristics
3	Air
4	Built Environment
5	Business & Management
6	Culture & Community
7	Education
8	Energy
9	Food
10	Hazardous Substances
11	Land
12	Purchasing
13	Research
14	Solid Waste
15	Transportation
16	Water

B. C2E2 - EPI

1	Energy
2	Water
3	Mater. Reso. & Waste Dispo.
4	Food
5	Land
6	Transportation
7	The Built Environment
8	Community
9	Research

C. CEI - Report Card

1	Administration
2	Climate Change & Energy
3	Food & Recycling
4	Green Building
5	Student Involvement
6	Transportation
7	Endowment Transparency
8	Investment Priorities
9	Shareholder Engagement

D. AASHE - STARS-1.0

1	*Education & Research*
	Co-curricular Education
	Curriculum
	Research
2	*Operations*
	Buildings
	Climate
	Dining Services
	Energy
	Grounds
	Purchasing
	Transportation
	Waste
	Water
3	*Plan., Admin. & Engage.*
	Coordination & Planning
	Diversity & Affordability
	Human Resources
	Investment
	Public Engagement
4	*Innovation*

E. NJHEPS - Snapshot

1	Solid Waste
2	Energy
3	Water/Sewage
4	Transportation
5	Indoor Air Quality
6	Landscape
7	Food Service
8	New Structures/Renovat.
9	Procurement
10	Curriculum

F. ULSF - SAQ

1	Curriculum
2	Research & Scholarship
3	Operations
4	Faculty & Staff Development & Rewards
5	Outreach & Service
6	Student Opportunities
7	Administration, Missions, & Planning

G. Good Company - SPTUC

Environment & Health	
	Energy & Water
1	Energy use, tracking & feedback
2	Water use, tracking & feedback
	Materials & Waste
3	Recycling rate, infrastructure and systems
4	Waste: reducing, reuse and disposal
5	Computer hardware purchasing and disposal
6	Paper use and Purchasing
7	Landscape Maintenance
	Health & Safety
8	Ergonomic safety
9	Indoor air quality (IAQ)
10	Custodial and maintenance chemical use
Governance, Learning & Policy	
	Planning & Purchasing
11	Campus construct. & develop.: plan. & policy
12	Transportation infrastructure and incentives
13	Purchasing tools and strategies
	Learning & Governance
14	Curriculum and support for ecological literacy
15	Governance for sustainability
Environment & Health	
S-1	Greenhouse gas (GHG) inventory
S-2	Energy: Renewables and source profile
S-3	Wood products purchasing policy
S-4	Food procurement by campus units
S-5	Benefits and employee assistance program
Governance, Learning & Policy	
S-6	Stakeholder involvement in new construction
S-7	"Green chemistry" curriculum
S-8	Investment policy for endowment funds
S-9	Labor policy for campus licensing
S-10	Systems communication for sustainability

4. Review of Admissions Guides

The next resource utilized was college admissions consulting guides. Peterson's manages the largest databases of college and university information and produces guidebooks such as *Peterson's Competitive Colleges*. In 2009 they released the first ever Sustainability in Higher Education Licensed Data Set which was used in the book *Peterson's Green Jobs for a New Economy: The College and Career Guide to Emerging Technologies* (Peterson's, 2009a). The Princeton Review, best known for test preparation material, also produces college admissions guides. After gathering data for three years they now include "Green Ratings" in *The Best Colleges* guide in addition to partnering with the United States Green Building Council (USGBC) to produce the freely available *Guide to 286 Green Colleges* (The Princeton Review, 2010a).

The Peterson's and Princeton Review datasets are important solely for the practical reason that the information that they require needs to be collected. A CSA might as well include most of the information required for the datasets so that it does not need to be gathered separately. Brief descriptions of the types of questions asked are contained in Table 4. Unlike the sustainability assessment toolkits described above, the indicators used by these companies were not completely developed by experts on sustainability nor were they designed to instigate improvements on campus. They were designed solely to provide a simple rating system for prospective students. Taylor University's Institutional Research Analyst opted not to complete the Peterson's survey in 2009 because it would have been too difficult to collect all of the information that was required. He did however return the Princeton Review's first green ratings survey. Taylor received a low score of 69 from the possible range of 60-99, partially because only about a quarter of the questions were answered (The Princeton Review, 2010b; S. Dayton, pers. comm., March 24, 2010).

Table 4: A summary of admissions sustainability guide questions (citations in the text).

Peterson's	
Categories	*Indicators*
building	landscaping
programs	departments
energy	alternative
	timers for temperature
	management systems
food	organic
	vegetarian options
endowment	renewable energy
	socially responsible
leadership	Talloires
	collaboration
	sustain office
manager	sustain coord
	managers for similar positions
	student government position
alumni	fund & network
sustainability	recognition program
	fees
	website
documentation	action, master, climate plans
purchasing	cleaning
	paper
research	faculty and funding
students	campus climate challenge
	club
	events
	publication
housing	themed housing
	model dorm room
food	garden
transport	free on campus transport
	bike
	car share
	incentives
	fleet emissions
recycling	RecycleMania
	electronics
	on campus center
	food
	chemicals
	limit printing

Princeton Review
Indicators
public commitment
greenhouse gas emis. Inven. & plan
committee
renewable energy %
sustain officer
purchasing requirements for variety
example projects
green jobs
student sustain research
major
gen ed requirement
vegetarian %
local food
LEED requirement
energy retrofits
cleaning products
organic landscaping
Recyclemania
waste diversion rate
driving alternatives

5. Examples from Other Institutions

The next step in the CSA development process is learning from CSAs at other schools. Four masters of environmental science students at the University of Michigan (U of M) in Ann Arbor completed a well-respected CSA as a joint thesis project in 2002. It was extremely thorough and included a methods section, all three dimensions of sustainability, recommendations, and a conclusion (it is over two-hundred pages long, not including the same length of appendices). The eight environmental indicator categories are fairly typical: energy, water use, food consumption, land and vegetation, air emissions, effluent, solid waste, and hazardous waste. Each of these categories is organized with five sections: a list of the indicators, descriptions and justifications of indicators, U of M context, methodology, and results and discussion (Rodriguez *et al.*, 2002). There are benefits to having all of that information grouped together, but all of the background information seems to bury the actual assessment and results. Since good discussions of the indicator results are usually included, it seems strange that no recommendations are made for improving each indicator. The recommendations chapter at the end of the report is equally disappointing, with only a few broad recommendations. Although the U of M report is interesting, the actual CSA has limited applicability to this project because it was not the first CSA at that school, it was performed by a sizeable team of students, and there is a large disparity in institution size.

To find a CSA project more similar to this one, the logical next place to look is at similar schools. To do this, a list of schools commonly used at Taylor for benchmarking in university planning and institutional research was utilized, in addition to a few additions for this project. This list includes the twelve other Christian College Consortium (CCC) institutions and six other comparable institutions. A list of these institutions, links to their websites, and information about their sustainability assessments or carbon emissions audits is included in Appendix C. Of these nineteen schools, twelve have some form of sustainability webpage mentioning their commitment

to the concept (AASHE, 2010b). Yet Seattle Pacific University's website was the only one to make any mention of sustainability reporting. In 2007 and 2008 they performed the STARS pilot assessment, in 2008 they began using the American College and University Presidents' Climate Commitment (ACUPCC) Reporting System, and in 2009 they produced a sustainability report (Seattle Pacific University, 2009). The relatively brief report does not include significant detail about the STARS results other than the scores for each credit. It focuses a little more on developing their ACUPCC carbon neutrality plan and on highlighting some positive efforts on campus (Walard, 2009).

6. Conclusions from Assessment Reviews

There are several useful conclusions that can be drawn from this process of considering distinctive elements of Taylor, brainstorming, reviewing recommendations in the literature, and observing successful CSAs from other schools. It is very clear that the different purposes for performing CSAs can result in very different frameworks. An audit such as the Princeton Review requires the collection of specific data and results in a score that is easily to benchmark against, but does little to instigate specific improvements. Inversely, the ULSF SAQ focuses on simple qualitative information that is difficult to compare, but is useful in stimulating thought on sustainability within and across campuses. Neither framework is inherently better nor worse, they just serve different roles. The goal of this assessment is to provide data for benchmarking *and* instigate improvement.

Comprehensive tools such as AASHE STARS and assessments such as the U of M CSA are good reminders of the importance of measuring all three components of the "triple bottom line" of sustainability: social, economic, and environmental. However, the fact that the overwhelming majority of indicators in the other assessment tools focus on environmental concerns is a reminder

that this area is better developed. Even within those frameworks that do include social and economic concern, many only address the social and financial aspects of environmental sustainability (ex: Peterson's asking about the existence of student fees for sustainability projects (Peterson's, 2009b)) instead of true social and financial sustainability (ex: Good Company's SPTUC including questions about ergonomic safety and the rates of injuries (Skov, 2004)). This lack of consensus, along with the fact that universities are already generally well equipped to monitor financial sustainability, is sufficient justification for placing the most emphasis on environmental sustainability in this first edition of Taylor's CSA.

These assessment reviews have been useful in developing criteria to select categories and indicators. As mentioned at the beginning of this section, the primary criterion is the impact of the action being assessed. This may seem backwards since the purpose of the assessment is to determine the impact or footprint of certain actions. It is possible to rely on personal experience, previous preliminary sustainability assessments, and recommendations from the literature to gather enough information to make informed decisions. The Good Company recommends consensus, action, and measurability as criteria (Skov, 2004). Seeking consensus was the purpose behind reviewing toolkits and previous CSAs. Action, or the ability to improve indicator results, is desirable but not completely necessary due to the possibility that some fundamental and unchangeable aspect of the university's operations may have a great environmental consequence. Five other good requirements for indicators are that they efficiently identify important issues, are measurable and comparable, measure more than "eco-efficiency", measure improvement and motivation, and must be understandable by all university stakeholders (Shriberg, 2002). Since this is not simply a snapshot audit, it is important to assess processes by including information on new initiatives. Motivation is also important because if energy efficiency initiatives are being supported

by university administrators purely to achieve cost reductions, improvements in this area may not transfer to categories such as sustainability education.

Greenhouse gas emissions are a very important part of any institution's environmental footprint and sustainability. Several of the toolkits and assessments reviewed include a climate change section, but even those that do not explicitly include one usually indicate that reducing a campus's carbon footprint is an important component of becoming more sustainable. While researching CSAs it is impossible not to notice the large number of carbon footprint measurement tools and schools that that use them as a part of a CSA or independently. Even STARS offers two points for performing a greenhouse gas emissions inventory and 14 points, the most of any indicator, for taking steps to reduce emissions (AASHE, 2010c). Similar to how STARS is immerging as the leader in sustainability rating, the Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator (CCC) is the most popular greenhouse gas emissions inventory tool. All of the required calculations are included in a convenient spreadsheet which has been used by over 500 schools. It is based on standards created by the international Greenhouse Gas (GHG) Protocol Initiative and is the tool recommended to signatories of the ACUPCC (CACP, 2009). The information required for the CCC overlaps nearly completely with information that would be gathered for a comprehensive CSA. All information required for the CCC will be included in Taylor's CSA and be given special priority. The final carbon footprint will be reported in its own section, but all of the constituent data is reported independently in the most appropriate section.

One important aspect of the methodology is the selection, strict adherence to, and clear explanation of spatial and temporal boundaries. If it is called a *campus* sustainability assessment, then why include anything that happens off of university owned land? Should the methane released by the dairy cows that produce the milk consumed on campus be included in the greenhouse gas emissions of dining services? Questions like these must be clearly and systematically answered to

allow for accurate benchmarking. Since the delineation of boundaries is an especially important issue in greenhouse gas reporting it is thoroughly explained in the CCC guide. The control approach to organizational boundaries will be used in this assessment. That means that emissions are measured for operations that occur in facilities that are under the practical control of the university. Operational boundaries are defined in terms of scope: Scope 1 is direct emissions from owned sources (ex: fuel in fleet vehicles), Scope 2 is indirect emissions not owned or operated by the university but directly linked (ex: purchased electricity), and Scope 3 is other emissions that can be attributed to the university (ex: commuting). This assessment will follow the ACUPCC protocol of including all Scope 1 and 2 emissions and Scope 3 emissions for commuting and financed travel to the extent possible. The practical concept of "de minimus," neglecting emission sources that are known to have a very small impact, is also applied (CACP, 2009).

A summary of conclusions drawn from the assessment review described above and their corresponding implications for the Taylor CSA is contained in Table 5.

Table 5: Conclusions from assessment review

	Conclusions from Review	Implications for this CSA
1	Purpose affects framework design	Goals: benchmarking & improvements
2	Social & economic indicators are less developed	Emphasize environmental indicators
3	Must know indicator criteria	Impact, consensus, measurability, status and changes, …
4	GHG Emissions are important	Use CA-CP CCC and emphasize these indicators
5	Boundaries must be defined	Organizational: Control, Operational: Scopes 1-3

C. Indicator Justification

The final assessment framework chosen for this assessment of Taylor University is listed below. The background information section is included for benchmarking purposes and is not considered part of the framework or indicator list. The framework includes 4 sections, 21 categories, 44 sub-categories, and 113 indicators.

I. Background Information

a. *CSA Info*
    1. Author
    2. Timeframe
    3. support
b. *Institutional Info*
    i. Classifications
        1. Carnegie Classifications
    ii. Population
        1. Full Time Students
        2. Part-Time Students
        3. Summer School Students
        4. Faculty
        5. Staff
    iii. Budget
        1. Operating Budget
        2. Research Budget
        3. Energy Budget
    iv. Physical Size
        1. Total Building Space
        2. Total Research Building Space

II. Operations

a. *Carbon Emissions*
    1. Greenhouse Gas Emissions
b. *Energy*
    i. On-Campus Production
        1. Cogeneration
        2. Other Sources of Heat and Electricity
    ii. Purchased
        1. Electricity
        2. Electric Fuel Mix
        3. Ability to Monitor
    iii. Use
        1. Energy Star
        2. Temperature on Timers
        3. Sensors for Lights
c. *Transportation*
    i. University Fleet
        1. Gallons Used
        2. Average Vehicle Efficiency
    ii. Financed & Outsourced
        1. Faculty & Staff Air (and Other) Miles
        2. Student Air (or Other) Miles
        3. Faculty/Staff Mileage Reimbursement
        4. Student Mileage Reimbursement
        5. Study Abroad Travel
    iii. Faculty & Staff Commuting
        1. Miles Driven/Rode

iv. Student Commuting
    1. Miles Driven/Rode
v. Students Travel from Home
    1. Air Miles
    2. Driving Miles
vi. Parking
    1. Car Parking Spaces
    2. Bike Parking Spaces
    3. Student Vehicles on Campus
vii. Initiatives
    1. Encourage biking
    2. Bike Loan/Rental Program
    3. Carpooling Incentives

d. Water

i. Water Usage
    1. Gallons Used
    2. Ability to Monitor
    3. Efficient Fixtures
ii. Wastewater
    1. Septic Systems
    2. Central Treatment System

e. Waste

i. Reduction
    1. Printing
ii. Recycling
    1. Paper
    2. Plastic
    3. Aluminum Cans
    4. Glass
    5. Metal
    6. Electronics
    7. Other
    8. All (Locally Recyclable)
    9. Reuse
    10. Campus Recycling Center
    11. Recyclmania™ Participation
iii. Composting
    1. Weight of Material Composted
iv. Landfill
    1. Tons of Trash Landfilled
v. Incinerated
    1. Tons Burned
vi. Toxic
    1. Disposed Of
    2. Students Trained
    3. Reduction Policies

f. Dining Services

i. Food
    1. Organic
    2. Vegetarian
    3. Local
ii. Waste
    1. Trayless
    2. Bulk Packaging
iii. Catering
    1. Disposable Items
    2. Leftovers

g. Built Environment

i. HVAC
    1. Heating Fuel
    2. Refrigerants
ii. Indoor Air
    1. Quality
    2. Cleaning Chemicals
    3. Furniture, Carpet, & Paint
iii. Residential
    1. Sustainability-Themed Housing
iv. New Construction
    1. LEED Certification

h. Landscaping

i. Forests
    1. Forest Preservation
ii. Agriculture
    1. Garden
iii. Managed Grounds
    1. Fertilizer
    2. Pesticide
    3. Herbicide
iv. Impervious
    1. Impervious Surfaces
    2. Snow Control
v. Water
    1. Runoff
    2. Irrigation

i. Purchasing

i. Paper
    1. Amount
    2. Recycled Content
ii. Electronics
    1. Energy Efficiency
iii. Vehicles
    1. Fuel Economy
iv. Toxic Materials
    1. Limit Purchasing

v. Offsets
    1. Retail Offsets
    2. Renewable Energy Certificates
vi. Policies
    1. Life-Cycle Costs
    2. Sustainable Purchasing Options
    3. Eliminate Bottled Water

III. Administration

a. Mission
    1. Mission Statement

b. Management
i. External
    1. Organization Membership
    2. Sign a Declaration
ii. Internal
    1. Sustainability Committee
    2. Sustainability Coordinator
    3. Recognition Program
    4. CSA Performed Regularly
    5. Action Plan

c. Planning
i. Construction and Development
    1. Master plan
    2. Building Age Profile
    3. Stakeholder Involvement

IV. People

a. Students
    1. Perception of Sustainability
    2. Organization
    3. Publications
ii. Enrollment
    1. Persistence

b. Community
i. Alumni
    1. Sustainability Fund
ii. Outreach
    1. Outreach Materials

c. Spiritual
    1. Emphasis of Campus Ministries

d. Education
i. Curriculum
    1. General Education Requirement
    2. Sustainability in Courses
    3. Sustainability Related Major
    4. Freshman Orientation
ii. Research
    1. Sustainability Research

e. Benefits

1. Health
2. Education

f. Safety

1. Campus Safety
2. Ergonomic Safety

V. Finance

a. Students

1. Sustainability Fees

b. Investments

1. Social Criteria
2. Environmental Criteria

c. Endowment

1. Size and Trends

D. Data Collection Procedures

Once the list of indicators was finalized it was time to get out and collect all of the data and information that it required. This process constituted a significant amount of time and effort, but also provided the opportunity to work with a variety of university employees. The first step was to set aside indicators for which the author already had adequate information from personal knowledge or preliminary assessments. Second, campus departments and personnel were identified who could best answer each question with an informed and timely response. This initially resulted in a list of 41 contacts, but eventually rose to 60 contacts managed through several spreadsheets. (One of these spreadsheets, with indicators grouped by initial contact person, is located in Appendix A as an example.) Third, each person was initially contacted by email with a clear, yet concise, explanation of the project, its importance, and the requested information. (Appendix B includes an example of one of these emails.) The fourth step was the tedious, but rewarding, process of maintaining communication with all of these leads until their respective questions were answered. Fourteen respondents agreed to meet in person, which required more work on the part of the researcher but also resulted in superior responses and valuable connections

for implementing improvements. Fifth, in many cases, and especially within the transportation category, acquired information required substantial data entry, calculations, and analysis before the original indicator could be satisfied.

V. Results, Benchmarking, & Recommendations

This results section includes the campus sustainability assessment that all of the previous work has been leading up to. It is organized the same way as the indicator justification section (IV.B), and follows the most logical conceptual progression possible. It is organized by category with separated sub-categories where necessary. Many of the indicators require a three part response: 1) the current data or information that answers the indicator question; 2) description of trends in the data and campus efforts that have influenced the data; and 3) information about the availability of the data. Including an explanation of data availability allows for recommendations regarding continuous data compilation for assessment by others before the next CSA is performed. Unless stated otherwise, data and information is from the 2008-2009 fiscal year.

A. Background Information

1. Campus Sustainability Assessment Information

The compiler and author of this CSA is a second year graduate student pursuing a Master's of Environmental Science degree at Taylor. This thesis project was selected in May, 2009; the proposal was accepted in December, 2009; and the final draft was defended in August, 2010. The project was suggested and supported by a faculty advisor in the Earth and Environmental Science Department at Taylor as an outgrowth of personal interest and as a follow up to the "preliminary assessment" class project conducted in spring 2009. The assessment project began as an academic pursuit with little involvement from non-academic staff. During the same time period university

administrators independently became increasingly supportive of efficiency and sustainability efforts. Consequently nearly all university employees were supportive of the assessment. The project was most tangibly supported by the university with the approval of a request for a stipend to cover the researcher's living expenses during the final summer of work.

To the author's knowledge, this is the first comprehensive assessment of environmental sustainability ever performed of Taylor.

2. Institutional Information

Taylor University is a small, residential, interdenominational Christian liberal arts university in Upland, Indiana. During the fall semester of 2009 there were 1,895 full-time students and 97 part-time students in attendance. 1589 students lived in university housing, with 1439 of these students living on-campus (Dayton, 2009). They are accompanied by the full-time equivalent (FTE) of 170 faculty members and 362 other staff (IPEDS, 2010). The university's operating budget for the 2008-2009 fiscal year was $57,521,907 and it has over $1,000,000 of active research grants (Taylor University, 2009b). In the 2009 calendar year the university spent $1,333,392 on electricity and natural gas. This natural gas is used to heat the university's 905,972 square feet of building space.

Taylor fits the following Carnegie Classifications (The Carnegie Foundation, 2004):

Undergraduate Instructional Program: Balanced arts & sciences/professions, no graduate coexistence (Bal/NGC)

Graduate Instructional Program: Single post-baccalaureate (other field) (S-Postbac/Other)

Enrollment Profile: Very high undergraduate (VHU)

Undergraduate Profile: Full-time four-year, more selective, lower transfer-in (FT4/MS/LTI)

Size and Setting: Small four-year, highly residential (S4/HR)

Basic: Baccalaureate Colleges--Diverse Fields (Bac/Diverse)

B. Operations

1. Carbon Emissions

a. Results

Last year Taylor released the GHG equivalent of 17,711 metric tons (MT), or over 19 million pounds of carbon dioxide into the atmosphere. That is a significant contribution to global climate change. It is 9.6 MT per student or 35.4 MT for every faculty and staff member. Normalized by building area this is 19.4 MT per thousand square feet or by operating budget it is 0.31 kg per dollar. Carbon dioxide equivalent (CO_2e) is a convenient measure of the global warming potential (GWP) of all greenhouse gases. This inventory measured the three main GHGs released by humans: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The CO_2e of methane is 25 and the equivalent of nitrous oxide is 298 (Forster, Ramaswamy, Artaxo *et al.,* 2007).

It is helpful to categorize emissions sources as Scope 1, 2, or 3; which are defined in section IV.A.6 (page 50) above. Purchased electricity is Taylor's only Scope 2 source. Figure 1 shows that emissions generated directly by Taylor buildings and employees make up 17% of the total with 89% of that from the combustion of natural gas for building and water heating. Electricity, Taylor's sole Scope 3 source, represents over half of all university emissions. Figure 2 shows that other emissions financed by Taylor make up 33% of the total with two-thirds of that from study

abroad flights (including Lighthouse trips) and three-quarters from travel. A fourth category, offsets, can be deducted from net emissions, but Taylor does not yet have any offsets.

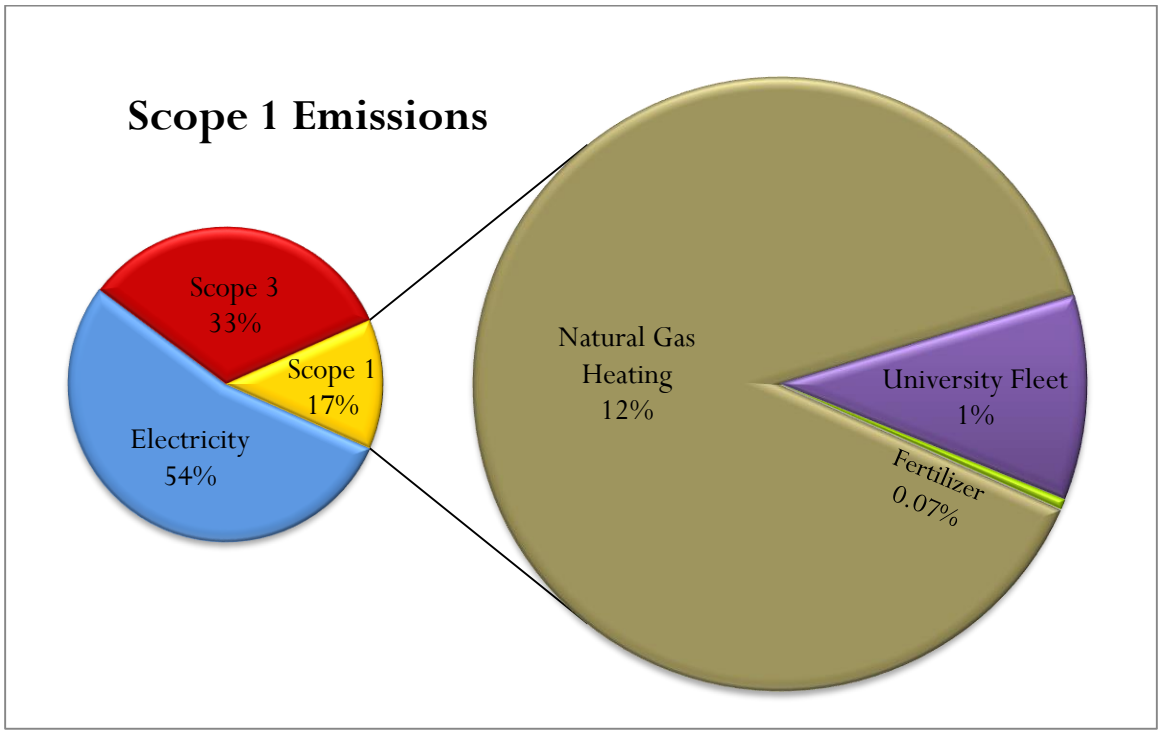

Figure 1: Pie charts of all Taylor's sources of GHGs with an enlarged view as Scope 1 sources. Purchased electricity is Taylor's only Scope 2 source. Percentages are for the entire campus carbon footprint.

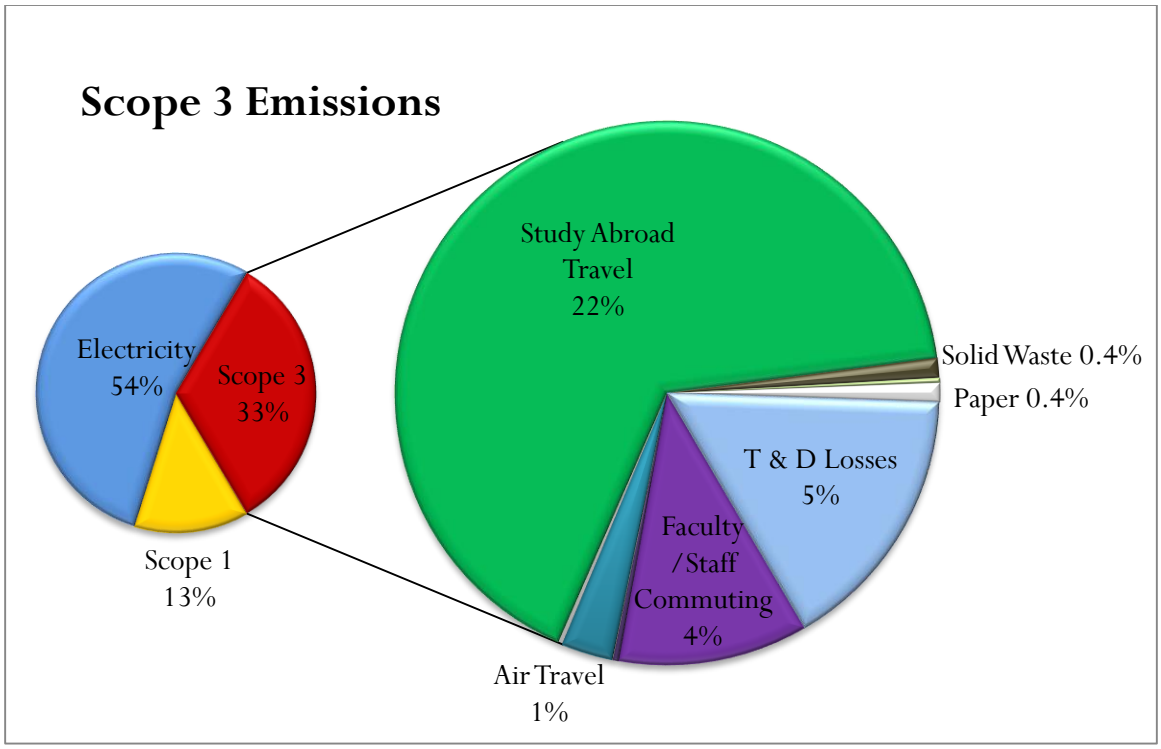

Figure 2: Pie charts of all Taylor's sources of GHGs with an enlarged view as Scope 3 sources. Purchased electricity is Taylor's only Scope 2 source. Percentages are for the entire campus carbon footprint. Unlabeled sources comprising less than 0.3% each are waste water treatment, student commuting, and other travel.

Unfortunately since this is the first year that this calculation was performed, there is not yet adequate historical information to compare it to. Most of the significant data was collected for the past ten years except for commuting and other non-study abroad transportation.

Each of the emissions sources are discussed further in later sections.

b. Comparisons

Since it is difficult to comprehend such a large amount of gas, it may be useful to list equivalent actions that could remove this amount of GHG from the atmosphere. Each of the following would limit the amount of carbon dioxide released into the atmosphere by humans by 17,711 MT CO_2e: taking 3,386 passenger cars off of the road for a year; saving 1.99 million gallons of gasoline; powering, heating, and cooling 1,507 homes for a year; planting 454,134 tree

seedlings and letting them grow for 10 years; preserving 168 acres of rainforest from deforestation; or not burning 92 railcars of coal (US EPA, 2010a).

The ACUPCC, AASHE, and CA-CP joined together to create a reporting system for the PCC required GHG reports which includes some statistical search and display abilities. These are very useful in making meaningful comparisons. However, it can be safely assumed that universities which are dedicated enough to sustainability to sign the PCC are also ahead of their peers at mitigating their impact on the climate. The averages of the samples discussed below are likely lower than the true population of American higher education institutions.

Out of a sample of 125 schools in the Carnegie class of "Baccalaureate Colleges" the average emissions per student is 9.02 MT CO_2e and 15.38 per thousand square feet (ACUPCC, 2010). Taylor is 6% and 27% respectively above these averages. A breakdown of the major sources for baccalaureate colleges is shown in Figure 3 below. Taylor is below average for stationary combustion and above for electricity, potentially due to the fact that some larger institutions produce their own electricity on campus. Another interesting note is that Taylor produces over three times as much CO_2e from study abroad trips as other colleges do with all of their air travel combined (ACUPCC, 2010). This is a result of the emphasis on "global engagement" as one of Taylor's brand attributes. Study abroad trips are discussed further in section V.B.3.a below.

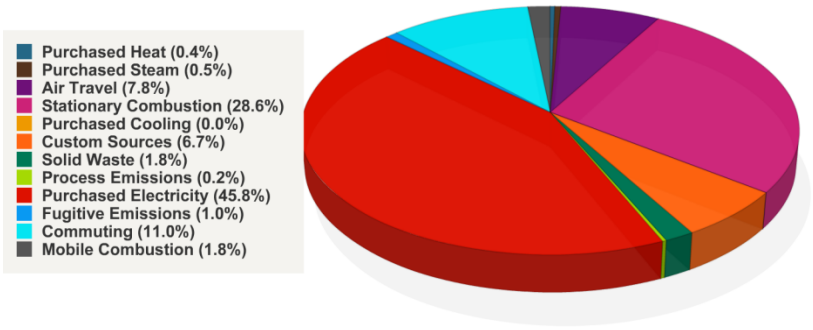

Figure 3: This pie chart shows the average percentage of carbon emissions coming from each source at the 125 baccalaureate colleges that have signed the PCC (ACUPCC, 2010).

Since such a large percentage of carbon emissions result from purchasing electricity, it is informative to compare Taylor against other universities in Indiana since such a high percentage of the state's electricity comes from dirty coal. Table 6 includes GHG reporting data for the six Indiana higher education institutions whose president's have signed the PCC and have met the reporting requirements. Taylor falls 5% below the average per area and 16% below the average per student.

Table 6: GHG data from Indiana Higher Education institutions whose president's have signed the PCC and have met the reporting requirements (ACUPCC, 2010).

Indiana Higher Education	**CA-CP CCC**	**Net Emissions**	**/FT student**	**/1k sq ft**
	Year	MT CO_2e	MT CO_2e	MT CO_2e
Ball State University	2008	192,873	11.6	28.6
DePauw University	2009	38,639	16.8	21.2
Franklin College of Indiana	2008	8,691	8.6	17.5
Goshen College	2009	9,508	10.7	12
Indiana State University	2008	98,066	9.3	22.6
Rose-Hulman Institute of Technology	2007	22,213	11.5	20.7
	Average	**61,665**	**11.4**	**20.4**

A final comparison can be made to Taylor's benchmarking institutions. Appendix C shows that Taylor's normalized emissions are higher than any of the other six reporting schools with the exception of the per student data point from Goshen (which is not coincidently also located in Indiana).

c. Recommendations

It can be concluded from all of this information that Taylor's emissions are in the expected range, although definitely on the high end. High levels of international study abroad participation and coal-generated electricity seem to be two of the main culprits for this. Yet these are both far from unchangeable facts. Each of the carbon sources are discussed further in later sections.

The only recommendation focused on climate change, is that the CA-CP CCC inventory is repeated on a yearly basis. It is important to know the total emissions of the university, which each student, faculty, staff, alumni, and other community member has a part in. Repeating the inventory will encourage the collection of information on each of the sources which can be used to reduce those emissions.

2. Energy

a. Results

On-Campus Production

Natural gas supplies warm water and warm air to 37 campus buildings through the cold Indiana winter. In the 2008-2009 fiscal year Taylor burned 453,335 hundred cubic feet (CCF) of natural gas. Figure 4 shows no persistent trends in natural gas use or cost. Figure 5 shows the typical pattern of gas usage on the entire campus for one year. Five gas meters serve multiple buildings and are split up using an estimated percentage used. Quantities and costs of natural gas use are already entered into a spreadsheet from monthly bills by the facilities services department. Vectren is the pipeline company and Energy USA supplies the gas (G. Eley, pers. comm., July 1, 2010). An example of a table for one year of natural gas data is included in Appendix E (The table is as provided, before any error checking an correction). The water and electricity spreadsheets are very similar. Taylor utilizes no cogeneration.

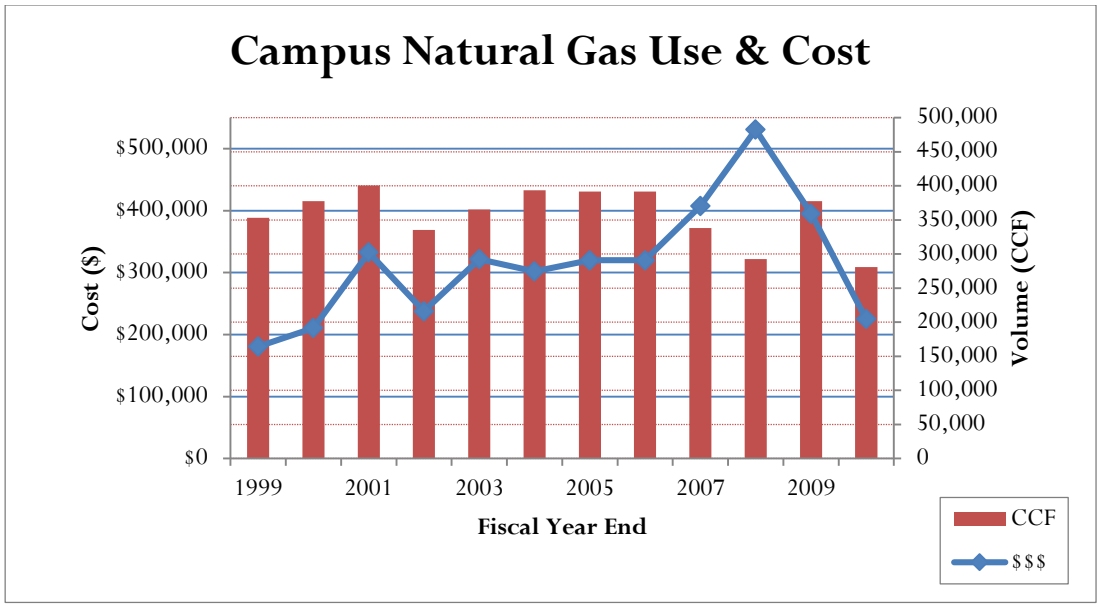

Figure 4: This dual axis graph displaying costs (blue, scale on left) and volumes (red, scale on right) of campus-wide natural gas usage for 1999-2010.

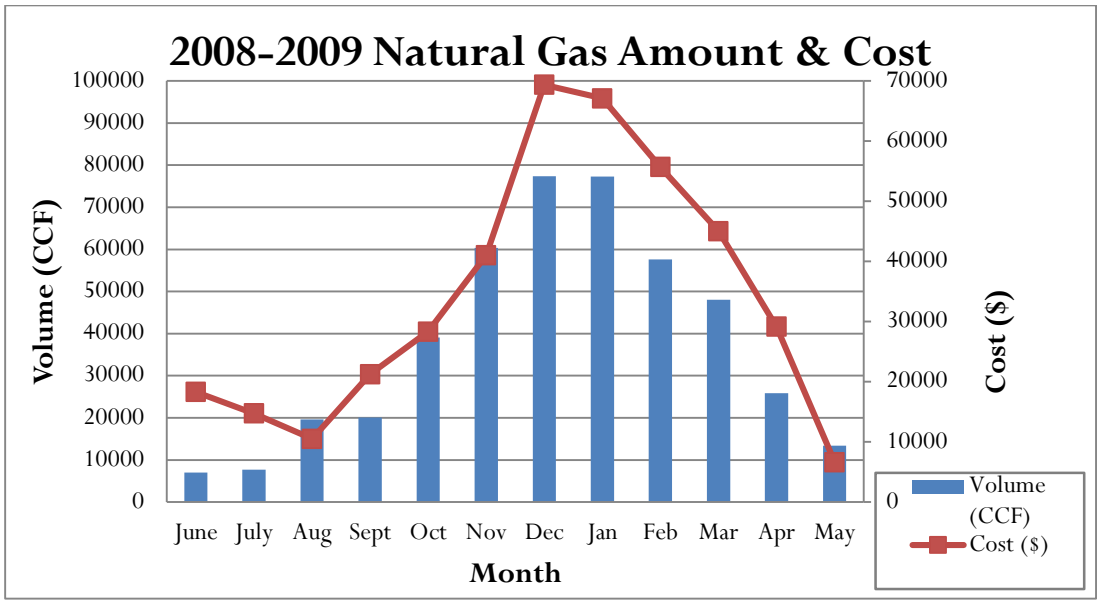

Figure 5: This dual axis graph displaying costs (blue, scale on left) and volumes (red, scale on right) of campus-wide natural gas usage for the 2008-2009 fiscal year.

Purchased

In the 2008-2009 fiscal year Taylor used 13,520,315 kilowatt hours (kWh) of electricity. Figure 6 shows that electricity usage increased steadily during the first half decade of the millennium and cost followed that trend all the way up to 2010. Figure 7 shows that there is no

significant trend in electricity usage during the year for the entire campus, although there definitely are changes in individual buildings. There are 42 electricity meters on campus, most of which are digital. Six of these meters serve multiple buildings and are split up using an estimated percentage used. Quantities and costs of electricity use are already entered into a spreadsheet from monthly bills by the facilities services department. Indiana Michigan Power, which is a subsidy of American Electric Power (AEP) provides our electricity. The fuel mix in this region of the country is predominantly coal, with most of the balance accounted for by nuclear (Michigan Public Service Commission cited Indiana Michigan Power, 2009). In 2007, 99.5% of electricity generated in Indiana came from coal and other fossil fuel sources (US Energy Information Administration, 2010). However, Taylor's AEP account manager did not reply to an inquiry into the exact fuel mix supplied.

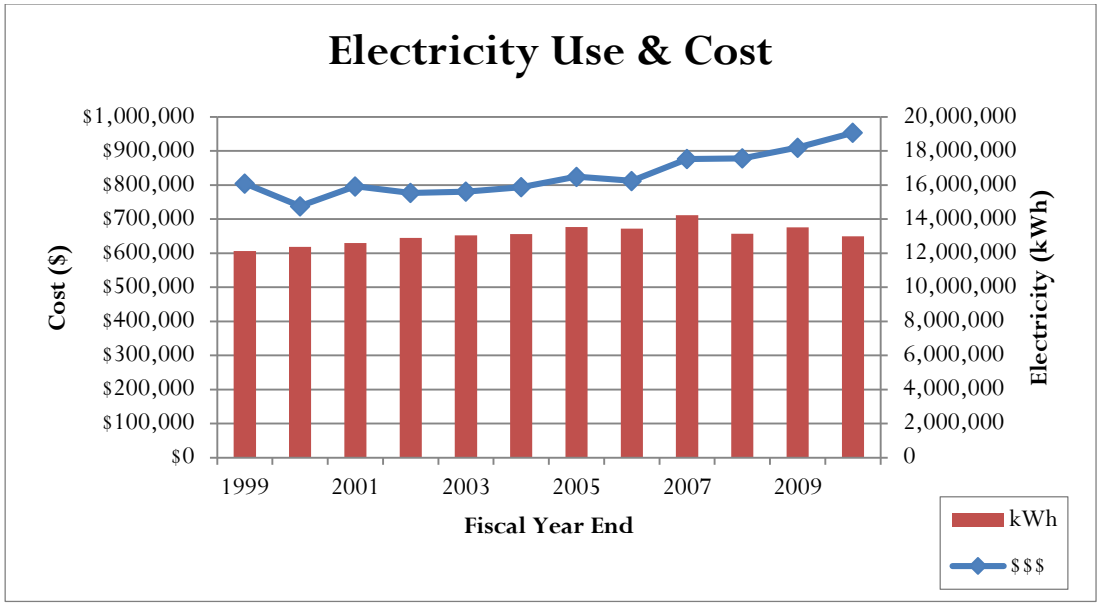

Figure 6: This dual axis graph displaying costs (blue, scale on left) and volumes (red, scale on right) of campus-wide electricity usage for 1999-2010.

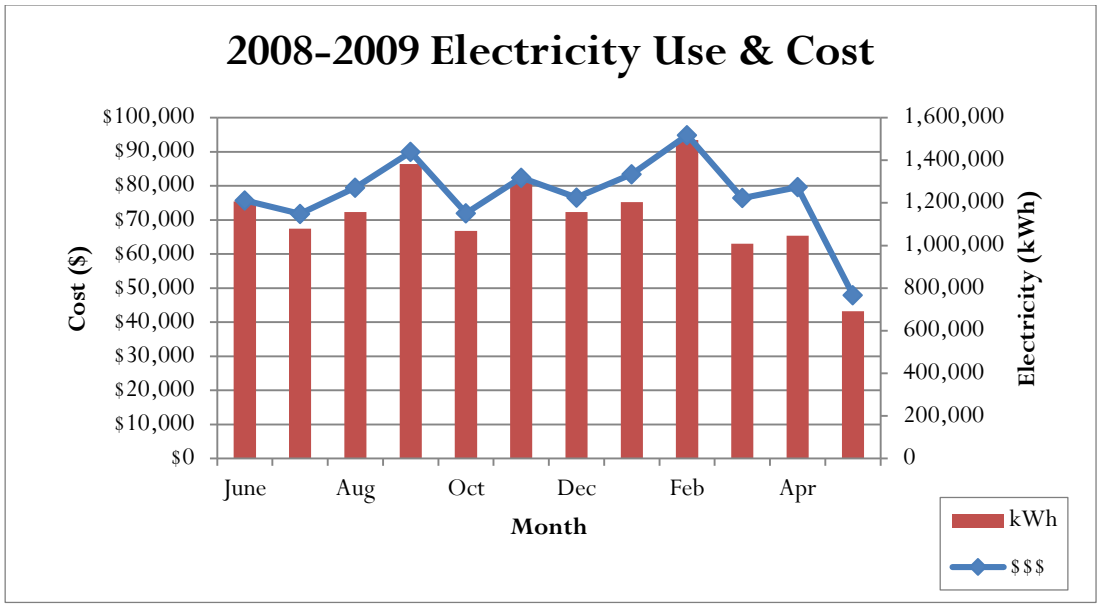

Figure 7: This dual axis graph displaying costs (blue, scale on left) and volumes (red, scale on right) of campus-wide electricity usage for the 2008-2009 fiscal year.

Six campus buildings have partial backup electricity generators that run on unleaded fuel. They are only used in emergencies and for brief preventative maintenance. The generator that backs up the information technology equipment and campus servers is turned on once every week to make sure that it can be utilized quickly (G. Eley, pers. comm., July 1, 2010).

Use

Taylor has recently engaged in several projects to reduce electricity consumption:

Students in Free Enterprise (SIFE) (the student business club) and SOC partnered to host Taylor's first annual "Green Week" in February, 2010. One part of that week was an energy competition, which resulted in substantial short-term electricity and cost reductions.

Table 7 summarizes the results. This was just a fun competition for the students to get them thinking about ways that they could easily save electricity.

Table 7: "Green Week" electricity competition results.

Place	Dorms	kWh used / Day		*Reduction from Normal*		Money Saved	
		/Dorm	/Person	*Percent*	kWh	/Dorm	/Person
1	**Gerig**	425	4.67	*75.61%*	657	$397.13	$4.36
2	**English**	1,400	6.39	*64.00%*	9,956	$750.16	$3.43
3	**Morris**	1,350	5.02	*52.84%*	5,271	$455.91	$1.69
4	**Swallow**	250	3.57	*25.55%*	459	$25.86	$0.37
5	**Olson**	1,100	3.83	*9.45%*	6,051	$34.61	$0.12
6	**Bergwall**	1,832	9.79	*8.23%*	343	$49.51	$0.26
7	**Wengatz**	1,350	5.31	*-7.43%*	-373	-$28.14	-$0.11
Totals or Averages		7,707	5.60	*32.61%*	**22,363**	**$1,685.04**	$1.22

The facilities services department has worked on several energy efficiency projects during the 2009-10 school year. They recently installed a total of 50 light switches and 18 sensors in nearly all of the bathrooms on campus. The switches are motion detectors near the doors that take the place of traditional light switches but can still be manually turned off or on. The sensors go on the ceiling in the middle of a room and were installed in locker rooms (S. Bragg, pers. comm., July 9, 2010). All of the classrooms in the Reade Center academic building have light sensors that have been there for at least five years and work well. Unfortunately they have not been installed in other academic buildings because some professors complain that they are too difficult to use. They will however be installed in all new construction (G. Eley, pers. comm., July 1, 2010).

Several years ago the decision was also made to upgrade all of the rented washers and dryers in residence halls to more energy efficient models.

Natural gas is also conserved by using building automation systems in some buildings that allow temperatures to be effectively allowed to float when the buildings are unoccupied. The university recently received an energy efficiency federal block grant that will be used to install variable frequency drives on motors in buildings to greatly improve efficiency. Another project that has been considered, approved, and entered the planning stay is switching from paper towel dispensers to high speed hand dryers in bathrooms. Table 8 below summarizes the anticipated

carbon emission reductions from this project, which is only one aspect of the environmental and financial benefits.

Table 8: CO_2e savings of switching to hand dryers

Unit	kg CO2 eq	lbs CO2 eq	MT CO2 eq
Paper Towel	68,848	151,783	68.85
Excel Dryer	21,684	47,806	21.68
difference	**47,163**	**103,978**	**47.16**
Net savings (10 yrs)	471,634	1,039,775	471.63

Taylor's IT department is also cognizant of the importance of and potential for energy savings with technology. "Virtually all" desktop computing equipment on campus is Energy Star approved, although anything more than three years old is much less efficient (T. Higley, pers. comm., July 9, 2010). Most printers and monitors are already set up to drop into very low power states when not in use. However, not all PC's are currently managed to utilize power saving modes. The client services department is currently in the process of creating a "Green Computing" webpage to give Taylor community members advice on how to reduce the electricity usage of their electronics among other things.

One example of efforts to reduce electricity usage from electronics is in the Educational Technology Center (ETC). They turn all of the computers in their labs off on weekends, and at least turn all monitors off every week night. They have also reduced unnecessary lighting (S. Curtis, pers. comm., July 13, 2010).

Construction on a new science building, the Euler Science Complex, began in June, 2010. This building will be discussed more in a later section, but it will include some alternative energy features. A photovoltaic will stretch across the existing Nussbaum Science Center roof. Two medium-small wind turbines rated at 20-50 kilowatts will be installed nearby as a part of the

construction (D. Takehara, pers. comm., June, 2010). These will provide a significant portion of the building's energy needs.

b. Comparisons

Electricity use was benchmarked in the carbon emissions section above. The rest of this section is not extremely applicable for comparison because Taylor is already working on many of the projects that have been identified as successful at other schools.

c. Recommendations

Many great improvements are already taking place to reduce Taylor's demand for energy from fossil-fuels. However, most of these projects are being pursued by specific departments and are relatively small in scale. These projects need to continue, especially those recommended in the Loyalton Group's "Energy Conservation Report" in Table 2. The single most important action to support these projects and instigate deeper and broader changes is to write and implement a university energy policy. This would be similar to many of the other items found in Taylor's Master Policy Manual. COST has already begun drafting a policy statement. At this point it is a broad document covering personal and administrative responsibilities, new buildings standards with regards to energy, commuting recommendations, and an indoor temperature policy.

3. Transportation

a. Results

Transportation is similar to utilities in that it has a large contribution toward Taylor's carbon footprint, but it is different in that it is not relatively easily measured and recorded. *Not yet*, that is. There are quite a few different dimensions of transportation on a university campus:

University Fleet

Taylor's vehicle fleet includes 90 units including 7 trailers, 5 off-road vehicles (ex: back hoe), 13 golf carts or utility vehicles, and 65 road vehicles. In the 2009 calendar year these road vehicles traveled a total of 583,247 miles as measured by their odometers. This is the equivalent of 135 round trips from Upland, IN to Los Angeles, CA. By using the US EPA's fuel economy ratings for each of these vehicles it is estimated that they consumed 33,711 gallons of unleaded gasoline in 2009 (US EPA, 2010b). Some of this fuel is purchased directly by the university and stored in a one thousand gallon, above ground tank next to the campus safety building. In the 2009 calendar year the university purchased 28,445 gallons of gasoline for on-road use. The remaining 5,266 gallons were purchased by individuals using the vehicles on trips. The CA-CP CCC estimates emissions based on miles driven, not gallons burned, so this was not a problem in those calculations.

The odometer readings were gathered from a spreadsheet maintained by the facilities services and campus police departments. It is supposed to be updated for every vehicle every month, however of the 924 pieces of data required for 2009, only 446, about half, were present. This does not include golf carts and utility vehicles which had no odometer or hour meter readings. However, the use of these vehicles was estimated from the number of gallons of off-road gasoline and off-road diesel purchased by the university in 2009. 2,100 gallons of diesel fuel was purchased along with 1,321 gallons of unleaded fuel, a small amount of which was used in backup generators for buildings. The data for these fuels which are stored in two 250 gallon tanks, along with the road gasoline mentioned previously, were gathered from Co-Alliance invoices and entered into a spreadsheet.

Financed & Outsourced: Faculty & Staff

University faculty and staff do a significant amount of job-related traveling. Gathering information on financed transportation that does not use fleet vehicles is difficult. Only cost information, which does not directly correlate the miles traveled or air pollution emissions, is currently gathered from the university. Yet even that information is not precise – for most campus departments there is only one line item for "travel expenses" which could include anything from plane tickets, to road tolls, to hotel fees, to fast food (B. Taylor, pers. comm., June 22, 2010). Some, but not all, departments were able to determine or estimate their employee's travel itineraries.

Sufficient information was gathered on faculty attending conferences and other professional development events. Taylor's Center for Teaching and Learning Excellence (CTLE) sponsors faculty presenting at some conferences, so they had a fairly good record. After discussing travel data collection with the deans of Taylor's three academic schools and their assistants it was decided that complete data collection would be too time consuming. An estimate of the percentage of faculty attending conferences and the frequency of those trips was requested instead. Regardless, the School of Natural and Applied Sciences still provided a nearly complete table of trips, locations, modes of transportation, etc. This included when university vehicles were used, which aided in the effort to not double-count miles. The Schools of Liberal Arts and Graduate and Professional studies both provided the number and percentage of faculty driving and flying to conferences in the past academic year. Average trip distances from CTLE and Natural Science were used to determine an approximated total distance traveled by automobile and airplane. Table 9:Table 9 shows the final summary data for professional development faculty travel for the 2009-2010 school year and Figure 8 displays the same information in graphical form. Combined, academic departments are responsible for 31, 402 driving miles and 196,493 flying miles.

Table 9: Professional development travel miles

Department	Driving	Flying
CTLE	12,271	19,773
Natural Science	11,343	64,368
Liberal Arts	6,305	80,600
Profess & Grad Stud	1,483	31,752
totals	31,402	196,493

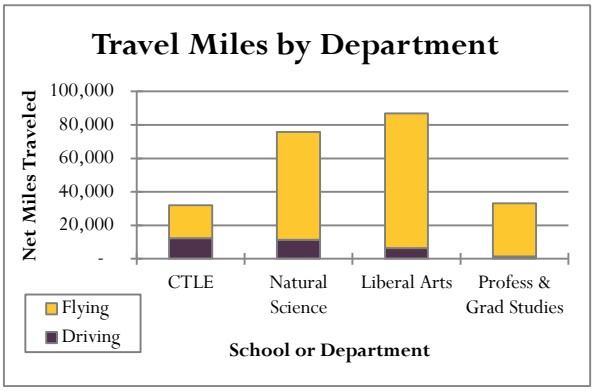

Figure 8: Distance totals and breakdown by method for professional development travel for the 2009-2010 school year.

Another category of travel sponsored by the university is bringing speakers in for chapel. This is unique to Taylor and other Christian schools that have frequent chapel addresses. During the 2009-2010 school year 40 of the 81 chapel sessions involved someone coming from away from Upland. From the speakers home locations is estimated that 14 of them flew to Indiana, and another 18 drove. This is a total of 35,500 flying miles and 5,800 driving miles. This resulted in the release of about 2,500 MT CO_2e. These calculations were done independently of the CCC.

University financed travel was not calculated for any other departments due to the difficulties explained above. The athletic department may generate significant air pollution through utility vehicles for campus transport, recruiting trips, van and buss team travel to normal competitions, air travel to national competitions, and air travel to mission trips. (A. Stucky, pers. comm., July 19, 2010). Similarly the music department also sponsors regular international tours. The admissions department also does a lot of traveling, but they have vehicles in the university fleet set aside for this (J. Breedlove, pers. comm., 12 July 2010). Finally, the university advancement office sends staff to visit prospective donors frequently. Most of these driving miles are included with the university fleet (including President Habecker's Honda Pilot), but flying miles are not.

Financed & Outsourced: Study Abroad

Student transportation that is financed by the university but outsourced to private vehicles or commercial airlines is predominantly for travel to off-campus study programs. This includes study abroad programs, domestic programs, and mission trips. Taylor World Outreach (TWO) Spring Break (SB) mission trips are not included. However, students are now awarded academic credit for participation, so they should be counted equal to Lighthouse trips in future assessments In the 2008-2009 school year, 472 students (93 for Lighthouse) traveled a total of 5,014,830 air miles (1,103,966 miles from Lighthouse). This is the equivalent of flying around the Earth at the equator 201 times! This data and the same numbers for 2001-2010 is shown in Figure 9. Figure 10 breaks down the average distances flown during each semester for the first decade of the millennium. Finally, Figure 11 shows the countries that Taylor students spend time in for academic credit during the 2007-2008 school year. Taylor's emphasis on sending students abroad is demonstrated by the establishment of the Spencer Center for Global Engagement in 2006.

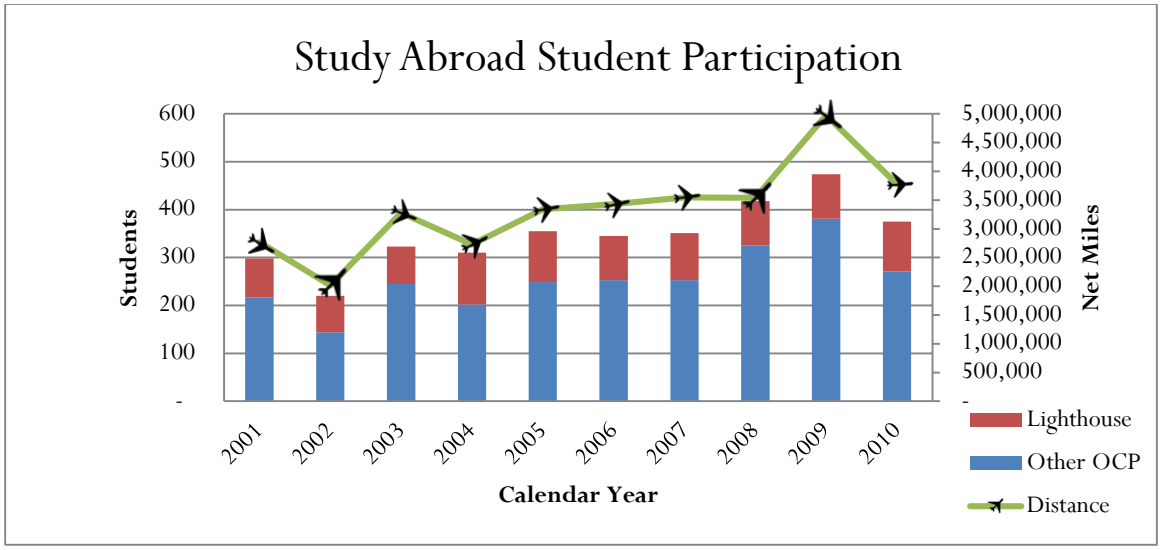

Figure 9: This dual axis graph shows the total number of air miles traveled by students on academic trips in each year on the right scale. The left scale is the number of students participating in Lighthouse mission trips or other off-campus programs.

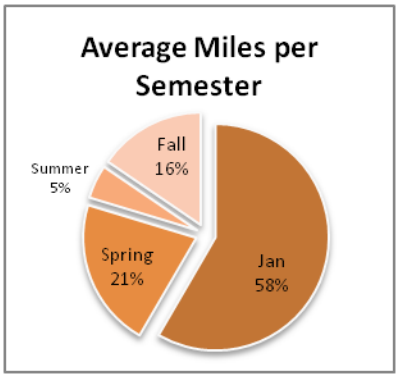

Figure 10: A pie chart breaking down the average total distances traveled for off campus programs by semester.

Figure 11: This world map shows the countries that Taylor students stayed in for academic credit during the 2007-2008 school year in red and past trips in dark gray (Dayton, 2009).

Faculty & Staff Commuting

It is easy to understand the large impact that employee commuting has on Taylor's sustainability when one considers that up to 606 employees come to campus 5 days every week, for about 50 weeks in the year. A rough calculation shows that this is about 300,000 trips in a year!

Taylor's geographic location is unique; many first time visitors describe it as, "in the middle of nowhere." This is a good and bad thing for staff commuting to Taylor. It results in a large number of staff living in the local community of Upland. According the Taylor Employee Directory 261 of the 527 (49.5%) Upland campus staff reside in Upland. Twenty of the addresses in the directory were from other states, so it is safe to assume that most of these are not commuting to Taylor on a regular basis and therefore were not included in calculations. With that in mind, over half of employees who commute to the Upland campus on a regular basis live in Upland. A further 143 staff live in the nearby towns of Fairmount, Gas City, Hartford City, Jonesboro, Marion, or Matthews. There are 123 Upland staff members who commute from further away than this. The downside of this setting is that some staff choose to live in a larger city which are further away, such as the 19 employees who live within the city of Fort Wayne or the 26 who live in Muncie.

More data was collected by using a survey conducted for the emissions audit performed by the Introductory Chemistry class in 2008. 162 faculty and staff responded to this survey (CHE 100 and Rosenberger, 2008). The modal split of how they responded that they usually commute to campus is displayed in Figure 13 below. Figure 12 shows the survey response of how often employees drive their cars to work.

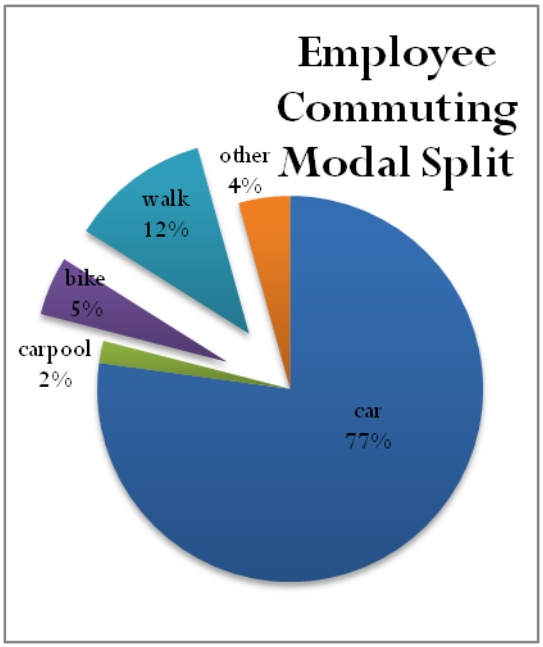

Figure 13: A pie chart showing the percentage of Taylor faculty and staff that usually use each type of transportation to commute to campus (CHE 100 and Rosenberger, 2008).

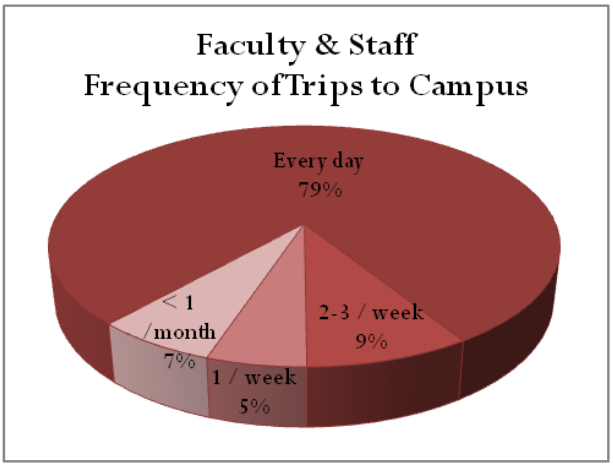

Figure 12: This pie chart shows how often Taylor faculty and staff usually drive to campus (CHE 100 and Rosenberger, 2008).

A total number of miles commuted was calculated using the information about what city employees live in, what percentage of them drive (alternative transpiration was assumed to only apply to Upland residents), how often they come to campus, and how many holiday and vacation days Taylor provides. Taylor employees cumulatively commute approximately 2.3 million miles every year. This is almost ten times the distance to the moon!

Student Commuting

Students must also commute from their residences to classes, the dining commons, or other location on campus. Since Taylor is a small residential university, student commuting is not a significant hindrance to the sustainability of the university – at least physically. Reducing short driving trips has the psychological impacts of getting students to think about alternative methods of transportation and question their reliance on private automobiles.

In the fall of 2008, 82% of students attending the Upland campus lived on campus (includes Campbell apartments), 4% were commuters, and 14% lived in approved off campus housing. The chemistry class transportation survey asked students two pertinent questions about commuting: 1). "If you live off-campus, how far is your home from campus?" 2.) "If you answered that you live off campus, what is your primary mode of transportation" (CHE 100 and Rosenberger, 2008)? From the responses it was determined that the average off campus student lives about 6 miles from campus, although 40% responded that they live within a mile of campus. Taking the responses of how off-campus students commute illustrated in Figure 14 into account reduces this average trip to about 5.5 miles. The final result is about 256,000 miles driven by students commuting in a school year.

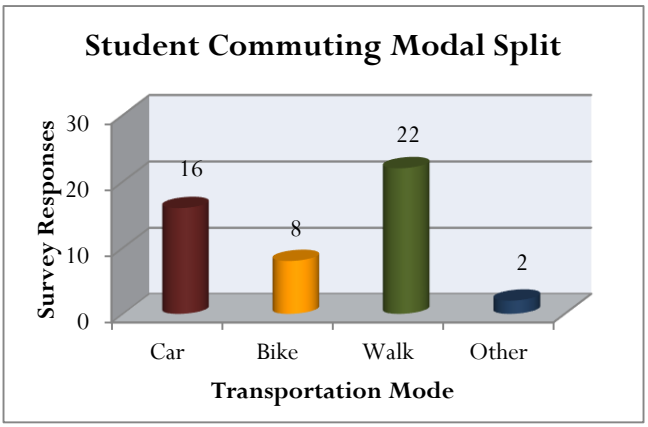

Figure 14: This graph show the number of Taylor students that usually use each type of transportation to commute to campus. Percentages could not be calculated because some respondents may have selected two options (CHE 100 and Rosenberger, 2008).

Students Travel from Home

Universities are far different from other institutions in that they require students to travel often great distances to remain for a portion of the year. However, most students make many trips

back and forth for holidays and other breaks. This transportation is not officially caused by the university so it is not included in the carbon footprint calculations. Yet the university does have some control over this in where it recruits from, how frequently it has breaks, if students are allowed to stay on campus during breaks, and how it supports them in finding efficient transportation home.

Parking

Taylor University supplies adequate quantities of inexpensive parking nearby nearly all buildings. There are 55 bike racks on campus with space for 488 bikes. Approximately half of these are located at residence halls. In the fall of 2009 this was approximately one bike parking location for ever three students. Anyone who walks around campus during the school year can see that there are not enough bike racks to handle all of the student bikes at residence halls. There are a total of 2,033 automobile parking spaces on campus. During the 2009-2010 school year 1,294 parking passes were sold to students for $10 each (J. Wallace, pers. comm., June 24, 2010). There are almost exactly the same number of parking spaces on campus as there are staff members (full and part time) and students with parking permits.

Initiatives

Taylor employees are not yet incentivized or encouraged to use alternative transportation such as carpooling or biking to campus (R. Sutherland, pers. comm., June 29, 2010). However, students are slightly discouraged from bringing cars by the small fee required to obtain a permit and sticker. Freshmen are not allowed to have cars on campus before the Thanksgiving holiday. This allows many of them an opportunity to realize that they really do not need a vehicle at college. The university also indirectly encourages students to carpool home for breaks by distributing a "Ride Finder" list with all of the students names and hometowns once every semester.

Dr. Michael Guebert and others are attempting to start a bicycle loan or sharing program on campus. They have already collected over a hundred discarded bikes from campus and secured a location adjacent to campus to work on them and store some of them. In the summer of 2010 the program got its unofficial start by fixing up approximately twenty bikes to loan to international students studying on campus for the summer.

b. Comparisons

Following are some modal splits from other university campuses that can aid in evaluating Taylor employee habits.

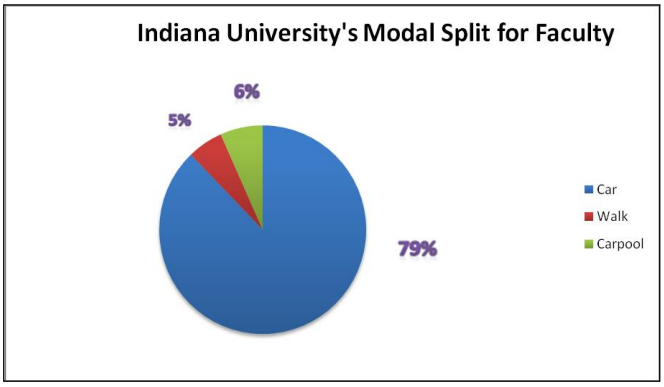

Figure 15: This graph from the 2009 preliminary CSA shows the reported modal split from Indiana University in 2001 (Crosby et al., 2009).

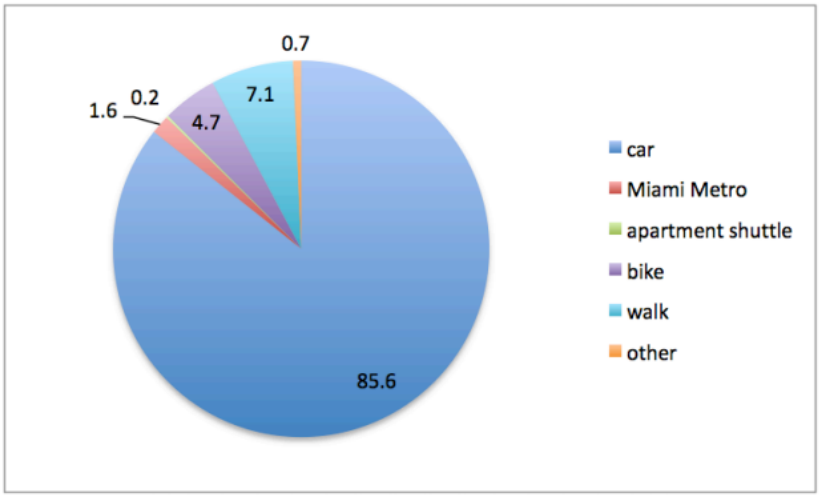

Figure 9: Modal split for faculty commuting trips: vehicle 85.6%, walk 7.1%, bike 4.7%, Miami Metro 1.6%, other 0.7%, apartment shuttle 0.2%.

Figure 16 Miami University located in Oxford, Ohio (Prytherch, 2008).

Table 10: Cornell University in Ithica, NY (Cornell University, 2009).

Faculty/Staff Residence Location

Distance from Campus	< ½ mi	½ mi to < 1 mi	1 mi to < 2 mi	2 mi to < 5 mi	5 mi to < 10 mi	10 mi to < 25 mi	> 25 mi
Today*	2.4%	7.0%	14.1%	29.1%	19.3%	20.9%	7.2%
50% CO_2 Reduction	5.0%	20.0%	29.5%	30.0%	9.0%	4.0%	2.5%

An article in *Business Officer* magazine contains many useful campus transportations examples and lessons. Following are a few of them (Hignite, 2010):

- Comprehensive GIS mapping to determine where students and employees commute from at The Evergreen State College.
- Short and long duration bike rentals, free campus cruiser bike use, and a mobile bike mechanic on campus are all part of the Colorado University at Boulder's bike program.
- Free bicycle borrowing programs failed at both Elon University and the University of Rhode Island. Elon has had success with a bike loan program though.
- Many campuses use high parking fees to fund other modes of transportation such as free bus passes. When their programs are initially successful and parking registration diminishes it lowers their revenue and ability to finance the alternative transportation programs.

c. Recommendations

ArcGIS (a Geographic Information Systems program) Geocoding could be used to calculate the precise distances commuted, but that is unnecessary. The information already provided is sufficient to gain an accurate understanding of this source of only four percent of Taylor's carbon emissions. Instead, developing and conducting a better survey would provide more important information on how often staff commute to campus and how they usually get there. Other recommendations include:

- Encourage university decision makers to consider the environmental costs when making decisions for conferences, study abroad, admissions, chapel, etc.
- Implement some form of a system to track department travel
- Include spring break trips in future calculations
- Strategically plan off-campus, academic, student travel so that short trips (spring break) stay within the country and long trips (semester, January, and Summer) may be international.
- A significant amount of carbon was released by chapel speakers, so future carbon emissions inventories should calculate travel distances for all speakers that are brought to Taylor, not just for Chapel.
- Encourage the chaplain to coordinate with nearby universities to coordinate speaker visits to reduce cost and carbon emissions.
- Officially encourage employees to use alternative transportation, even if it is not incentivized.
- Raise the cost to obtain a parking permit and use the extra income to fund alternative transportation programs or other sustainability initiatives.
- Reduce the campus area designated for parking. This is included in the Campus Master Plan as a reduction from 1.23 parking spaces per FTE student to 1.09 when the master plan is completed (The Troyer Group, 2008).
- Reduce student trips off-campus by providing what they need on campus including food staples and Red Box™ movie dispensers (Tuttle Construction, 2010).
- Improve upon the "Ride Finder" by offering hometown information in map format on the internet with options to advertise or request a ride.

4. Water

a. Results

Water is monitored on Taylor's campus the same way as natural gas and electricity. There are 36 meters on campus, 6 of which meter multiple small buildings. Quantities and costs of water use are already entered into a spreadsheet from monthly bills by the facilities services department. Sanitary water delivery and wastewater removal are provided by the Town of Upland.

Use

In 2009 Taylor used 27,852,635 gallons of water. Figure 17 shows the annual price of water purchasing for the entire campus along with the quantity purchased. Food service is the campus's largest single water consumer (the Grille is included in the purple section of the graph but accounts for only about 10% of food service consumption). Irrigation, which is actually metered at five different fields, also demands a lot of water in the summer. Irrigation is much more variable because the grounds department tries not to water unless absolutely necessary or for newly planted grass. The graph demonstrates that despite a persistent decline in demand, water prices are rising at a great enough rate to offset this and increase costs.

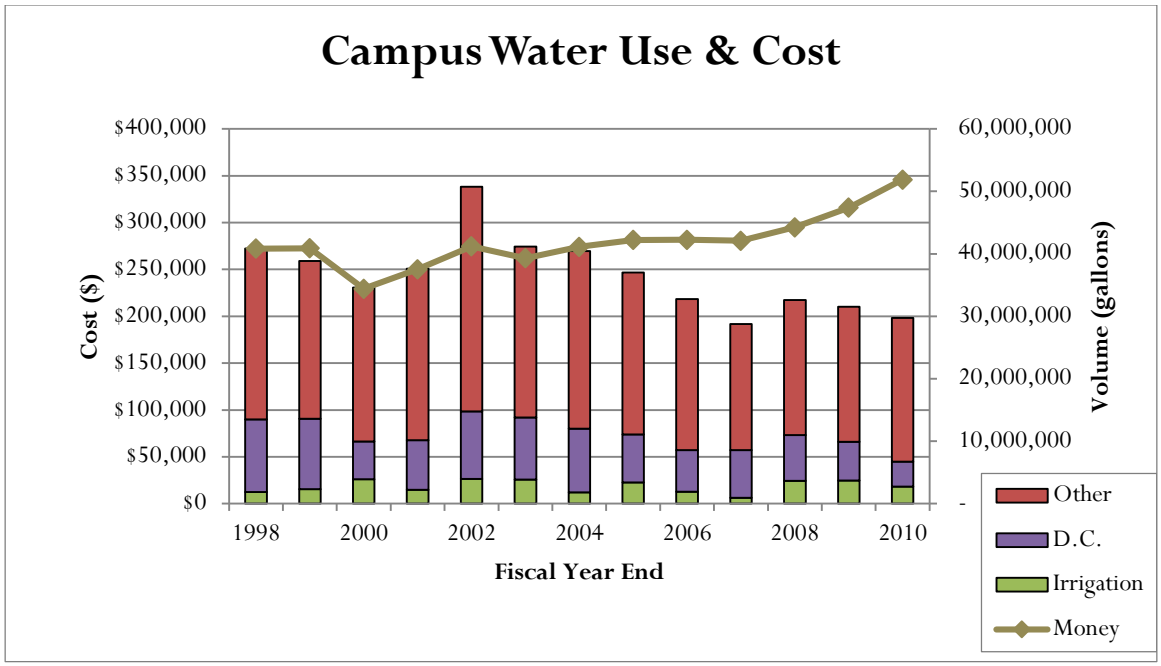

Figure 17: Dual axis graph showing annual campus water cost and consumption separated by major users.

Residence halls comprise approximately half of the campus demand for water. Figure 18 shows the amount of water used by an average resident of each residence per school year. The large variation can be attributed partially to the habits of the buildings residents, but also to the fixtures (shower heads, faucets, toilets, urinals, etc) that are in place in each building. If differences were due solely to the occupants one would expect a distinct difference between male and female dorms, but there is none. The importance of efficient water fixtures is demonstrated by some of the significant drops in water use displayed on the graph. These correspond to when large numbers of fixtures were replaced.

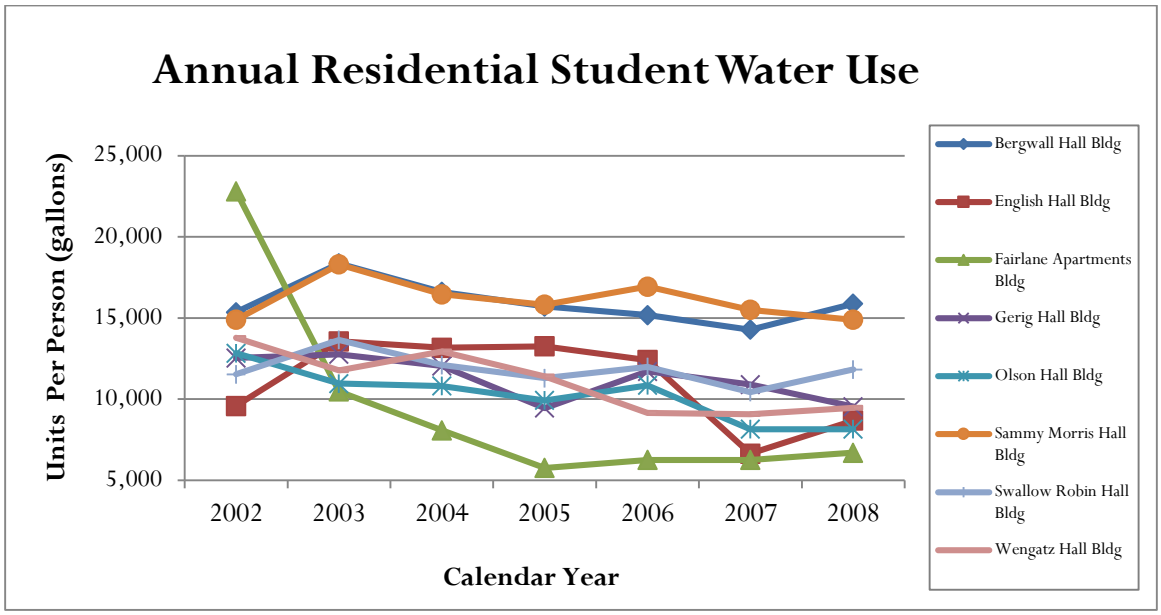

Figure 18: Graph showing yearly water consumption for every residence hall normalized by occupancy.

The Taylor facilities services and purchasing departments have purchasing standards that specify what new fixtures can be purchased, and consequently their efficiency. All new water fixtures qualify as low-flow or energy conserving (G. Eley, pers. comm., July 1, 2010). The new

faucets, urinals, and toilets come with "flushometers" or built in parts that use solar powered sensors to improve hygiene, conserve water, and conserve electricity.

Water use fluctuates throughout the year depending on how many people are living and eating on campus (for school or summer camps) and what the irrigation demand is. Figure 19 shows that the demand was lowest in January (many students are away from campus) and June (between when students leave and summer camps start in earnest).

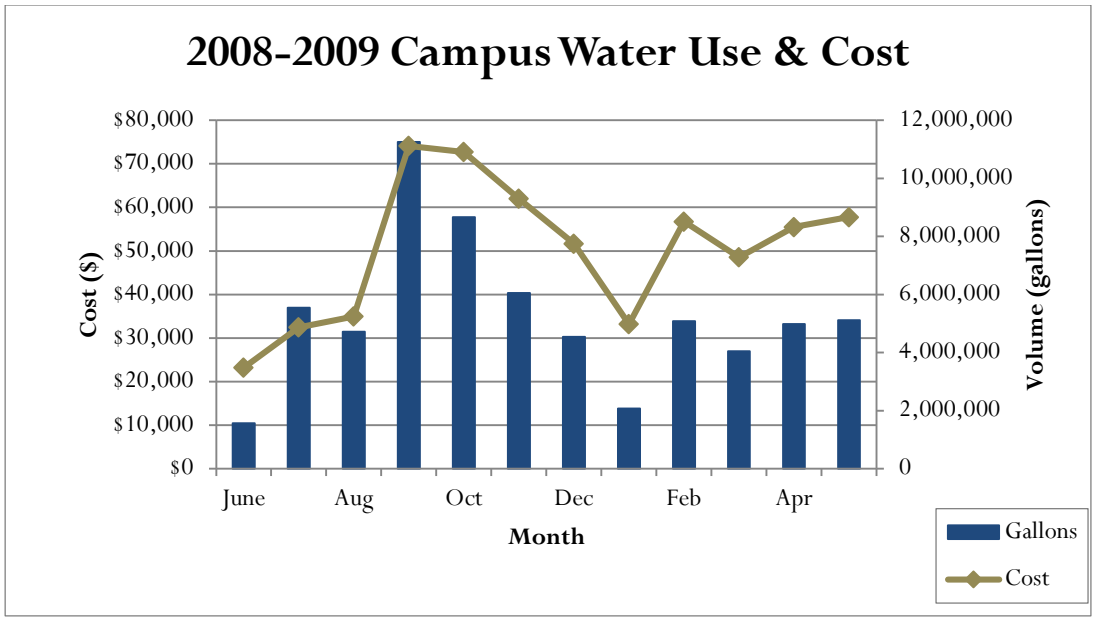

Figure 19: Dual axis graph showing monthly campus water consumption and cost for the 2008-2009 fiscal year.

Wastewater

Wastewater includes all of the water that is the Town of Upland pumps out of the aquifer and delivers to campus except water used for irrigation. This water is also accounted for separately so that the university does not pay the wastewater processing fee. In 2009 Taylor produced 27,852,635 gallons of wastewater that had to be processed at the Upland Wastewater Treatment Facility. No Taylor owned buildings use a septic system; all pump their waste to the treatment facility (G. Eley, pers. comm., July 1, 2010).

Taylor students were exposed to global water use issues as a focus of "Green Week" in the spring of 2010. During the "Green Week" chapel two students spoke about water issues while talking about a recent Lighthouse trip to Guatemala.

Information about rainwater can be found in a section below.

b. Comparisons

In Upland water is fairly cheap, of good quality, and fairly secure.

Carnegie Mellon University is a private university with about 5,000 thousand undergraduate students in Pittsburgh, Pennsylvania. The "Green Practices Committee" at their university decided to conduct a baseline water assessment of the campus too look for areas in need of improvement. Some of their subsequent efforts included improving the availability of data by expanding metering to more independent buildings, monitoring and reducing storm water runoff, and developing water conservation plans for specific departments. Some aspects of this assessment idea are covered in this project, but there is much left to be done. A larger team of experienced faculty, interested students, and involved staff members could quickly and effectively evaluate the aspects of and areas on Taylor's campus that need to most attention.

c. Recommendations

The facilities services and purchasing departments should continue to work together to identify, test, and install the most efficient plumbing fixtures available. The best example of this is waterless urinals. These increasingly popular urinals reduce large amounts of wasted water and work as well or better than conventional urinals when cleaned properly. In new construction and renovation projects the construction design team needs to work with building users, especially in residence halls, to find solutions that are economically, socially, and environmentally sustainable. For example, low-flow shower heads are economically and environmentally desirable, but may not

provide the pressure desired in some bathrooms. This sometimes results in students removing or replacing the shower head on their own, which makes the situation worse than when it started. One idea to limit water waste in residence bathrooms is to install timed push-button showers that only stay on for a set period of time so that they are not left running with no one in them.

Some other short term recommendations include:

- As with all topics in this assessment, continuous monitoring of data is useful in identifying problems early and evaluating the effectiveness of marketing or mechanical initiatives.
- Test functionality and public reception to improved plumbing fixtures such as waterless toilets and push-button showers (Tuttle Construction, 2010).
- Make regular and systematic checks for leaks, drips, and water efficiency.

Long term recommendations:

- Promote water use conservation among staff and students.
- Retrofit problem areas and establish plans for upgrades for old and new construction.
- Install "gray water" systems to utilize rainwater for non-potable applications such as irrigation or flushing toilets.

5. Waste

a. Results

This category is organized from best to worst: reduction, recycling, composting, landfilling, and hazardous waste.

Reduction

Two recent campus waste reduction efforts dealt with paper. The first is the planned switch from paper towel dispensers to high speed hand driers mentioned in the V.B.1 Carbon Emissions section above. 1,638 cases of paper towels are currently used every year, each case has 6 rolls in it, each roll has 533 ft^2 of paper towels on it, and the paper towels have a density of 0.027 kg per m^2 (Dettling and Margni, 2009). This equates to 5,241,600 ft^2 or 41,000 lbs (20.5 tons) of paper towels not purchased and not put in a landfill every year.

The following are reduction efforts and results from a variety of campus departments.

1. Campus mailings have been reduced from 2-3 every day to 10-12 in a whole school year. They have been replaced with e-mail, posters, and ¼ sheet fliers on DC tables.
2. The Advancement department has reduced its number of major mailings by targeting specific audiences and using the phone more often.
3. Programs for Theatre productions have been reduced from one for every audience member to half as many by collecting unwanted copies at the end of performances and reusing them.
4. Human resources switched from paper to electronic time sheets, pay statements, and Master Policy Manuals.
5. Professors utilize more electronic resources (like Blackboard™) and fewer paper handouts.
6. Course catalogs and class schedules are now distributed nearly exclusively electronically instead of printing large quantities of these documents, which can be hundreds of pages long (S. Neideck, pers. comm., July 1, 2010).

The reduction in the use of standard 20 lb white multiuse paper by the Print Shop is a good example of the effect that these procedural changes have had. From 2002-2004 about 28 skids of this paper was purchased each year, but by 2009 only 16 skids were purchased in a year. This is a reduction of 43%, 12 tons, or 24,000 lbs of paper (S. Neideck, pers. comm., July 1, 2010).

Recycling and Reuse

Taylor's recycling program is notable in that it has been in place since at least 1980. Recycling invoices for 2009 showed that 76.08 tons of paper products, 15.96 tons of metal (including 840 lbs of aluminum cans (nearly 27,000 cans)), and 0.28 tons of plastic were recycled. In addition the IT department recycles and estimated 50-60 computers with accompanying monitors, 12 printers, and other assorted equipment 3-4 times a year. This is approximately 2 tons of electronic waste recycled every year. Figure 20 shows these totals compared to trash brought to the landfill. This results in a recycling-only landfill diversion rate of 19.7%.

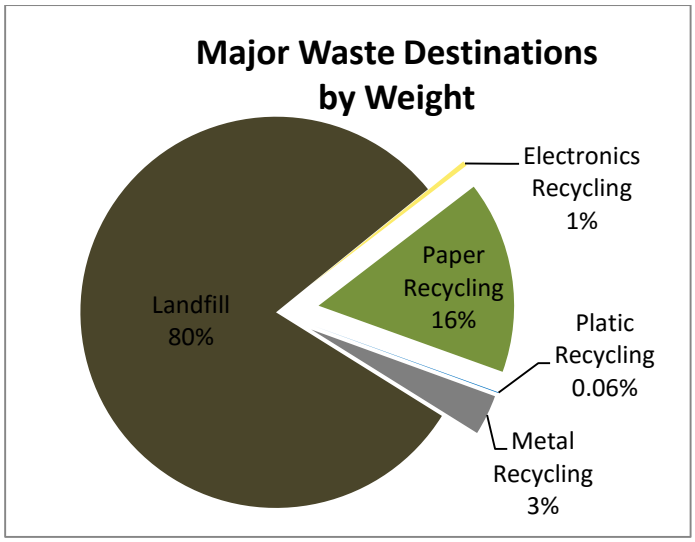

Figure 20: Percentages of recycling diversion from landfill waste for 2009 by weight.

The types of materials recycled or reused are as follow:

- Paper: mixed paper, office paper, magazines, hard bound books, corrugated cardboard
    - The DC, the Grille, and Facilities Services are the largest generators of recycled corrugated cardboard.
    - In addition to book recycling hundreds of books are dropped in donation boxes placed around campus at the end of semesters.

- Plastic: Only #1 and #2 plastics
- Metal: aluminum cans, tin cans, scrap metal (including iron, steel, aluminum, copper, brass, and others)
    - In the summer of 2010 tin can recycling was discontinued because a whole trailer full of cans from the DC was worth less than $20, which was not worth the time or gas to deliver it. However, it these cans were crushed in a simple machine made for that purpose it could become a profitable activity, just like the other recycling streams. Unfortunately, DC workers refused to make this change, so the program was temporarily suspended (P. Lightfoot, pers. comm., June 24, 2010).
- Glass:
    - Many years of successful glass recycling came to an end in 2008 when Taylor's shredded glass collector discontinued their service. Glass is still collected some places on campus and stored with the hope that a glass recycler will be found soon.
- Tires:
    - Taylor pays a fee to have tires picked up and recycled. This includes worn-out tires from campus vehicles, tires removed from Taylor's new property, and tires removed from the Mississinewa River during an annual student cleanup event
- Electronics: all IT managed desktop computer equipment, cabling, audio equipment, etc
    - Until recently Taylor's IT department paid $1,000 three or four times every year to have electronic equipment picked up and recycled. Starting in 2010 Green Wave Computer Recycling began collecting and recycling electronic equipment a no charge. They do all of the disassembly in Indianapolis and send the separated materials to recyclers within the United States. Because of this change the IT

department has officially opened electronics recycling up beyond just the campus to personal equipment of Taylor employees.

Recycling is collected at various points on campus and brought to a central collection, storage, and baling facility before pick-up. This main collection center is open to all Taylor community members to drop off their recycling as well. This is especially important because curbside recycling collection was discontinued by the town of Upland in early 2010. Collection sites for paper, aluminum cans, and plastic bottles are present in all of the academic and residence facilities. However, the quantity, standardization, and visibility of collection sites could be improved. An SOC Recycling Committee recently did an assessment of recycling on campus and make recommendations for improvement. One of their recommendations was to add an additional 74 recycling bins to the 140 already present on campus.

On Earth Day in 2008 some SOC students did a simple waste stream assessment of residence halls. They gathered on bag of trash from a central location in each dorm and sorted it to determine the content of recyclable materials. By volume, approximately half of this waste being sent to the landfill was recyclable. This was displayed to the student body by placing the separated garbage and recyclable materials outside of the chapel. The men who collect bags of trash and recycling from around campus estimate that one-half to two-thirds of what is thrown away could be recycled (R. Tedder, pers. comm., April 29, 2010).

There are also several programs in place to reuse materials. It is estimated by facilities services that half a ton of materials are reused, half a ton are donated, and 1.25 tons are re-sold through the work of the facilities services department (Crosby et al., 2009). Old furniture and clothes are often donated to local charities such as a woman's shelter. Campus departments and employees are allowed to place some unneeded items such as furniture in campus storage to reuse

it at a later time. After two years this material is re-sold to others outside of the TU community. Used fleet vehicles are also sold when they are replaced. A similar, but student led, program is the Annual Student Support in Salvaging Trash (ASSIST). ASSIST is a joint venture between the Stewards of Creation club (SOC), Helping Hand campus ministry, and the facilities services department. Its purpose is to decrease waste and help local community members in need by donating items such as couches, TV's, fans, lumber, lamps, clothes, food, laundry detergent, etc. at the end of the school year. For the past few years only household items and no furniture have been collected by Helping Hand.

The IT department donates used network server equipment to Christian ministries for their use. In 2009 the Computer Science and Engineering Department in collaboration with the new Center for Mission Computing donated 32 computers to Bingham University in Nigeria. Great care was taken to assure that these computers were fully functional, would be of great use to the students and faculty there, and would not quickly find their way into a landfill.

No outdoor recycling bins are currently in place. The athletics department does not provide recycling at any of its events. This is because of high levels of trash in recycling receptacles at sporting events in the past (A. Stucky, pers. comm., July 19, 2010).

Composting

Food composting is discussed in the dining services section below.

Yard waste is dealt with separately from all other wastes. It is never put into dumpsters by grounds workers. Instead it is taken out to the west edge of campus and dumped in piles to let compost. This waste includes some tree leaves that are collected in the fall and occasionally some grass clippings when the grass is growing especially quickly.

Landfill

Taylor maintains two permanent trash collection sites on the Upland campus, a 29-yard compactor for waste from the dining hall and a 40-yard compact for all other waste. These dumpsters are replaced by Waste Management when needed, usually twice monthly. In addition, open "roll-off" dumpsters are delivered and used for special events such as move-out weekend at the dorms or summer renovation projects. A fee is paid for delivery and removal in addition to a fee per ton of waste. In 2009 Taylor generated 384.08 tons of solid waste, which was down 6% from 409.78 tons in 2008.

Waste Management takes the garbage generated at Taylor to the Jay County Landfill 99% of the time. This landfill, located in Portland, Indiana, generates electricity by burning the methane generated by the waste. This is one of the best possible scenarios for a landfill because electricity is generated and a potent GHG is kept out of the atmosphere. Occasionally, Taylor's waste will be taken from the Kokomo, Indiana transfer station to the Oak Ridge Landfill in Logansport, Indiana (Waste Management, pers. comm., 15 July 2010). None of Taylor's waste is incinerated.

Hazardous

Very little information was gathered on hazardous wastes. A small quantity of hazardous wastes are generated at Taylor so it is exempt from many hazardous waste laws. Hazardous wastes are used in chemistry labs, some art department classes, and at the Physical Plant. Several students worked for the facilities services department in the summers of 2009 and 2010 to compile Material Safety Data Sheets (MSDS) and information on hazardous materials on campus.

Taylor currently throws mercury-containing, burnt-out fluorescent lamps in the trash compactor. This is highly discouraged by the EPA but not illegal for small waste generators in

Indiana. However the facilities services department is currently looking for the most cost-effective method of recycling these bulbs.

b. Comparisons

The best way to compare recycling across campuses is with the rate of recyclables diverted from the landfill. Recyclemania, a college recycling competition and benchmarking tool, has a wealth of recycling data from over 600 schools that participated in the competition (CURC, 2010). However, the recycling rate at over 80% of the participating schools increases (sometimes temporarily) during the competition when data is collected. Not including food waste, the highest recycling rate reported was 88% by the University of Hawaii at Hilo, and the highest rate of a school actually competing was 72% at California State University – San Marcos. Not including the waste coming from the DC, which includes a high proportion of food waste, Taylor's diversion rate was 24% in 2009. No schools in the Mid-Central College Conference, of which Taylor is a part, participated. In Indiana, Indiana State University achieved 76% recycling while DePauw had 43%, Purdue's main campus had 29%, Indiana University at Bloomington had 27%, and Purdue University at Calumet had 24%. Within the CCC and Taylor's other benchmarking institutions Gordon College achieved 35%, Northland 25%, Messiah 19%, and Trinity 15%. Messiah's program goes beyond the typical waste bins on campus (although they do have those - Figure 21). Messiah students instituted the first recycling program at the Christian music festival "Creation," in 2008 and recycled over 60,000 bottles and cans. In 2010 the university also purchased a machine to "densify" stryrofoam for later recycling.

California has a law mandating that all state schools recycle at least 50% of their waste (California Assembly Bill, 1999). In some cases this has resulted in schools such as San José State University to hire waste collectors who will sort out the remaining recycling in the waste stream

(San José State University, 2008). This is a beneficial program, but it does not replace the importance or efficiency of recycling separation at the source. Programs like the one at Sane Jose State, combining increased student awareness and participation with increased capacity to recycle on the facilities side, are driving up the waste diversion rate at many schools across the country.

There are many great examples of end-of-semester move out programs that are successful in many different ways. Clemson University's "Lighten You Load" campus move out program's primary goal is to reduce the quantity of usable items thrown away. In the programs second year (2002) 11,500 lbs of goods, mostly food and clothing, were collected. They list the primary challenge of the project as overcoming student's "affluenza" (Gaulin, 2002). Pomona College, with only 1,500 students, manages to collect enough reusable items at the end of the school year to fill nine 40'x8'x10' storage containers. This is made possible by hiring 25 students to collect items full-time at the end of the semester. Despite this large investment, the program is able to remain sustainable by paying for itself through the sale of good. Items like clothing and bedding are donated, but items like appliances and furniture are stored until the beginning of the next semester when they are sold (Pham and Patterson, 2009).

c. Recommendations

Taylor's has a successful recycling program, but it could benefit greatly from some improvement efforts. On the social side, more educational initiatives are needed and more emphasis needs to be placed on recycling by the administration. Corresponding improvements in recycling infrastructure are also required to see the greatest possible improvements. A new campus standard recycling bin is needed to provide aesthetic appeal and consistency for ease of use. Recycling bins are needed in far more locations, especially specific points of waste generation near

printers or pop machines. The importance of recycling also needs to be reiterated to housekeeping staff so that they will not take shortcuts such as placing trash in with recycling.

One specific program that has been successful at other universities is providing students with small recycling bins in their rooms. This greatly increases the convenience of recycling consequently the likelihood of it occurring.

The SOC Recycling Committee proposed the above recommendations and several others after their campus assessment. Their specific recommendations for the number of new recycling bins, the contents of recycling signs, and actual bins themselves are all included in Appendix I. Figure 21 is an example of the item specific lids from Messiah University. These lids are a final defense against costly contamination of recycling from garbage or other items.

Figure 21: Recommended recycling bin lid from Messiah College (photo by S. Morley).

The ASSIST program has tremendous potential, and needs to be reinvigorated. Since the end of the semester is such a busy time for students, it may be necessary to hire a student to coordinate the efforts of volunteers. This program should have the primary goal of donating reusable items and the secondary goal of reducing the volume of trash discarded.

6. Dining Services

a. Results

Taylor's dining services is contracted to Creative Dining Services (CDS). The main dining facility that serves most of the students and visitors is the Hodson Dining Commons (DC). It serves three all-you-can-eat meals every day except for holidays. The secondary food service location is the Grille, which is a "retail outlet" located in the student union (V.

Figure 22: A CDS "Grow" food label (Creative Dining Services, 2010).

Rhodes, pers. comm., June 28, 2010). This location serves about 500 meals a day; mostly senior students, students who cannot go to the DC due to class conflicts, and faculty (V. Rhodes, pers. comm., June 28, 2010). CDS also runs a catering service based in the DC.

In 2008 CDS started a sustainability promoting program called Grow™. The program is marketed as beginning with a focus on education then transitioning to action. Their emphasis is on providing some specific foods that are good for people and the planet. They fall into the following five categories: "earth friendly, go local, hormone-free dairy, natural protein, and sustainable seafood" (Creative Dining Services, 2010). Figure 22 is an example of a label that would be found on a food item. This program is a good effort to meet the demands of CDS's clients, yet it is very far from addressing the all of the environmental impacts that the operations of dining services facilities have on the environment. There are few indications that this program has been seriously implemented at Taylor, but according to the dining services staff that is because Taylor students are not interested (M. Pasma, pers. comm., December 3, 2008).

Food

The DC and Grille both provide at least one vegetarian main course option that every meal. However, they do not provide certified organic meals. They DC does offer some certified organic bread options though, but this is less than one percent of their food purchases. All of the milk that they provide is free of artificial-hormones (N. Maurer, pers. comm., July 12, 2010).

Food for catering, the Grille, and the DC is purchased locally "whenever possible" (Pasma cited Crosby et al., 2009). However, they estimate that only about two to three percent of their food is purchased locally. The main reason for this disappointing total is that about 80% of their food comes from Gordon Food Service located in Grand Rapids, Michigan. Following are a list of some of the locally purchased foods:

- All tomato products (whole tomatoes, diced tomatoes, tomato paste, etc.) are purchased from the Red Gold Company which is located in Orestes, 25 miles from Upland. The products also go through their distribution center is located in Alexandria, also 25 miles from Upland
- When apples are in season in Indiana, they are purchased from Heinlein Orchard nearby.
- When watermelons are in season, they are purchased from an Upland farmer related to a CDS employee.
- Honey is purchased from a local bee farm when available.
- All of the hard ice cream served in the DC comes from Glover's Ice Cream in Frankfurt, 65 miles from Upland.
- Some bread comes from Aunt Millie's Bakery which is headquartered in Fort Wayne, 60 from Taylor
- The majority of meats come from Muncie Meats, located in Muncie. However the meat comes from a variety of sources before arriving there.
- Similarly, Piazza Produce is headquartered in Indianapolis and provides most of Taylor's produce, but most of it probably comes from far away (Pasma cited Crosby et al., 2009).

Waste

The DC is the largest generator of trash on Taylor's campus. In 2009, 95 tons of solid waste was generated at the DC. This was down 12% from 2008, but still represents one quarter of all waste that Taylor sends to the landfill. The DC staff would like to reuse and donate more food than they currently do, but they are limited by health codes. Many buffet items are reused for student meals, but if food is left unattended at any time it cannot be reused. They are also unwilling to allow food charities to pick up food because if something goes wrong, even after it

leaves their facilities, they could be sued (K. Thornburgh, pers. comm., July 2, 2010). Most of the food waste that remains on student's plates for example, is run through a "pulper" then put in the dumpster. This includes paper products such as the napkins that are made from recycled paper and are biodegradable. According to the catering manager, Kathy Thornburgh, the DC management has offered to give this waste away as compost but no one will take it (pers. comm., July 2, 2010). The former Dining Services manager, Mathew Pasma, said that they are willing to participate in composting but a different department (i.e. grounds) needs to designate a site and pay for it (Pasma cited Crosby et al., 2009). According to the Grille manager, Vickie Rhodes, composting Grille waste is not possible. She reported that this is not because they are not willing, but because customers would never properly separate their waste. Her evidence for this is that in the 2009-2010 school year, after placing covers on trash cans so that deli baskets could not fit in, they still lost 456 baskets (pers. comm., June 28, 2010).

Nearly all food, consumables, and other items purchased by dining services are delivered in cardboard boxes. Nearly all of this cardboard is recycled, but very little of it is reused. In fact, the only reusable container that the DC comes in contact with is plastic milk crates used to hold large plastic bladders of milk.

Other methods for reducing waste are not using disposable items, purchasing items in bulk, and eliminating the use of trays. All of the tableware used in the DC is washed with a commercial dishwasher and reused. However all tableware offered at the Grille is disposable. CDS provides almost all applicable products (ex: food staples, condiments, and napkins) in bulk. Sugar and other sweeteners are not purchased in bulk because it can be easily ruined by moisture. Crackers are also not purchased in bulk because of concerns over cracking and sanitation. Several years ago fry oil was picked up by a local farmer to turn into biodiesel, but that is no longer the case.

After hearing about the waste and cost reduction benefits of eliminating trays from dining halls at other schools, Taylor's administration required the DC to follow suit. Unfortunately, the cost of replacing the conveyer belt that takes dirty dishes from the dining area to the kitchen was prohibitive. So instead, after several trial days, the DC went "semi-trayless" by only placing trays next to the conveyer belt for students to stack their dishes on to send the back to the kitchen. It was hoped that this system would still result in a partial reduction in water use for tray washing and a reduction in uneaten food that students took but did not eat. Nathan Maurer, Assistant Director of Dining Services, reports that since that program was instituted in 2009 more tableware has been broken, but he thinks that water usage and soap cost were reduced. The way that food was served and the quantities allowed also changed around that same time and may have offset any reductions in food waste (N. Maurer, pers. comm., July 12, 2010). The actual water used by the DC did decrease by 2.3 million gallons or 32% from 2008 to 2010 (see Figure 23), and the tray reduction was at least a contributing factor.

Catering

The CDS catering service varies from the DC and Grille in that they take food to those being served. They usually serve on glass tableware with the standard DC utensils unless serving outside of the DC in which case they use disposable products for convenience unless specifically requested otherwise. They recycle cardboard and aluminum drink cans but none of their plastic products. In the summer of 2010 they began using family-sized condiment bottles at tables instead of small individually wrapped packages.

The Grille is similar in that it offers a large variety of disposable products and spends a significant portion of its budget on them. Two examples that are very obvious when looking in any campus trash can is plastic grocery bags and thin foam drink cups. In the 2009-2010 fiscal year 85

cases of cups (about $7,500) and 31 *cases* of plastic bags were purchased, used, and discarded (V. Rhodes, pers. comm., June 28, 2010). In 2009 they switched many of their products such as utensils, plates, and bowls from plastic to plant-based, biodegradable materials. They did this to "look" more sustainable because they were pressured by the campus community to do so. They originally used Potatoware but have switched to Enviroware, which is not compostable but is advertised to biodegrade in a landfill within 10 years (Dispoz-o Products, 2010). All of Taylor's dining services have used napkins made from unbleached and recycled paper since 2009.

Other

By nature of its operations and the large number of people that it serves every day, the DC building usually consumes the most water of any campus building, the second most electricity, and more than twice as much natural gas as any other building. Figure 23, Figure 24, and Figure 25 show the trends in DC utility use from 1998-2010 and Table 11 summaries averages and values for 2009. Near the beginning of 2009 many of the lights in the DC were replaced with more efficient models which has helped to decrease electricity use somewhat.

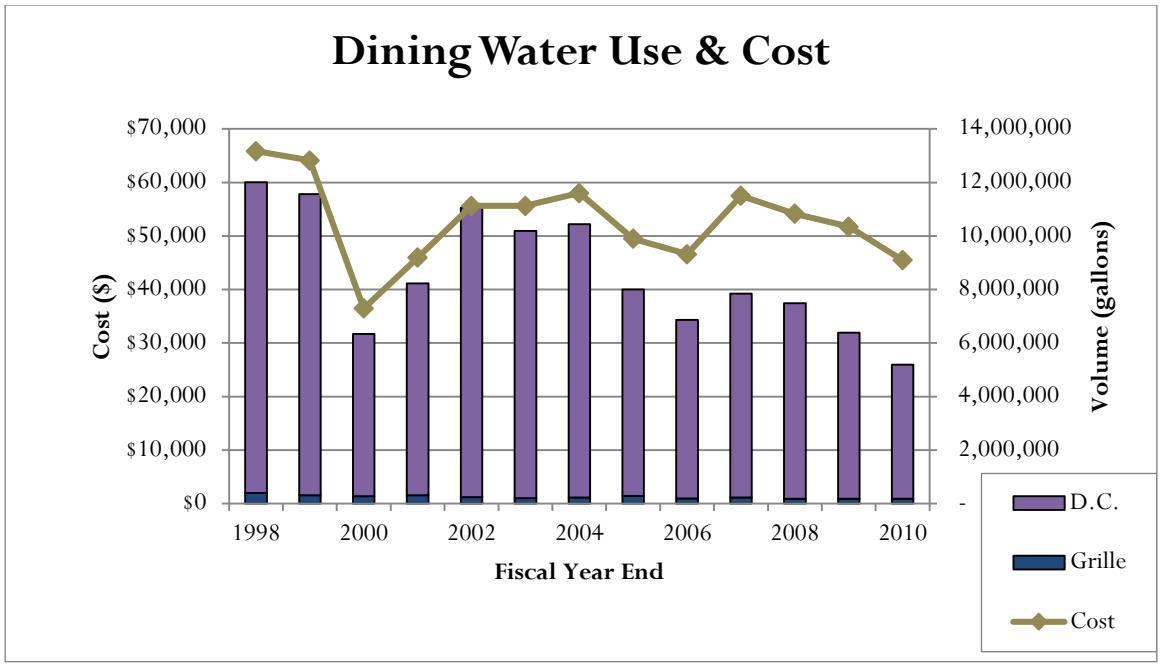

Figure 23: Water use and cost for the dining commons and Grille from 1998-2010.

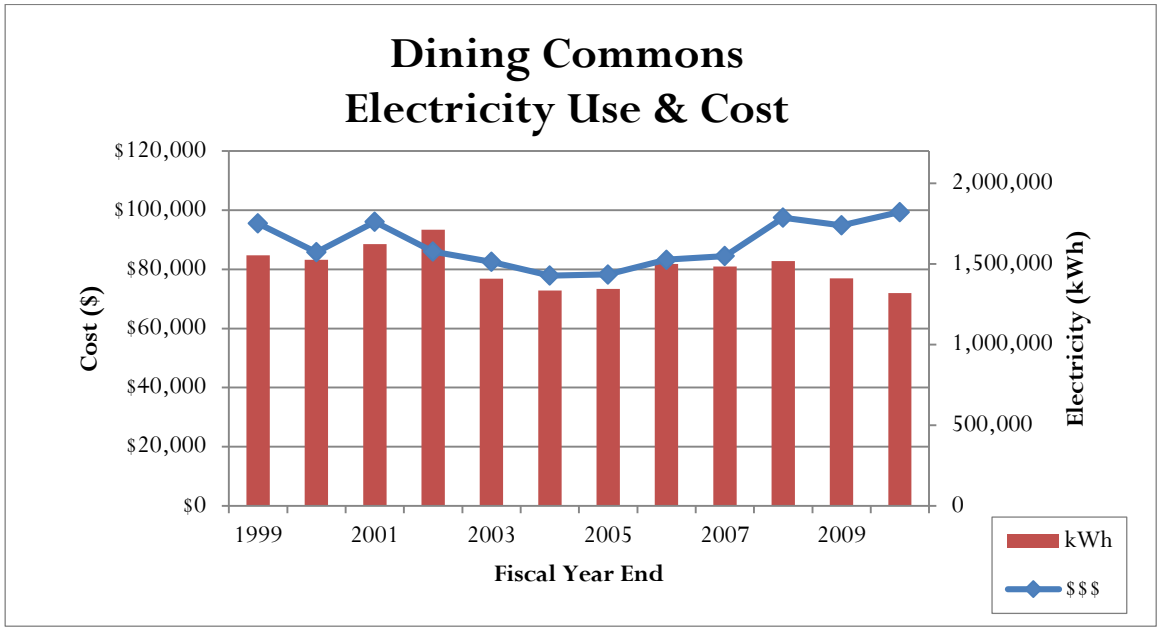

Figure 24: Electricity use and cost for the dining commons from 1999-2010.

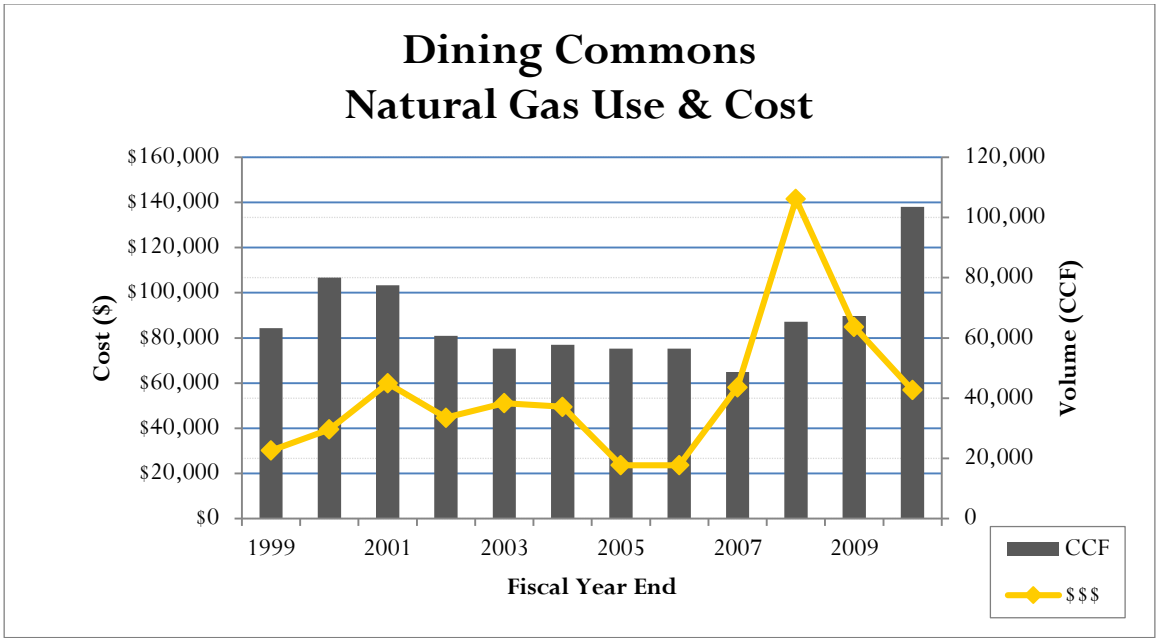

Figure 25: Natural gas use and cost for heating the dining commons from 1999-2010.

Table 11: Utility use and costs summary for 1999-2010.

Utility	Ave Cost	Ave Use	2009 Use	% Below Ave
Water (g)	$ 50,362	8,336,708	6,201,700	25.61%
Electric (kWh)	$ 88,467	1,478,070	1,410,955	4.54%
Natural Gas (CCF)	$ 55,335	66,120	67,261	-1.72%

b. Comparisons

Food

Many colleges have committed to buying as much of their food locally as their local climate allows. At Oberlin College about 35% of the food budget is spend on local products purchased from 30 different local farms and dairies. Vassar College has a "Farm-to-Vassar" program that buys 30% of its food from 23 local producers. Williams College spends 12% of its food budget on grass-fed beef and organic produce from local farms (Sustainable Endowments Institute, 2009a).

Over 100 colleges have taken locally sourced food even further by starting community gardens on campus (Valluri, 2010). Many of these gardens supply produce to their campus dining

service. Three of Taylor's benchmarking institutions have active gardens on campus (AASHE, 2010d). Calvin's small 576 square feet garden is open to students, faculty, staff, alumni, and their families (Calvin College, 2010a). Northland's *Mino Aki Community Garden* has been in existence since the mid 1990s with the primary goal of giving students and understand of and appreciation for the earth and where their food comes from. It produces 25 different crops and has expanded to the point of renting out small plots to community members (Northland College, 2010). Unity College runs on and off-campus community gardens, hires several people to manage them, and provides produce to campus dining services (Pyles, 2010). Some other colleges, including Warren Wilson College, have taken this to the next level by running entire farms with mostly student employees and volunteers (Biemiller, 2006).

Waste

Organic materials can constitute 80% of municipal solid waste, and college campuses are no different (Edwards, 1990). A campus-wide, day-long trash collection and sort at the University of Washington revealed that 42% of what was in the trash was compostable despite the fact that they already have a fairly successful composting program (University of Washington, 2010). Manchester College in Indiana has a successful composting program called "Project Clean Plate." This program encourages cafeteria users to scrape their plates into a bin to be donated to a local hog farmer and, equally importantly, to make them think more about how much food they are wasting. The university's dining services provider has committed to donating the amount of money saved by reducing waste to local food charities (Manchester College, 2010). Carleton College has a composting program that, in addition to on-campus students, half of the off-campus students participate in it (Sustainable Endowments Institute, 2009b).

At Calvin College, through the auspices of the "Grow" program, changes are taking place to make their dining services more sustainable. Some example of their current efforts are buying more regional food, minimizing disposable tableware, implement a reusable mug program with discounted drinks, donating food to homeless and needy people, and investigate composting. Creative Dining Services at Taylor however, said that it was unable to do many of these improvements. A large part of the discrepancy may come from the active involvement of the student Environmental Stewardship Coalition at Calvin (Calvin College, 2010b).

c. Recommendations

The main action that needs to occur before major changes will be made is that students need to express concern about the GHG emissions for transporting their food, the ethicality and safety of factory farmed meat, the landfill space taken up by their food waste, the cost of DC utilities, and other impacts of dining services at Taylor. This may require CDS and Taylor staff to begin making small changes to educate students about larger issues. CDS's Grow campaign could be very useful in this regard.

Food

The first step in improving the sustainability of the food served is to purchase more organic foods and acquire more local suppliers. Next, work should begin to find support and a location for a campus garden. This may be done in collaboration with *Victory Acres*, a local community supported organic farm where students often volunteer. Taylor's administration is open to the idea of a campus garden, as long as it is well thought out (G. Habecker and R. Sutherland, pers. comm., May 12, 2010). Some recommendations from a new garden at Concordia College are to start with a task force, plan for sustaining the garden – not just starting, use it as an educational tool, and involve community groups such as elementary schools (Rice, 2010).

Waste

Taylor has enough support, infrastructure, and land to support food composting; it just needs a champion to get it started. It may be best to start small with interested students separating their food waste at the DC, volunteers taking it to a location on the west edge of campus, and volunteers maintaining the compost pile with the supervision of a grounds worker.

Other

Despite their efforts to improve, the Grille needs to further reduce their use of disposable products. Their current small kitchen space will not allow them to efficiently wash large quantities of dishes, so for now more creative methods are required. For example, many other universities allow students to fill up their own bottles from the drink machines. Students could be given a small incentive for bringing their own cups, bags, and utensils. When a new Student Union is built the Grille needs to be given the facilities required to use non-disposable tableware for eat-in customers.

Three specific ideas for reducing utility use at the DC are as follow. Install clear plastic hanging temperature shields on walk-in freezer doors to reduce airflow out open doors. The Loyalton energy audit recommended installing a pre-rinse nozzle on dishwashers (The Loyalton Group, 2009). Finally, assess the age and efficiency of natural gas heaters because DC natural gas usage has increased dramatically in 2010.

7. Built Environment

a. Results

HVAC

Preventative maintenance is rarely performed on air conditioners, so refrigerants are not often removed. When they are removed they are picked up by a company that reclaims them. Even less frequently refrigerant will leak, in which case more is purchased to replace it.

Information could not be gathered on the exact type or quantity of refrigerants used (G. Eley, pers. comm., July 1, 2010).

Indoor Air

No existing Upland buildings have air quality sensors. When completed in 2012 the ESC will have built-in CO_2 monitors throughout. The facilities services department has made an effort to improve indoor air quality. David Gray, the Housekeeping Supervisor, reported that his department tried to use four "green" cleaners, but discontinued two because of poor performance. The Ecolab® QC™ 31 Neutral Cleaner is a general cleaner that accounts for about 10-15% of housekeeping chemical use. Ecolab® QC™ 52E is a Green Seal™ certified glass cleaner that also accounts for about 10-15% of housekeeping chemical use (pers. comm., July 8, 2010). Air quality is also considered in the purchase of carpet, glues, and paint. Almost all new carpeting (and glues) emits low amounts of volatile organic compounds (VOC) (G. Holloway, pers. comm., July 8, 2010). For the last two years the campus standard paint has also been low-VOC. All products purchased for the ESC will emit low or no VOC (G. Eley, pers. comm., July 1, 2010).

Indoor pests are usually managed with traps, but fumigation is occasionally used in residence halls when unoccupied if the pests exceed tolerable levels. Food storage and preparation areas in the Grille and DC are required by law to be regularly inspected and fumigated (Crosby et al., 2009).

Residential

According to Steve Morley, the Director of Residence Life, Taylor does not have any halls or floors that are specifically sustainability themed. However, Campbell Hall, the newest university residence opened in 2008, was designed using sustainability principles, but was not certified as such. Specific examples include low-VOC paint, Energy Star® qualified appliances,

and Energy Star® qualified windows. This was not communicated to students well enough, but one article was published in the student newspaper about the efficient washers and dryers (pers. comm., July 8, 2010).

New Construction

In 2010 Taylor's main building project was the ESC, seen below in Figure 26. As a matter of fact, it is Taylor's largest building project ever in terms of cost and physical size (Taylor University, 2010a). The building was designed with the intent of achieving LEED® Silver certification. Leadership in Energy and Environmental Design (LEED) is the leading green building rating system developed and administered by the United States Green Building Council (USGBC). The building has several notable sustainability features. A heliostat located in the center of the building will track, reflect, and diffuse sunlight into the core of the building. An array of solar panels on the Nussbaum roof and two wind turbines nearby will provide much of the buildings electricity needs. The building will utilize geothermal heating and cooling which is low-cost and has a small carbon footprint. Finally, an energy monitoring and control room adjacent to the atrium will display real-time data on all of these energy features and will be a great k-12 and university teaching and research tool.

Figure 26: A computer rendering of Taylor's future Euler Science Complex (Taylor University, 2010b).

Taylor currently plans to build new buildings with LEED and sustainability principles in mind, but without seeking certification. Gregg Holloway, Taylor's Supervisor of Contracts and Purchasing, is a LEED AP, which means that he is certified by the USGBC to be a knowledgeable green building professional.

b. Comparisons

Residential

The "EcoDorm" at Warren Wilson College is an ideal example of a more sustainable dorm (see Figure 27 at right). It was requested by students, designed in part by students and faculty, and achieved LEED Platinum certification. Some of its design features include siding timber from campus trees, photovoltaics, solar hot water heater, rainwater cistern, composting toilets, and passive heating and cooling. The building cost $180 per square foot

Figure 27: The "EcoDorm" at Warren Wilson College (BuildingGreen.com, 2003).

compared to $120 for other construction on their campus. However, the Vice President of Business said that it is worth it when using full-cost accounting and considering long-term benefits such as reduce utility usage (Bowe, 2006).

New Construction

A common trend on campus is instituting a green building policy, often requiring some level of LEED certification for all new construction. Nearby Ball State University has passed one such resolution requiring that all new buildings on campus seek LEED certification. Part of the goal of this resolution is to provide applied research opportunities for faculty and students interested in aspects of green building. Sacred Heart University went much further by requiring that all new construction and renovations meet the strict LEED Gold level of certification. The University of California at Santa Barbara is going all out with renovating all 25 existing buildings to meet LEED Silver requirements (National Wildlife Federation, 2010). The USGBC even has a specific campaign targeted at college campuses (US Green Building Council, 2010). In 2009, 13 university buildings were awarded the elusive LEED Platinum rating (Webster and Sweeney, 2010).

c. Recommendations

When it comes to making the built environment more sustainable Taylor should start small and build on successes. The ESC has the potential to become a launching pad for new ideas and sustainability initiatives.

Indoor Air

The housekeeping supervisor should build on the success of existing Green Seal™ products by seeking and testing other products with reduced human and environmental impacts.

Residential

Campbell Hall should be assessed to determine if the green building features were beneficial economically, socially, and environmentally. Until another dorm enters the design phase Taylor should concentrate on improving the existing residences. One method is to focus on student's behavior by providing a model "green" dorm room to give students ideas about how they can reduce electricity use, reduce waste, and improve health.

New Construction

Until commissioning is completed on the new science building the focus should be on making the most from that building's features through education and enhanced monitoring. After that period university stakeholders will hopefully have a better idea of the benefits from this type of building. At that point a formal commitment to green building or LEED certification should be proposed. Lessons learned from the ESC can also apply to retrofits and renovations in existing buildings.

8. Landscaping

a. Results

Taylor University's campus covers 285 acres in Upland, Indiana. A map of the campus is contained in Appendix J.

Forests

Taylor's main campus includes approximately three acres of forest near the southwest corner. This land is used for a ropes course and walking trails. Taylor has a 145 acre, mostly forested, arboretum (it is also a registered Indiana Natural Area) at the northwest edge of its campus. The university also manages a 20 acre prairie restoration project. In 2007 the university acquired an additional 680 acres of land northwest of the traditional campus. It is delineated with a yellow border in Figure 28. Much of this land is still rented out for farming. The remaining land is

primarily oak-hickory second growth forests and old-fields (Crosby et al., 2009). The only current uses of this land by the Taylor community are mountain biking, other recreation, and ecological experiments. The university administration has not yet determined if and how it will develop the land.

One of the research studies focused on this property is looking at the carbon being held in this forest. Environmental science master's student Jee Hwan Lee and his advisor, Dr. Edwin Squiers, plan to calculate the amount of carbon that will be sequestered in this forest if it is allowed to stand (J. Lee, pers. comm., May, 2010). When this project is complete it should allow for this forest to be used as a partial offset of Taylor's carbon emissions. Another research project on this land involved the planting of 1,000 trees in an old-field.

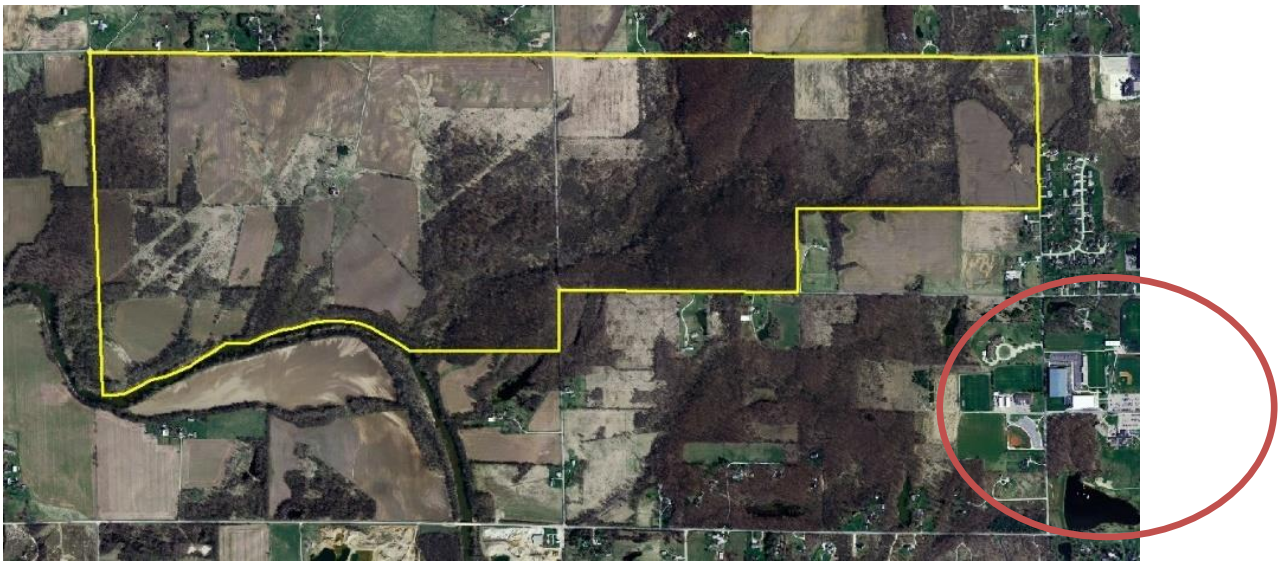

Figure 28: Taylor's "new property" is bordered in yellow with the campus in red (map provided by Kelly Pugh).

Agriculture

Taylor has not been directly involved in agriculture in the past several decades. As mentioned above, some students are interested in starting a community garden.

Managed Grounds

Open lawn areas account for 60% of the campus area (The Troyer Group, 2003). Taylor does not have a Master Landscape Plan, but rather relies on scheduled upkeep and dealing with situations as they arrive (Crosby et al., 2009). In flower bed and landscaped areas native plants are used when possible. The landscaping around the ESC will feature mostly native plants that do not require irrigation.

Fertilizer is applied once each in the spring and fall at a rate of approximately 300 lbs per acre. Approximately 19,000 pounds of 19:5:9 fertilizer is applied yearly, although only 16,000 were applied in 2009 (P. Lightfoot, pers. comm., June 24, 2010). A small amount of organic fertilizer is used for greenhouse plants (Crosby et al., 2009).

Herbicides are applied year-round with the only scheduled application in the spring to control dandelions on the campus lawn near buildings. Approximately 20 gallons of *Speedzone* is applied yearly. The grounds department determined that this product was acceptable to use because it did not appear on a comprehensive list of unsafe herbicides published by a California university. Approximately 50 gallons of glyphosate (off-brand *Roundup*™) is applied every year at a 40:1 concentration. This is used around trees and buildings. Approximately 10 gallons of *Pendulum* is mixed with the glyphosate as a pre-emergent killer applied and applied around buildings and ornamental trees every year (P. Lightfoot, pers. comm., June 24, 2010).

Species specific pesticides are used conservatively by a licensed operator (Steve Puckett). Pesticides are also used to control pests in Taylor's two greenhouses. This pesticide is a natural derivative of bacteria, which makes it work better and longer than synthetic pesticides, but it is also more expensive (P. Lightfoot, pers. comm., June 24, 2010). Occasionally moles become a problem in manicured athletic fields. They are eliminated with toxic baited worms or live traps (Crosby et al., 2009).

Impervious Surfaces

Taylor campus area is approximately 29% impervious surfaces (buildings, roads, parking lots, and sidewalks) (Crosby et al., 2009). These roads and sidewalks are kept safe in the winter with a combination of plowing and applied ice melt. The type used is more effective and more environmentally friendly than typical rock salt. In 2009, 60,000 lbs or 30 tons of this ice melt was applied when needed.

Water

Irrigation is only used for newly planted grass, the landscaping around the Memorial Prayer Chapel, and athletic fields when necessary (P. Lightfoot, pers. comm., June 24, 2010). Figure 17 shows the amount of water used for irrigation, which varies with yearly rainfall. In 2009 approximately 3.7 million gallons of water were used for irrigation.

Most rain falling on Taylor's campus flows to Taylor Lake or to the president's pond and then to the pond in the arboretum. A slope and drainage map prepared by the Troyer Group as a part of the Preliminary Campus Inventory Report completed on October 9-10, 2003 in support of the Campus Master Plan is included in Figure 29 (The Troyer Group, 2003). No outdoor drains on Taylor's campus lead to the Upland Sewage Treatment Plant. Upland is in the Mississinewa River basin. Copper sulfate is added to the president's pond and the swimming area of Taylor Lake in the summer. *Aqua Shade* is also added to the president's pond to reflect some of the green light so that plants do not receive enough to take over (P. Lightfoot, pers. comm., June 24, 2010).

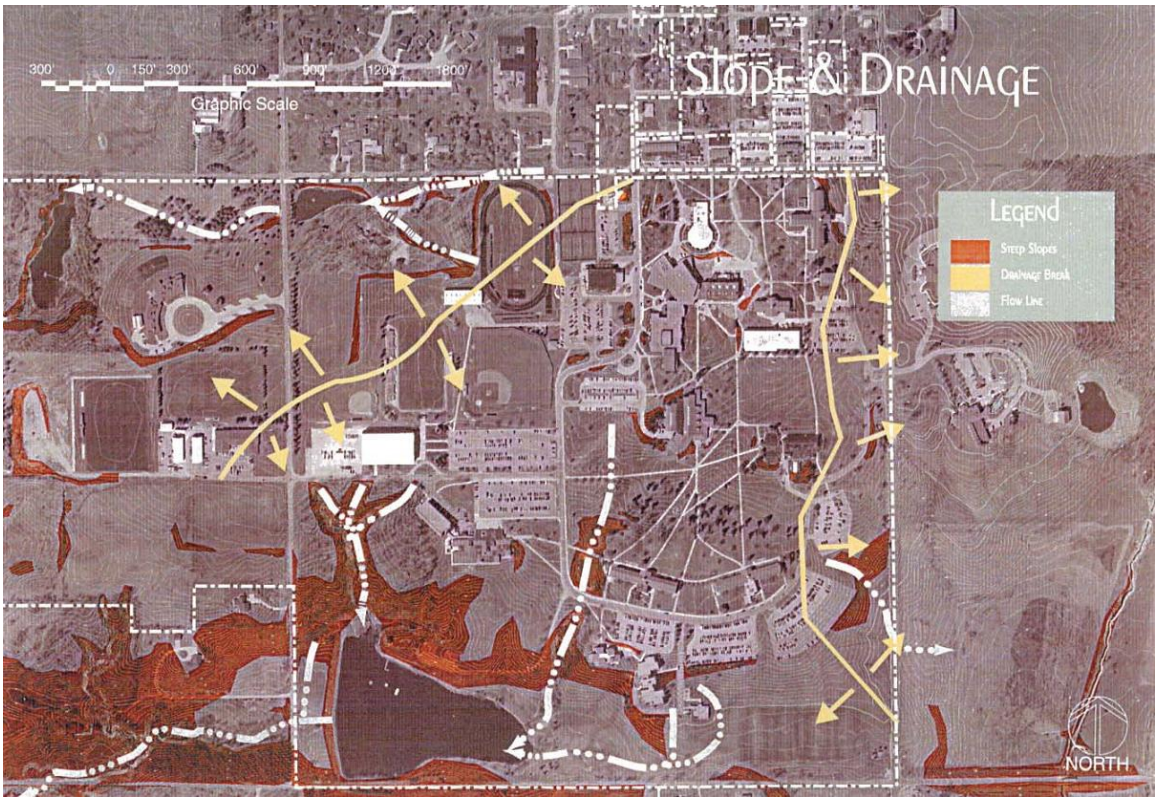

Figure 29: A slope and drainage map prepared by the Troyer Group as a part of the Preliminary Campus Inventory Report completed on October 9-10, 2003 in support of Taylor's Campus Master Plan (The Troyer Group, 2003).

When the Memorial Prayer Chapel was built in 2008 a bioswale was incorporated nearby to allow water to flow to the lake in a controlled manner. The ESC will utilize an open-loop geothermal system for heating and cooling. The water from this system will flow to the lake through a new path dug in the summer of 2010.

Dr. Michael Guebert and some of his students have performed research in preparation of the creation of a wetland northeast of the Randall Center where water flows from the president's pond to the arboretum pond. His Geospatial Analysis class also annually measures the topography of the erosion ditch leading from The KSAC to Taylor Lake. This ditch is eroding at a very swift rate.

b. Comparisons

In 2001 a Goshen College student compiled a detailed list of native plants found on campus and information about them such as their requirements and best landscaping applications. This was done to aid in the development of a Master Landscape Plan. It was also intended to start dialog about the relationship of the campus community to the landscape and environment around it (Scott, 2001).

In 2003 students and faculty from Villanova University created a storm water wetland to manage overland flow. The three goals of the project were to remove non-point source pollution from runoff, reduce peak storm water flow, and develop a wetland habitat. This will also allow for research to be conducted on the effectiveness of the new wetland at slowing and filtering the water.

c. Recommendations

By developing a Master Landscape Plan Taylor could reduce land use disputes and give the grounds department clear goals and procedures to follow. The plan should allow for changes in fertilizer use and pest management so that more natural approaches can be tested and adopted. As a part of this plan Taylor should commit to preserving the forested areas of the new property, just as it did with the current arboretum. It will overlap with the existing Campus Master Plan in the call for limiting new roads and parking lots in order to make the campus more pedestrian-friendly (The Troyer Group, 2008).

The environmental science department should follow the lead of Villanova University and develop the wetland near the Randall Center. Major landscaping also needs to occur south of the KSAC main entrance where storm water erosion is caring large amounts of soil into Taylor Lake.

9. Purchasing

a. Results

Items

Taylor requires a large quantity of paper for mailings, office use, classroom use, textbooks, and other uses. The campus departments that handle or use the most amount of paper are the Print Shop, the Art Department, the ETC, the Admissions office, and the Advancement office (including Development, University Relations, and related departments). The last two on this list mail out many printed materials which are often outsourced, so their paper use was not included within this assessment (S. Neideck, pers. comm., July 1, 2010). Neither the Art Department nor the ETC were able to collect any useful data (M. Mahan, pers. comm., June 28, 2010; S. Curtis, pers. comm., July 13, 2010). They Print Shop, which is utilized by other campus departments for most of their major printing projects in addition to copy paper, was able to provide a detailed list of paper use (included in Appendix K). This list included information on number of sheets or envelopes, weight, type of paper, recycled content, and certification. The print shop used nearly 4,292,063 sheets of paper and 487,700 envelopes in 2009. This is a total of 27.6 tons or 55,217 lbs of paper. The weighted average recycled content is almost 21%. Figure 30 shows what percentage (by weight) of the paper purchased carries each of the major sustainable forestry certifications (the total is greater than 100% because some paper carries multiple certifications). The Forest Stewardship Council (FSC) is the most widely recognized and respected program. Green Seal places their mark on a wide variety of products that meet their environmental requirements. SFI stands for the Sustainable Forestry Imitative and PEFC stands for Programme for the Endorsement of Forest Certification (S. Neideck, pers. comm., July 1, 2010).

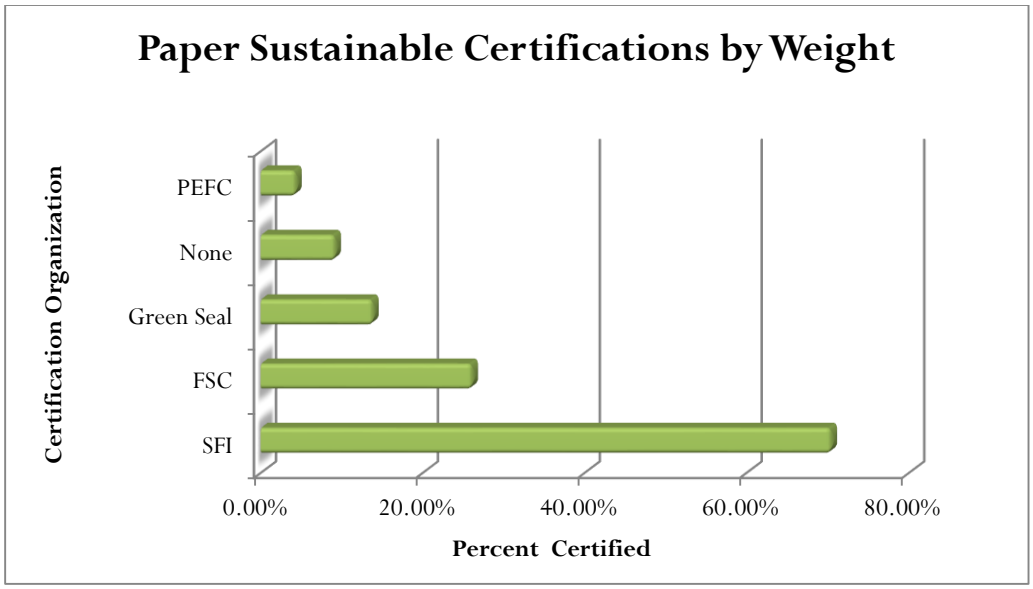

Figure 30: Percentage by weight of Print Shot paper carrying each sustainable forestry certification in 2009.

When it comes to electronics, Taylor operates under a decentralized model where the Information Technology (IT) Department manages and maintains computers and printers, but they are purchased from departmental budgets with consultation from IT. Nearly all desktop computing equipment is Energy Star approved, but some of it is old enough that it is far less efficient than newer equipment. The current printer culture is a frustration for IT because many employees desire and have an inkjet printer on their desk even though this is far less efficient than centralized laser printers, especially when considering ink use (T. Higley, pers. comm., July 9, 2010).

There is currently no campus standard for automobile purchases, so there is no minimum required miles per gallon (mpg) rating. The newest fleet vehicles are 2010 Taurus cars with a combined fuel economy of 21 mpg from 18 mpg in the city and 27 mpg on the highway (US EPA, 2010b).

Policies

The Chemistry Department has improved it's labs to use less toxic materials in smaller quantities. The department also has a Chemical Hygiene Plan which explains proper procedures (D. Hammond, pers. comm., July 7, 2010).

Taylor does not, has never, and does not plan to begin purchasing retail carbon emission offsets or renewable energy certificates (REC) (R. Sutherland, pers. comm., June 29, 2010).

Taylor's Purchasing Manager reports that although the university tries to buy energy efficient equipment, there is no requirement to do so or consider lifecycle costs. Office Max and furniture vendors have been willing and able to work with the university to provide more environmentally sustainable purchasing options (G. Holloway, pers. comm., July 8, 2010).

There have been no substantial efforts to reduce or eliminate bottled water use on campus. In fact, the Board of Trustees specifically requests bottled water for all of their meetings (K. Thornburgh, pers. comm., July 2, 2010).

b. Comparisons

In 2006 the University of Vermont updated its purchasing policy to require all routine printing and copying to use 100% recycled, chlorine-free paper. This change was due to the work of two interns in the campus sustainability office. That change came at a cost of $20,000-$30,000 to the university (Thompson *et al.*, 2006).

Villanova University has a purchasing policy in place that states that all electrical appliances must be meet Energy Star requirements. This policy was first written by a subcommittee of a quality improvement environment committee, and then adopted all the way up to a vice president who signed it into effect (Boulton and Durham, 2005).

At Pacific Lutheran University students distributed over one thousand Nalgene® BPA-free water bottles for a nominal fee of one dollar in an effort to reduce disposable bottled water use.

This was accompanied by a retrofit of seven water fountain on campus so that they could easily be used to refill Nalgene bottles. In the first year of the program the sale of bottled water decreased by 30% (McConathy and Cooley, 2009).

c. Recommendations

It seems that the best way to institute purchasing changes is to enact written purchasing or other campus policies. The Energy Policy draft discussed by COST already mentions fleet vehicle fuel efficiency. Policies that should be researched, proposed, and implemented include minimum paper recycled content, all appliances Energy Star approved, minimum fuel efficiency for new vehicles, and the prohibiting university funds to be spent on bottled water intended to be used on campus.

C. Administration

1. Mission

a. Results

The following are excerpts taken from Taylor's Master Policy Manual (*emphasis* added).

> **2.4.B** The University Purposes
>
> To involve students in learning experiences imbued with a vital Christian interpretation of truth and life, which fosters their spiritual, intellectual, emotional, physical, vocational, and social development.
>
> To educate students to recognize that all truth is God's truth and that the Christian faith should permeate all learning leading to a consistent life of worship, service, *stewardship*, and world outreach…
>
> **4.2.G** General Education
>
> Spiritual Activity
>
> Students who are spiritually active have developed an intellectual and experiential understanding of the Christian heritage enacted in a consistent lifestyle of study, worship, service, *stewardship*, and world outreach.
>
> Responsible Stewardship
>
> *Students who are responsible stewards have developed an understanding of God's command to be good caretakers of His creation*, and practice individual accountability in managing spiritual, intellectual, personal, physical, and economic resources… (Taylor University, 2009a).

All three dimensions of sustainability are incorporated in these statements. Environmental stewardship is not a dominant theme in Taylor's guiding statements, but it is explicitly mentioned.

b. Comparisons

It is typical for evangelical Christian college to mention stewardship of creation somewhere in their guiding principles or mission statements. Seattle Pacific University's Statement of Faith includes, "We affirm, further, that we human beings are created by God in God's own image to be stewards of creation, and that we are called to love God with all our heart, soul, mind and strength, and to love others as ourselves" (Seattle Pacific University, 2010).

c. Recommendations

The concepts of creation care, stewardship, or sustainability should be included in Taylor's Life Together Covenant which guides the actions and interactions of students. Creation care is an important part of service to God and others.

2. Management – External

a. Results

Taylor has been a member of AASHE since 2008 (G. Eley, pers. comm., July 1, 2010). Despite a request by the SOC club, Dr. Habecker has not signed the PCC. COST also briefly considered the PCC during its first year of existence. STARS participation has been considered, but the cost ($900) has prohibited it (G. Eley, pers. comm., July 23, 2010).

b. Comparisons

As shown in Appendix C, nine of Taylor's eighteen benchmarking institutions are AASHE members and five are STARS participants. Seven of them have signed the PCC.

c. Recommendations

Taylor should maintain AASHE membership and participation. Taylor should also register for STARS as a charter participant before August 20, 2010. STARS membership offers access to expertly developed tools for sustainability assessment which can lead to campus improvements. Although this CSA has performed a similar function as STARS, it cannot compare as a simple benchmarking tool. COST should also *seriously* consider the PCC. The PCC is a serious commitment that requires thorough study. Fortunately it allows for an initial period of assessment and planning. The goal of PCC is climate neutrality, but each school can select their own timeframe and methods for achieving that goal.

3. Management – Internal

a. Results

- Sustainability Committee: Yes, COST was formed in 2008 but has not made any major accomplishments.
- Sustainability Coordinator: Yes, Taylor graduate Kevin Crosby was hired as the first Coordinator of Stewardship and Sustainability (CSS) on July 19, 2010. This position reports to the Director of Facilities services.
- Recognition Program: Taylor has no recognition program for campus sustainability efforts.
- CSA Performed Regularly: No, this is the first CSA performed on Taylor.
- Action Plan: No environmental or sustainability action plan has been written or adopted.

b. Comparisons

Six of Taylor's benchmarking schools have full time sustainability coordinators or their equivalents. Six of the seven institutions that have signed the PCC have submitted their action plan.

c. Recommendations

While celebrating the arrival of their first sustainability employee, Taylor staff must vigilantly pursue sustainable actions and not count on the new coordinator to improve the university's sustainability singlehandedly. Under the direction of the CSS, COST must become an active clearing house of ideas and facilitator of meaningful actions. After implementing some of the most urgent sustainability initiatives on campus the CSS should turn his attention to developing a sustainability and climate action plan that will act as a framework for all future initiatives. One of the key recommendations of this assessment is to continue to perform CSAs regularly. The information, comparison, and recommendations gathered in this report should have enough benefit that replication is desired so that sustainability stakeholders like COST will know what areas are lacking and need to most attention. Future CSAs should be performed biennially and may be abbreviated from this comprehensive assessment.

4. Planning

a. Results

Construction and Development

- Master plan: Taylor has a Campus Master Plan that is updated as needed. The most recent version available was presented to the Board of Trustees on June 23, 2008. It includes components of President Habecker's "Vision 2016."
- Building Age Profile: Taylor's buildings contain a lot of history with eight of them originally constructed before 1960. Fortunately most of them have been renovated to continue to make good use of resources by using existing structures while also bringing them up to date with technology and efficiency. The only building without major work done since 1960 is the heat plant, which is scheduled for demolition in 2010 or 2011.

Figure 20 shows the historical distribution of buildings with major model jobs replacing the original build date.

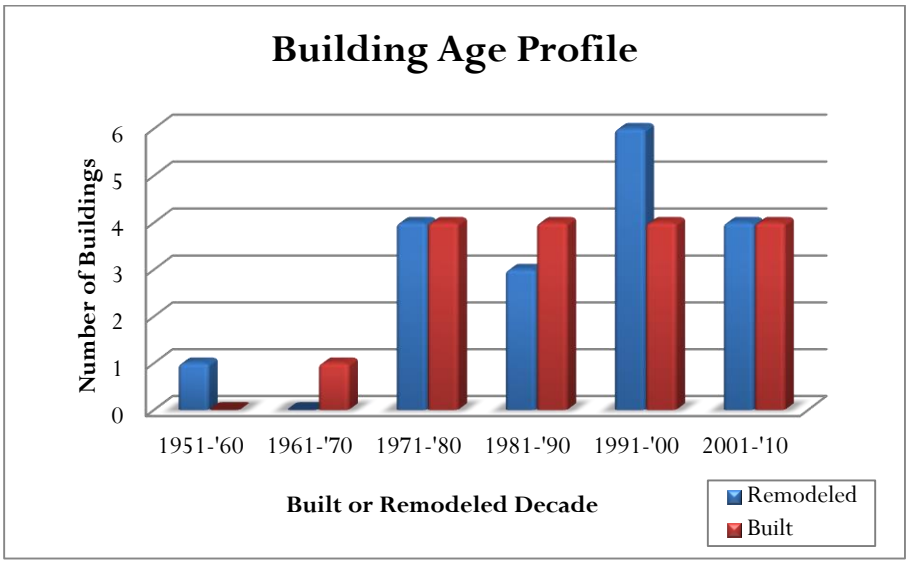

Figure 31: The age profile of buildings where major remodeling efforts have replaced the original date built.

- Stakeholder Involvement: Taylor's official building design and construction policy is for program areas using the space to oversee building design with input from Facilities Services and the business office. Then those two groups take over managing the project once construction begins (R. Sutherland, pers. comm., June 29, 2010). This policy was evident with the involvement of every science faculty and many students in the design phase of the ESC.

b. Comparisons

No comparison information is available or applicable.

c. Recommendations

Continue to emphasize the Long Range Campus Master Plan and allow all stakeholders to view it. Continue renovating old buildings as long as they can achieve close to the same efficiencies of new buildings. Continue to allow and encourage stakeholder involvement in new buildings

projects. Do more to utilize academic expertise in campus operations. A positive example is requesting Environmental Science faculty assistance in determining land use for the new property including the placement of a mountain bike trail. Another example is having Computer Science faculty design electronic display software energy features of the ESC.

D. People

1. Students

a. Results

Taylor students seem to care less about environmental issues than their peers at other schools. There may be no simple explanation for this, but some likely contributing factors are as follows. Environmental concerns were historically affiliated with liberal thought which was opposed by the "religious right," a group that the parents of many Taylor students identify with. Until recently, the Church has not placed adequate emphasis on creation care. Students who desire to serve in missions or become politically active focus on issues such as social justice instead of environmental justice or other environmental concerns. Finally, Taylor's location in the midst of the agricultural Midwest does not appeal to students who desire to spend time in wilderness.

There actually is one statistic that sheds some light on these observations and conjectures. It is part of the Cooperative Institutional Research Project (CIRP) within the Higher Education Institute (HERI) at UCLA (B. Maher, pers. comm., March 25, 2010). The entry and exit surveys used are "The Freshman Survey" and "College Senior Survey" (Higher Education Research Institute, 2010). Responses are reported for students who answer with "essential" or "very important" to the statement, "Becoming involved in programs to clean up the environment." Table 1 shows the primary results for the longitudinal study of over 100 Taylor students both ending years. Taylor students are significantly less concerned with the environment that the average private college

student. Between 2002 and 2004 the environmental concern of incoming students actually decreased, but the rate of increase grew so that seniors graduating in 2008 were slightly more concerned than those in 2006. This is encouraging in that it may indicate that Taylor is instilling its "responsible stewardship" general education goal more effectively. Despite these gains, other private schools show even more improvement, results in graduates that are over twice as likely to "become involved in programs to clean up the environment." Taylor men enter college with more concern than their female counterparts, but graduate with significantly less. This trend is not true in the broader group of private colleges.

Table 12: CIRP survey longitudinal responses on environmental cleanup

		Taylor			Nonsect 4-yr Colls			All Priv 4-yr Colls		
Year	**Group**	**Freshman**	**Senior**	**Change**	**Freshman**	**Senior**	**Change**	**Freshman**	**Senior**	**Change**
2006	**All**	4.0	11.2	*7.2*	18.4	24.5	*6.1*	15.0	23.7	*8.7*
2006	Men	6.0	6.0	*0.0*	17.4	23.3	*5.9*	15.3	24.1	*8.8*
2006	Women	2.7	14.7	*12.0*	18.9	25.1	*6.2*	14.8	23.5	*8.7*
2008	**All**	2.3	13.8	*11.5*	17.5	29.3	*11.8*	16.5	30.4	*13.9*
2008	Men	3.2	9.7	*6.5*	16.0	29.5	*13.5*	15.7	30.6	*14.9*
2008	Women	1.8	16.1	*14.3*	18.4	29.3	*10.9*	16.9	30.3	*13.4*

A separate results document also compares Taylor to a peer group of Anderson University, Asbury College, Bethel University, Biola University, and Indiana Wesleyan University. This report is not longitudinal; it only looks at the senior survey. In this group of students Taylor men score 19.6, nearly 4 points higher than women. Taylor's average is 17.3, which is 4.2 below the peer group and 13.1 below all private colleges.

Taylor's environmental club Stewards of Creation (SOC) is described in section III.A on page 28. It is loosely affiliated with national and international creation care organizations *Renewal: Students Caring for Creation*, *Restoring Eden*, and *A Rocha*.

SOC publishes a newsletter called *The Green Plunger* up to biweekly. It covers a range of topics from upcoming events, energy conservation tips, Christian stewardship, and others. Articles about Taylor's sustainability initiatives are increasing in frequency in *The ECHO*, the campus newspaper; *SEG-WAY News*, the Upland newspaper, and *The Marion Chronicle Tribune* which serves all of Grant County. Articles from the first half of 2010 include:

- *The ECHO*
    - "World Water Day sparks awareness in Taylor community" March 19, 2010 (Malik *et al.*, 2010)
    - "Why your garbage matters" April 23, 2010 (Cleveland, 2010)
- *SEG-way News*
    - "'Green Week' Raises Awareness of Stewardship on Taylor Campus" March 26, 2010 (Gore, 2010)
    - "Kevin Crosby named Coordinator of Campus Sustainability and Stewardship at Taylor" July 22, 2010 (SEG-WAY News, 2010)
- *The Marion Chronicle Tribune*
    - "Taylor focusing on 'green'" February 25, 2010 (Wallace, 2010)
    - "Taylor celebrates Earth Day" April 27, 2010 (Abernathy, 2010)
    - "Universities re-examine beliefs with a green lens" April 22, 2010 (Flynn, 2010)
    - "LEED to boost Taylor's efficiency: School to reduce environmental impact" June 6, 2010 (Flynn, 2010)
    - "Taylor to reduce ecological footprint with new position: Crosby has pages on how to make school more sustainable" July 1, 2010 (Flynn, 2010)

Enrollment

According to the Integrated Postsecondary Education Data System (IPEDS) standards, Taylor's freshman retention for 2008 was 85.4% and the average from 2000-2008 was 87.3%. The incoming class of 2003 had a six year graduation rate not much lower than the retention rate at 76.8% (S. Dayton, pers. comm., June 25, 2010). The average six year graduation rate for cohorts 2000-2003 was 77.3% (Dayton, 2009)

a. Comparisons

See discussion of Table 12 above.

Using the IPEDS Data Center "Generate Pre-defined Reports" function a table of 5-year graduation rates (more data was available for this statistic than for 6-year rates) was created for Taylor's 18 benchmarking institutions for the incoming cohort year 2001.

Table 13 shows that Taylor has the third highest graduation rate, although it is far behind Wheaton (IPEDS, 2010).

Table 13: IPEDS graduation data on Taylor's benchmarking institutions

Bachelor's Degree within 5 years Cohort year 2001	
Institution name	**Total**
Wheaton College	84.1%
Bethel University	75.3%
Taylor University	*74.7%*
Earlham College	73.0%
Messiah College	72.4%
Calvin College	72.3%
Houghton College	71.3%
Westmont College	68.6%
Gordon College	67.6%
Seattle Pacific University	63.9%
Asbury College	62.5%
George Fox University	62.5%
Goshen College	62.2%
The Evergreen State College	55.2%
Malone College	54.1%
Northland College	53.3%
Greenville College	52.5%
Trinity International University	42.6%
Unity College	41.5%

b. Recommendations

Student support is required for many sustainability initiatives it is important that faculty and staff support SOC as much as possible. This is also an opportunity to educate students outside of a traditional class room. One way to stir up student and community support for campus sustainability projects is to continue to communicate efforts through newspaper articles. A way to encourage students to continue to live out stewardship after graduation is to give students the opportunity to sign a graduation pledge to consider the social and environmental impacts of their lifestyle and future jobs.

CIRP survey results should continue to be monitored. This will allow for more effective targeting of students (focusing on men for example). If a general education sustainability requirement is implemented this data should also indicate if students are internalizing concern for the environment.

Taylor's relatively high graduation rate indicates that the enrollment system is sustainable if the graduation rate is maintained.

2. Community

a. Results

Alumni

There is currently no Alumni Sustainability Fund or related University Advancement initiative (M. Gin, pers. comm., June 23, 2010). The closest thing to this is fundraising for the ESC, which has included marketing focusing on the "sustainability features."

Outreach

There are not currently any specific sustainability focused outreach materials because sustainability was only recently institutionalized in the new CSS position. As stated above, any outreach materials that mention sustainability is likely focused on the ESC. Local newspapers have run a few environmentally themed articles on Taylor which are listed in section V.D.1.a above. Taylor's website has no sustainability or environment pages except the basic Environmental Science Department site. Greg Eley did grant permission to initiate the formation of a sustainability page on Taylor's website (pers. comm., July 23).

Another source of outreach materials is through Taylor's president, Dr. Eugene Habecker. Dr. Habecker hosts a brief daily program titled *Fresh Perspectives* on the WBCL Radio Network.

(Taylor University, 2010c). Since the program began in 2006, Dr. Habecker has devoted at least three full segments to creation care. Excerpts from these shows are included below:

- "A Good Steward." July 16, 2008
    - "Let's obey God's command to take care of what he has given us. It's not just a good thing to do, it's out duty. It's an act of worship" (Habecker, 2008).
- "Going Green." March 8, 2010
    - "From the beginning, God instructed us to care for the land and to protect the environment so that we might be sustained by it. As such, when you 'go green', you are 'going God'" (Habecker, 2010a).
- "Earth Day." April 22, 2010
    - "Followers of Jesus Christ care about the planet because we love the Creator… God established human being as stewards of the earth, and some of the ways that we can carry out that stewardship include planting trees, purchasing energy saving appliances, and reusing and recycling items" (Habecker, 2010b).

b. Comparisons

The University of California at Berkeley set up a Berkeley Environmental Alumni Network that has four different channels for donations to go to campus sustainability projects. Alumni are able to log into the network online and get directly connected by viewing information about the plans and progress of the different initiatives (Campus In Power, 2008).

Many university sustainability coordinators or their equivalents choose to maintain blogs instead of or in addition to a traditional webpage. Blogs allow for the author to constantly provide new information while still keeping the old information accessible. Unity College's sustainability blog is written by Mike Womersley, Associate Professor of Human Ecology (Womersley, 2010).

c. Recommendations

The Development office is launching a new program called "giving circles" that connects a group of donors and allows them to work together to allocate their funds (M. Gin, pers. comm., June 23, 2010). When research is done in the fall of 2010 on what campus projects need the money, the CSS should be ready with a list of interested alumni and potential projects that are in need of funding.

Creating a sustainability page on Taylor's website should be a top priority. This site will serve two main functions. First, it will serve as a clearinghouse of sustainability information for the Taylor community. This will include justifications for creation care, environmental stewardship, and all aspects of sustainability; information on current initiatives; and policy documents such as the planned Energy Policy. The second function is advertising Taylor's commitment to sustainability to those outside the immediate Taylor community. It is especially important to communicate with prospective students so that those who have a passion for the environment and/or sustainability will come to Taylor and support sustainability initiatives.

3. Spiritual

a. Results

Taylor campus pastor, Randall Gruendyke, incorporates the principles of creation care and stewardship in his preaching. In the spring of 2010 he allowed an entire chapel to be "Green Week" themed. This chapel included musical worship, testimonies from Dr. Michael Guebert, Dr. Jeff Cramer, and graduate student Kevin Crosby. Students Andrea Parra Undaneta and Heather Nichols also discussed the Lighthouse trip to Guatemala which focused on water resources, health, and hygiene. The photo below ran on the front page of the Marion Chronicle Tribune (Wallace, 2010).

Figure 32: (L to R) Dr. Michael Gueber, Andrea Parra Undaneta, Heather Nichols, Kevin Crosby, and Dr. Jeff Cramer (not pictured) addressed the Taylor student body during the "Green Week" chapel on Feb 24, 2010 (Wallace, 2010).

b. Comparisons

Matthew and Nancy Sleeth are just two examples of the demand for chapel speakers on the subject of creation care. Matthew Sleeth is a medical doctor turned author and advocate for creation care and living simply. In the past year and a half they have spoken on creation care at over 13 colleges and Universities including Asbury and Houghton Colleges.

c. Recommendations

Continue to work with campus ministries and Pastor Gruendyke to educate students about the Biblical foundations of creation care.

4. Education

a. Results

Restoring Eden is a Christian ministry organization focusing on environmental appreciation, stewardship, and advocacy. On November 3rd, 2009 they sponsored a presentation at Taylor titled "Ankle –Deep in reality." Sara Kaweesa came from Uganda to speak with Christians and others in the United States about creation stewardship and the potential devastating effects of climate change on her home.

Curriculum

As a liberal arts institution Taylor has several general education requirements that must satisfied by all graduates. Environment and Society, the introductory environmental science course for non-science majors, and Introduction to Environmental Science, the introductory environmental science course for science major both count as one of the two required science classes. Every fall approximately 45 students enroll in the intro class. Environment and society, which is very similar to the other course, draws 30 students in January, 45 in the spring, and 10 in the summer. Although this does not fully qualify as having a sustainability general education requirement, it is the closest requirement that Taylor has. These two classes are the primary courses where sustainability considerations are discussed. Dr. Rukshan Fernando's International Social Work covers some of social sustainability. Dr. Hadley Mitchell's Economic Development and Environmental and Natural Resource Economics courses include the concept of economic sustainability (M. Guebert, pers. comm., June 28, 2010). Dr. Chandler also teaches a graduate level course Topics in International Community Development which addresses sustainable development.

Taylor offers both bachelor's and master's degrees in Environmental Science. While courses in these majors relate to sustainability, especially environmental sustainability, they should not be counted as sustainability related majors.

Sustainability and sustainable practices are not yet built into the freshman orientation curriculum. However, in the fall of 2009 Environmental Science Master's student Kevin Crosby was given the opportunity to speak the freshman class on a panel. This led to some limited sustainability information and opportunities for getting involved to be communicated to the freshmen.

Research

Dr Michael Guebert has performed sustainability research in relation to the development of this assessment and the possible establishment of a "Sustainable Living" lab based science course.

b. Comparisons

Sustainability courses, specializations, and majors are popping up at higher education institutions all over the country. Messiah College will offer a bachelor of arts in sustainability studies for the first time in the fall of 2010. This makes it one of four Christian higher education institutions offering a sustainability related degree focusing on humanities and social sciences instead of environmental science (Messiah College, 2010).

c. Recommendations

As campus sustainability improvements are implemented by the CSS and the facilities services department academic departments, epically students, should be encouraged to get involved. After all, the university exists to educate. A sustainability focused course like the one that may be proposed by Dr. Guebert would be a good addition the current course offerings. Incorporating elements of sustainability into more pre-existing courses would have the possibility to reach more students.

5. Benefits

a. Results

Despite offering slightly lower pay that some comparable institutions, Taylor is committed to the health and wellbeing of its employees and therefore offers excellent benefits (G. Eley, pers. comm., June 4, 2010). Some of these benefits include adoption reimbursement, tuition scholarships, a first time home buyer loan, death benefits, professional development reimbursement, maternity leave, and life insurance. Medical benefits are offered through the plan

supervisor *Employee Plans* of *Insurance and Risk Management*. This plan includes "medical, dental and prescription drug, group term life and accidental death and dismemberment, group long-term disability, medical reimbursement accounts, dependent care reimbursement accounts, and severance benefits" (Taylor University, 2009a). The tuition scholarship applies to full time employees, their spouses, and their dependents.

b. Comparisons

Table 14 has ranked IPEDS data on the average 12-month salary for all full time faculty for the seven available benchmarking institutions and Taylor (IPEDS, 2010). Taylor's salary is only about $600 below the group mean. The average tenure and distribution of faculty types (full professor, adjunct professor, etc) is likely to have a large impact on this data as well.

Table 14: IPEDS salary data for benchmarking institutions (IPEDS, 2010)

2008	Full Time Faculty
Institution	Average Salary
Wheaton College	$89,762
Seattle Pacific University	$81,955
George Fox University	$69,797
Earlham College	$69,275
Taylor University	$68,868
Bethel University	$65,861
Greenville College	$56,758
Goshen College	$53,553

c. Recommendations

Taylor compensates its employees fairly both financially and with benefits.

6. Safety

a. Results

According to the security *Right to Know Information* published on the university website by the campus police office, the most recent crimes committed on the Upland campus were one burglary and nine liquor law violations arrests in 2004 (Wallace, 2007).

No information could be gathered on workplace or ergonomic safety except that the Facilities Services department exceeds requirements in health and safety training of its employees.

b. Comparisons

In comparison, Indiana Wesleyan University's most recent offences were twelve burglaries in 2008 and 2007, five liquor law violations in 2008 and one in 2007, and one "simple assault" in 2007 (Indiana Wesleyan University, 2010).

c. Recommendations

The Taylor police and campus community do a good job of keeping the campus safe. They could improve by using a hybrid vehicle, such as a Ford Escape Hybrid, which is perfectly suited for the type of campus driving that the police officers do. This would nearly triple the fuel economy, which is substantial when 24,000 miles are driven every year. Expected fuel savings would be around $3,000 every year.

E. Finance

1. Students

a. Results

The university administration is not open to parking or other fees to pay for sustainability initiatives. Students may argue over these fees. For many students, extra feeds only increase the amount of financial aid awarded because it is determined that the student cannot pay anymore, so

the university ends up footing most of the bill anyway (R. Sutherland, pers. comm., June 29, 2010).

b. Comparisons

In 2000, the Northland College Student Association approved a $10 fee for all students every semester to fund renewable energy and energy conservation projects on campus. The fee was doubled in 2002 and again to $40 in 2009 (AASHE, 2010e). This fund gathers about $25,000 every year. Past projects include solar hot water panels for a pool, energy monitoring equipment, a geothermal system, trees, signage, and an evacuated tube water heater for showers in a residence hall (Northland College Environmental Council, 2005).

c. Recommendations

Student support must be gathered before moving forward with any sort of student fee. At a brainstorming session during "Green Week" some students already proposed implementing a "Green Tax" to fund sustainability initiatives (Tuttle Construction, 2010).

2. Investments

a. Results

Taylor University currently has a socially responsible investment policy in place. It disallows investment in companies that deal with tobacco, alcohol, illegal drugs, gaming, and abortion. This policy does not deal with renewable energy or sustainable forestry. Unfortunately, mergers and acquisitions are making it increasingly difficult to monitor this policy and maintain compliance (R. Sutherland, pers. comm., June 29, 2010).

b. Comparisons

Earlham College has a socially responsible investment policy. This policy is broadly and very specifically based on the Quaker beliefs on which the university was founded. Investment

limitations include companies that support war activities; are involved with tobacco, alcohol, or gambling; or irresponsibly use the natural environment or degrade individuals (Earlham College, 2009).

c. Recommendations

Since university investment policies are largely symbolic, the recommendation of this report is to keep the current socially responsible investment policy but focus on improving environmental sustainability in other ways.

3. Endowment

a. Results

Taylor's financial endowment in June, 2010 was $63,482,000 (R. Sutherland, pers. comm., June 29, 2010).

b. Comparisons

Data was acquired for as many of Taylor's benchmarking institutions as was available (NACUB, 2010). Table 15 shows the rank out of 864 schools, the endowment size in thousands of dollars, and the percent change from 2008. Taylor is about in the middle of the pack when it comes to endowment size. Taylor's endowment did shrink proportionally less than all but one other endowment from last year.

Table 15: Institution endowment in thousands of dollars (NACUB, 2010).

Rank	Institution	2009	2008	% change
191	Earlham College	$ 254,016	$ 345,000	-26.4%
196	Wheaton College	$ 250,695	$ 321,930	-22.1%
345	Messiah College	$ 99,881	$ 128,009	-22.0%
392	Calvin College	$ 80,763	$ 101,387	-20.3%
412	Goshen College	$ 72,085	$ 106,264	-32.2%
458	*Taylor University*	*$ 60,945*	*$ 75,479*	*-19.3%*
578	Seattle Pacific University	$ 37,753	$ 50,954	-25.9%
617	Houghton College	$ 30,509	$ 42,339	-27.9%
641	Asbury University	$ 27,615	$ 33,449	-17.4%
692	Gordon College	$ 20,645	$ 27,782	-25.7%
731	George Fox University	$ 16,046	$ 20,515	-21.8%
748	Northland College	$ 14,623	$ 18,457	-20.8%

c. Recommendations

A university's endowment is an important indicator of its financial stability and ability to grow. Endowment recommendations are beyond the scope of this assessment other than to provide encouragement to increase the size of the endowment.

F. Assessment Summary

Taylor University's operations have a huge impact on the local population, economy, and environment. In the past year Taylor's fleet vehicles drove half a million miles and Taylor employees drove 2.3 million miles on local roads commuting to campus. Campus buildings and operations consumed 13.5 million kilowatt hours of electricity and are responsible for polluting local air by requiring about 6,700 tons of nonrenewable coal to be burnt. Taylor paid the city of Upland to pump 27.8 million gallons of water out of the aquifer beneath campus and treat almost that same amount in the sewage treatment facility. The Taylor community sent 62 truckloads totaling 384 tons of solid waste to sit forever in a landfill in nearby Jay County. However, by also sending 92 tons of materials to be recycled it saved natural resources and lowered the cost of

goods. Taylor's campus contains beautiful landscaping and forest, but some of the 8 tons of fertilizer used washes into local rivers.

Taylor's operations also have global ramifications. Taylor professors flew at least 196,000 miles for professional development and students flew 5 million miles for off-campus academic programs. This travel resulted in 23% of Taylor's 19 million pounds of GHG emissions. That is 35 metric tons per thousand square feet of building space or 9.6 metric tons per student. The type of automobiles, paper, furniture, and food that Taylor purchases also affects the profitability of companies offering environmentally friendly products.

Taylor is slowly addressing stewardship and sustainability issues at the administrative level. Part of the general education section of Taylor's mission and purpose statements says that the university wants to develop "students who are responsible stewards [and] have developed an understanding of God's command to be good caretakers of His creation" (Taylor University, 2009a). Taylor's only external connection that directly relates to sustainability is its membership in AASHE. Internally, a sustainability council was established in 2007 and on July 19, 2010 Taylor hired its first Coordinator of Stewardship and Sustainability. The university does not have a climate action or sustainability plan. A socially responsible investing policy is in place and economic sustainability is assured by a $63 million endowment.

Taylor's most important impact is what it teaches its students. Undergraduate and graduate environmental science degrees are the most related to sustainability. All Taylor classes are taught on the foundation of a Christian worldview and the chapel program is open to addressing stewardship. Incoming students have a lot to learn because only three percent say that programs to clean up the environment are important to them.

Taylor is within the mid-range of comparable schools on most of the quantifiable indicators used. This is an exciting time for sustainability in Upland because of the great possibilities offered

by the completion of this, the first CSA, and by the hiring of a fulltime sustainability coordinator. The final conclusion from this assessment is that Taylor University is not currently a sustainable institution and no matter what effort is taken, it will not become one in the near future. Although Taylor is stable economically and socially, our societal model that depends on consumption and resource extraction make it very difficult to conceive of a fully sustainable university. This fact makes it far more, not less, important for Taylor University to enthusiastically pursue sustainability.

G. Main Recommendations

The following list of recommendations is based on those above and is prioritized by environmental impact, educational impact, and cost savings. This is not like one of the myriad "Top ten easy ways to go Green" lists frequently published. If these recommendations were easy, they would have already been done.

1. Hire a Sustainability Coordinator
    a. This occurred while the assessment was taking place.
2. Write and implement an energy policy
    a. This document should include expectations for individual employees and the university on topics including indoor temperature, computer use, printer use, lighting levels, and appliance efficiency.
3. Improve energy efficiency with equipment upgrades
4. Write and implement a transportation policy
5. Revamp and rejuvenate the campus recycling system
6. Redeploy a unified and supported year-end donation program
7. Repeat a CSA biennially

    a. STARS is preferable

8. Motivate and engage major sustainability stakeholders such as COST members
9. Focus on educating and engaging students in responsible environmental behavior
    a. Do this, in part, through a sustainability course and involvement in sustainability projects
10. Implement a system to track faculty and staff travel distances
11. Reduce Grille waste by allowing students to use reusable bottles
12. Start a waste reduction program at the DC
    a. Start composting food waste
13. Continue to implement water fixture improvements.
    a. Test functionality and reception of waterless urinals and push-button showers
14. Identify funding for sustainability projects
    a. Network with alumni and have students vote on a fee
15. Sign ACUPCC & create a climate action plan
16. Celebrate successes and sustainability features with advertising, campus signage, and other communication
17. Write and implement a bottled water ban or reduction policy
18. Start a campus garden
19. Set aside a portion of the new property as another arboretum

VI. Conclusion and Discussion

While working on data collection and analysis for the assessment it was very easy to get caught up in the details and lose track of the main goals. It was concluded in section IV.B.6 that the purpose of an assessment greatly affects its structure and contents. So when a researcher loses sight

of the purpose there is a danger of diminishing the usefulness of the assessment. For example, the Grille manager provided information on every disposable item that they purchased (there were a lot of them), but although it was interesting, this information was not applicable to the sustainability related questions identified for this assessment. Another tendency was to focus solely on the GHG emissions audit instead of broader sustainability. This was tempting because of the easy quantitative nature of calculating emissions as opposed to describing the effects that more abstract university policies have on the local environment or economy.

The value of this report is in both the big picture and the details. Looking at it holistically allows the reader to gain a feel for the current strengths and weaknesses of the university and observe where there are gaps in effort or information. Hopefully the assessment was organized in such a way as to facilitate this process. Although the big picture is important and the assessment summary includes some highlights, no effort was made to completely quantify the results. Rating and ranking tools such as STARS and the Sustainability Report Card are useful for comparing institutions, but may be misleading when it comes to the sustainability of each individual school. As the following quote explains, attempting to reduce sustainability to a number can be detrimental.

> It is our contention that the idea of measuring sustainability in absolute, traditional, objective, empirical and reductionist terms, as with [sustainability indicators], is non-viable. It cannot be done because sustainability itself is not a single element. Or better, it can be done but it will be done badly, oversimplifying complexity and reducing a variety of relevant and legitimate views and understandings to the dominant mindset of the scientist. A façade of objectivity can be generated… Sustainability is, we believe, a highly complex and contested term open to a wide variety of interpretations and conceptualizations. In short, it is a concept dependent upon the various perceptions of the stakeholders residing within the problem context. Sustainability is not an absolute quantity to be measured (Bell and Morse, 2008).

Yet the details of the assessment are what will really help with selecting, implementing, and monitoring specific improvements. For example, the gathered utilities information can be further broken down by building and normalized by floor area or number of students for residence

halls. This will allow for targeted social marketing campaigns and good decision making about where new fixtures or building equipment is needed most. When data collection and analysis yielded information that I thought would be useful to the departments providing the raw data the results were sent directly to them. For example, study abroad spreadsheets of organized data entered from old roster printouts was provided to the off-campus programs office along with information about the GHG impact of international flights.

A. Successes

This assessment was successful in gathering nearly all of the information required for the Princeton Review and Peterson's sustainability questionnaires. A 2009 Princeton Review study found that 66% of potential college applicants and their parents said that they would use information about how sustainable a school is in making decisions about where to go to college. Answering these questions well should not be a primary concern of campus sustainability offices or programs, but it is nice to be able to be able to use the information gathered in as many ways as possible. Attracting more students with an interest in sustainability may become a minor positive feedback loop because if those students attend they will likely help to further improve the sustainability of the university.

That is just one example of the ways that a CSA can change what it is supposed to measure. The process of performing this CSA may have made the university more sustainable by forcing people to think about these issues. This is a classic case of the observer effect, where measuring or observing something or someone causes a change from the initial undisturbed state. In this case it is mostly desirable because although the primary research question focuses on assessment, the ultimate goal of the study is to "improve the sustainability of Taylor." There are also some drawbacks to this occurrence. Improvements in the university during the assessment period can be

described, but it raises questions about exactly when snapshot data such as the number of bike racks was gathered. This is especially difficult when the researcher is actively involved in campus sustainability initiatives, as was the case in this assessment. This leads to report recommendations being proposed and sometimes accepted before they can even be included in the report. Data also needs to be as recent as possible to be relevant and useful.

B. Limitations

The findings of this study were consistent with the comment included in nearly every other sustainability assessment report that data is very difficult to collect. A report from the Northeast Campus Sustainability Consortium, which includes sustainability leaders like Tufts University and Yale University, concluded that sustainability indicator data is difficult to collect and always takes more time than expected, even with the help of student interns. They also found that data collection was especially difficult for new sustainability officers (Thompson *et al.*, 2005). Despite this, the researcher was pleasantly surprised by many employees that agreed to spend considerable time gathering data that was not already compiled. In a couple of cases it was necessary to request that these employees limit the amount of time spent gathering data so that gathering comparable data for future CSAs would not consume an unsustainable amount of employee time. Contrarily, those who did not return emails or did not follow through on commitments took a disproportionately large amount of time to follow up with and encourage to provide assistance. As expected, there was a strong correlation between how well the researcher knew the employees and the quality of information that they provided. Fortunately, no contacts replied with a criticism of the study or a flat refusal to cooperate.

Most of the assessment data was collected during the summer. This time was preferable for contacting faculty members who had far fewer distractions than during the school year.

However, most of the data providers were non-academic staff that are much more difficult to work with in the summer due to the high frequencies of vacations.

C. The Future

In an online article Melissa Alvarez proposes that the best way to combat "greenwashing" is to offer something of value in sustainability reports. Rather than touting the accomplishments and care of a company (or university), sustainability reports should include information that is useful to others. Part of reversing the damage that our institutions have done to the environment is assisting others in reducing their impact as well. This can be done by sharing tools, case studies, and what has been learned (Alvares, 2010). The implication for this project is that it is important to share the report publically. Future Taylor CSA reports, which will hopefully have more successful projects to discuss, should include more information about what made the projects successful.

To make all of the work that went into this assessment and report worthwhile, the information must be shared with Taylor stakeholders. The author needs to follow up on the original plan, described in section IV.A.2 (page 38), to create other reports from the information in this thesis paper. The first is an academic paper consisting of essentially everything before chapter V (the assessment) of this paper. It will be shared with those at Taylor and other schools who are considering performing or have begun designing a CSA. The second will be Taylor's first ever sustainability report; a condensed version of the CSA in this paper. Nixon's meta-analysis of sustainability assessments found that the most frequent effect of a CSA was, "greater campus community awareness of sustainability issues." This is a major hope for this report and the reason why an attractive and readable report must be produced (Nixon, 2002). The final document will include comparisons and recommendations, the latter of which will be more thoroughly described than in this paper. This may be included as the second half of the sustainability report. The second

most likely campus change from a CSA was the expansion of the campus recycling program, which is one of the main recommendations of this assessment (Nixon, 2002).

Future Taylor CSAs should be able to duplicate parts of this assessment and learn from others. Sustainability indicators may be added or removed, but those that are kept should not be changed so as to facilitate accurate benchmarking. Benchmarking institutions should also be kept as similar as possible but reviewed to assure continued applicability. One suggestion is to add more Indiana schools because of carbon emissions and utility similarities and their familiarity to the Taylor community.

If Taylor follows the trends, the future looks bright for follow-up CSAs. Most CSAs after the first on a campus are usually more sophisticated and are three times as likely to receive administrative support. This is likely because initial CSAs prove their worth partially through increasing the number and public profile of campus sustainability initiatives. Follow-up reports are also more likely to receive publicity, involve staff, and involve students (Nixon, 2002).

Overall, this thesis project was a positive experience for the student researcher. It required, as a thesis project should, a tremendous amount of thought and time. If for no other reason, this project was a success because it prepared the researcher to effectively fill the position of Coordinator of Stewardship and Sustainability at Taylor. The full impact that this CSA will have is partially dependent on continued work in this new role.

VII. Literature Cited

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VIII. Appendices

A. Appendix A: Indicator description and contact table

This is an example of just a few columns from one worksheet from an Excel file used to manage indicator organization, contact information, and status.

Priority	Contacts	Sub-category	Indicator
1	**Greg Eley**	Budget	Energy Budget
		Physical Size	Total Building Space
			Total Research Building Space
		University Fleet	gallons used
			average vehicle efficiency
		parking	bike parking spaces
		On-Campus Production	Cogeneration
			Other sources of heat or electricity
		Purchased	Electricity
			Electric fuel mix
			Ability to monitor
		use	Energy Star
			temperature on timers
			sensors for lights
		Built Environment	Refrigerants
		Indoor Air	Indoor Air Quality
			Cleaning Chemicals
			Furniture & Carpet
		incinerated	tons burned
		landfilled	tons of trash landfilled
		recycling (3R's)	glass
		toxic	toxic waste disposed of
			art students trained
		wastewater	septic systems - gallons
		water usage	gallons used
			efficient fixtures
		water	stormwater runoff...?
		Offsets	Purchased retail offsets
			Renewable Energy Certificates
		vehicles	efficiency of new fleet vehicles
		toxic materials	existence of a program to limit
		external	AASHE member
		Campus Construct. & Develop.	Master plan
			Age profile of buildings
2	**Paul Lightfoot**	composting	weight of material composted
		recycling (3R's)	paper
			plastic
			aluminum
			glass

			other metal
			electronics
			other
			all locally=recyclable
			furniture and reusable items donated
			campus center
		managed grounds	fertilizer application
		water	irrigation
			stormwater runoff...?
		impervious	impervious surfaces
3	**Jeff Wallace**	University Fleet	gallons used
			average vehicle efficiency
		parking	car parking spaces
			on-campus students w/ cars
		vehicles	efficiency of new fleet vehicles
4	**Gregg Holloway**	Indoor Air	Furniture & Carpet
		Paper	pounds purchased and used
			average amount of recycled content
			replace paper materials with digital copies
		policies	look at life-cycle costs, not juse price
			Avail. of sustain. purchasing options
			eliminate bottled water
5	**Ron Sutherland**	Budget	Operating Budget
			Research Budget
		initiatives	carpooling incentives for faculty/staff
		Campus Constr. & Develop.	stakeholders are involved in building planning
		Students	sustainability fees
		Investments	review for social and environmental criteria
			no investment in tobacco
			support renew. energy and sustainable forestry
		endowment	size of endowment
6	**Steve Dayton**	Population	Full Time Students
			Part-Time Students
			Summer School Students
			Faculty
			Staff
		enrollment	retention rate
7	**Robert Craton**	Faculty/Staff Communting	miles driven/rode
		students home <--> school	air miles
			driving gas
8	**Nathan Maurer**	food	organic
			vegetarian options
			local
		waste	trayless

			purchase items in bulk
9	Vickie Rhodes	food	organic vegetarian options local
		waste	purchase items in bulk
10	Kathy Thornburgh	events/catering	reduce waste by eliminating disposables eliminate use of bottled water donate/use leftovers
11	Michael Guebert	initiatives	encourage biking bike loan/rental program
		Education	% stud. taking classes w/ sustain. component sustainability related major
12	Dick Squiers	forests	Forest Preservation
13	Shawnda Freer	Education	Sustain. mentioned in new stud. Orient.
14	Faye Chechowich	Research	# faculty doing sustainability research
		Financed & Outsourced	faculty/staff air (or other) miles faculty/staff mileage reimbursement
15	Dan Hammond	toxic	chemistry policies in place
		toxic materials	existence of a program to limit
16	Mary Mahan	toxic	art students trained
		Paper	pounds purchased and used
17	T.J. Higley	use	Energy Star
		electronics	energy efficiency
18	T.R. Knight	recycling (3R's)	Electronics
19	Gary Friesen	Waste reduction efforts	printing
20	Linda Reneau	Financed & Outsourced	faculty/staff air (or other) miles student air (or other) miles faculty/staff mileage reimbursement student mileage reimbursement
21	Toni Newlin	Faculty/Staff Communting	miles driven/rode
		Safe workplaces	employee days lost due to injuries
		Benefits	health education
22	Steve Morley	residential	sustainability themed housing
		students home <--> school	air miles

23	Randall Gruendyke	Spiritual	important part of chapel program
24	Steve Austin	Students	sustainability fees
25	Janet Shaffer	Education	general education requirement % students taking classes with sustain component
26	Lori Slater	Student Commuting	miles driven/rode
27	Brent Maher	Students	survey results
28	Jim Garringer	outreach	outreach materials
29	Mark Biermann	outreach	outreach materials
30	Kristin Goldman	Financed & Outsourced	study abroad travel
31	Jenny Collins	Financed & Outsourced	study abroad travel
32	Steve Curtis	Paper	pounds purchased and used average amount of recycled content
33	Steve Neideck	Paper Waste reduction efforts	pounds purchased and used average amount of recycled content replace paper materials with digital copies printing
34	Matt Gin	alumni	alumni sustainability fund
35	David Gray	Indoor Air	Cleaning Chemicals
36	Chip Long	wastewater	Central treatment system - gallons
37	Eric Smith	University Fleet	gallons used
38	Tim Ziegler	University Fleet	gallons used
39	Bev Klepser	University Fleet	gallons used
40	Laura Brocker	University Fleet	gallons used
41	Jane Breedlove	University Fleet Financed & Outsourced	gallons used faculty/staff air (or other) miles faculty/staff mileage reimbursement
42	Donna Boatwright		
43	Debbie Snyder	Financed & Outsourced	faculty/staff air (or other) miles faculty/staff mileage reimbursement

44	**Megan Updike**	Built Environment	Refrigerants
		toxic	toxic waste disposed of
			art students trained
			chemistry policies in place
		toxic materials	existence of a program to limit
45	**Tim Ziegler**	Mission	in mission statement

B. Appendix B: Data Request Email Example

Below is an example of a data request email. Thirty-nine initial-contact emails similar to this one were written. All of these emails resulted in at least one but usually several more subsequent emails, phone calls, or personal conversations.

Toni Newlin

Sustainability Assessment Questions

Toni,

I have a few questions for you relating to information about Taylor employees. The information that I am seeking is part of an environmental sustainability assessment of Taylor University for my Master's of Environmental Science thesis project. This project will not only fulfill my thesis requirements, but it will also result in a recommendations report that will guide the university's efforts in becoming more efficient and sustainable. As you know, in July I will be hired by Taylor to fill the new position of Coordinator of Stewardship and Sustainability and begin implementing improvements. So any answers that you can provide will not only be useful to me, but will also assist me in serving the university in the near future.

I have two specific questions for you at this time. I would be glad to meet with you in person to discuss these questions sometime next week. However, I have included the questions below so that you can answer them via email if that is easier for you.

1. One of the most important categories in my report is transportation, but unfortunately it is also one of the most difficult to gather information about. Two components of that are faculty and staff commuting to and from campus. My assessment asks how many miles are driven by Taylor faculty between their homes and offices each year. Correspondingly, how many miles are driven by Taylor staff between their homes and offices each year? So my question for you is can you provide me with a list of Taylor faculty and staff and their home addresses? I have heard that this information was available in an employee directory but is no longer included. I spoke with Bob Craton about this yesterday, but he said that I would need to get permission from you to see that information. It would be best if I could get it in a spreadsheet or database format so that I can import it into a geographic information systems (GIS) computer program to hopefully analyze the distance traveled to work for each employee and find an average and sum.

2. How many employee days are lost each year due to injuries? Data for the 2009 calendar year is most important, but it would be useful as far back as 2000.

Thank you for any assistance that you can give. I am confident that the time spent on this project will prove to be worthwhile when I complete the reports and begin making improvements. Please let me know if you have any questions, comments, or concerns.

Kevin Crosby
kevin_crosby@taylor.edu
616.403.7712

C. Appendix C: Table of Information on Peer Institutions

From left to right, the columns in this table contain information on school names, sustainability website extension address, link to CSA if completed, sustainability coordinator name and year that the position was created, date signed up for AASHE 1.0, ACUPCC signatory schools with links to their GHG reports, net scopes 1-3 emissions from the CA-CP calculator, normalized emissions by full-time student, and normalized emissions by 1,000 square feet of building space (AASHE, 2010b; AASHE, 2010f; ACUPCC, 2010).

Group	Sustain site	CSA	Sustain Coordinator	AASHE 1.0	ACUPCC Signed	Net Emissions	/FT student	/1k sq ft
School	link	link	Year position created	Member	recent GHG	MT CO2e	MT CO2e	MT
Christian College Consortium								
Asbury University		no						
Bethel University	/greencouncil	no						
George Fox University	/green	CA-CP						
Gordon College	/sustainable	no						
Greenville College		no						
Houghton College	/creationcare	no	Ginny Routhe 2009	member	not due yet			
Malone University		no						
Messiah College	/sustainability	no			2008 CA-CP	24,133	8.6	18.0
Seattle Pacific University	/sustainability	/depts…	Bethany Walrad 2009	10/22/2009	2009 CA-CP	6,219	1.7	5.6
Taylor University		no	Kevin Crosby 2010	member		17,711	9.6	19.5
Trinity International University		no						
Westmont College	/recycling	no						
Wheaton College	/esac	no						
Other								
Calvin College	/admin…	no		member				
Earlham College		no		12/31/2009				
Goshen College	/gogreen	no	Glenn Gilbert	12/29/2009	2009 CA-CP	9,508	10.7	12.0
Northland College	/sustainability	no	Clare Hintz 2007	12/28/2009	2009 CA-CP	4,017	7.2	9.3
The Evergreen State College	/sustainability	no	Scott Morgan	12/21/2009	2008 CA-CP	10,858	2.8	6.7
Unity College	/Sustainability…	no	Jesse Pyles	member	2008 CA-CP	841	1.6	5.6
total reporting	12	2	7	5	7	7	7	7

D. Appendix D:CA-CP Results Table

This is part of one the results spreadsheets from the CA-CP Campus Carbon Calculators. Rows and columns that were not used were removed.

MODULE	Summary															
WORKSHEET	Total Emissions in Metric Tonnes CO_2 Equivalents															
UNIVERSITY	Taylor Univeristy															
				Scope 2	Scope 3											
Fiscal Year	Other On-Campus Stationary	Direct Transportation	Agriculture	Purchased Electricity	Faculty / Staff Commuting	Student Commuting	Directly Financed Air Travel	Other Directly Financed Travel	Study Abroad Air Travel	Solid Waste	Wastewater	Paper Purchasing	Scope 2 T&D Losses	Total Scope 1	Total Scope 2	Total Scope 3
	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2			MT eCO_2	MT eCO_2	MT eCO_2	MT eCO_2
1999	1,923.9	-	-	11,205.7	-	-	-	-	-	-	18.9	-	1,108.3	1,923.9	11,205.7	1,127.1
2000	2,056.5	-	-	11,431.7	-	-	-	-	-	-	16.8	-	1,130.6	2,056.5	11,431.7	1,147.4
2001	2,181.9	-	-	11,638.8	-	-	-	-	2,223.9	-	18.3	-	1,151.1	2,181.9	11,638.8	3,393.3
2002	1,826.1	-	-	11,915.0	-	-	-	-	1,289.1	-	29.6	-	1,178.4	1,826.1	11,915.0	2,497.2
2003	1,990.1	-	-	12,050.7	-	-	-	-	2,568.7	-	20.0	-	1,191.8	1,990.1	12,050.7	3,780.5
2004	2,142.7	-	-	12,126.1	-	-	-	-	2,134.7	-	19.6	-	1,199.3	2,142.7	12,126.1	3,353.6
2005	2,133.9	-	-	12,510.7	-	-	-	-	2,604.1	-	18.0	-	1,237.3	2,133.9	12,510.7	3,859.4
2006	2,133.9	-	-	12,428.2	-	-	-	-	2,739.7	-	15.9	-	1,229.2	2,133.9	12,428.2	3,984.8
2007	1,841.3	-	-	9,995.1	-	-	-	-	2,718.1	-	13.6	-	988.5	1,841.3	9,995.1	3,720.2
2008	1,594.2	-	14.9	9,226.3	-	-	-	-	2,758.5	73.1	14.1	-	912.5	1,609.1	9,226.3	3,758.1
2009	2,091.2	254.0	12.8	9,492.2	579.9	20.5	180.1	15.0	3,893.4	67.1	17.5	65.8	938.8	2,358.0	9,492.2	5,778.0
2010	1,944.7	254.0	10.6	9,827.8	-	-	180.1	15.0	3,546.9	61.0	15.4	65.8	972.0	2,209.2	9,827.8	4,856.2

E. Appendix E: Example Natural Gas Recording Spreadsheet (2009-9)

Org	Facility Budget Name	June $	June Units	July $	July Units	Aug $	Aug Units	Sept $	Sept Units	Oct $	Oct Units	Nov $	Nov Units	Dec $	Dec Units	Jan $	Jan Units	Feb $	Feb Units	Mar $	Mar Units	April $	April Units	May $	May Units
1711	Ayres Memorial Bldg	$46	0	$46	0	$46	0	$46	1	$57	8	$220	174	$753	770	$1,145	1207	$668	712	$366	364	$236	249	$48	15
1712	Fine Arts III	$492	254	$856	279	$241	675	$738	641	$917	860	$1,353	1920	$2,695	2816	$2,752	347	$0	0	$1,854	1724	$940	972	$167	546
1713	Hermanson Music Bldg	$1,151	159	$77	20	$99	33	$968	121	$126	318	$360	1773	$1,973	2586	$1,943	245	$352	1530	$936	1059	$400	469	$50	18
1714	Nussbaum Science Bldg	$1,120	1161	$1,569	945	$492	1434	$300	987	$1,492	2111	$2,833	4264	$5,079	6141	$5,126	646	$4,175	4398	$3,570	3824	$2,474	2970	$467	1858
1715	Randall Env Std Ctr Bldg	$2,233	310	$700	105	$321	606	$705	306	$907	1300	$1,710	2176	$2,557	2820	$2,341	295	$2,499	2581	$1,943	2016	$3,220	1553	$175	373
1716	Reade Center Bldg	$265	937	$569	217	$239	768	$916	928	$1,036	1341	$1,563	2507	$2,667	3539	$2,666	336	$487	2230	$1,626	1984	$1,274	1681	$213	899
1717	Rupp Comm Arts Bldg	$738	380	$1,283	419	$362	1013	$1,108	962	$1,376	1291	$2,030	2879	$4,042	4223	$4,128	520	$1,289	4633	$2,780	2587	$1,411	1459	$251	818
1718	Zondervan Library Bldg	$108	77	$285	29	$188	9	$216	378	$659	1297	$1,657	2838	$3,045	3845	$2,889	364	$2,376	2707	$2,214	1957	$1,206	1516	$140	241
1726	Atterbury Bldg	$34	12	$31	10	$62	21	$39	19	$110	82	$335	283	$481	419			$319	282	$197	181	$80	87	$25	13
1727	Freimuth Bldg	$23	8	$29	6	$43	0	$27	20	$103	295	$393	667	$714	865	$647	81	$554	629	$408	461	$313	396	$44	92
1728	Heat Plant Bldg	$19	6	$24	5	$35	0	$22	16	$70	200	$267	452	$484	587	$439	55	$376	427	$277	313	$213	269	$30	63
1729	Helena Bldg	$47	1	$46	0	$92	0	$51	4	$105	52	$293	220	$487	398			$284	222	$158	113	$74	39	$46	0
1730	Maintenance - Boyd Bldg	$1,353	262	$155	78	$116	122	$63	71	$190	421	$685	1680	$1,853	2420	$1,817	229	$376	1656	$1,008	1151	$533	656	$66	104
1732	President's House Bldg	$31	13	$26	9	$76	38	$172	125	$301	246	$652	556	$785	677			$502	440	$341	316	$222	274	$77	91
1735	Sickler Bldg	$219	87	$116	67	$36	58	$70	58	$71	82	$112	210	$236	307	$230	29	$52	205	$139	156	$76	90	$11	12
1742	Campus Safety Bldg	$2	0	$2	2	$5	0	$4	5	$21	70	$112	232	$280	339	$284	36	$248	265	$691	2514	$57	10	$2	1
1746	Odle Gym	$54	$42	$64	$31	$31	$61	$88	$104	$117	$223	$360	$441	$602	$608	$593	$75	$480	$440	$293	270	$178	$183	$26	$78
1747	Rediger Chapel Bldg	$44	0	$44	29	$87	0	$73	86	$402	1328	$2,125	4417	$5,316	6444	$5,397	680	$4,704	5040	$1,822	274	$1,089	182	$46	10
1748	Kesler Act. Cntr.	$624	$488	$740	$356	$353	$701	$1,010	$1,190	$1,341	$2,563	$4,137	$5,068	$6,925	$6,998	$6,818	$859	$5,521	$5,066	$3,364	3103	$2,047	2109	$304	903
1749	Student Union Bldg	$15	5	$19	4	$28	0	$17	13	$55	158	$210	357	$382	464	$346	44	$297	337	$218	247	$168	212	$24	49
1750	Memorial Prayer Chapel			$18	0	$53	14	$154	122	$402	340	$871	751	$1,107	994			$781	719	$470	472	$261	339	$28	17
1756	Bergwall Hall Bldg	$345	27	$432	292	$444	618	$585	590	$779	871	$92	747	$592	643	$748	994	$1,194	243	$808	647	$445	63	$0	0
1757	English Hall Bldg	$2,153	441	$693	68	$419	1467	$1,145	1108	$1,154	1214	$1,227	1078	$1,035	1007	$730	92	$296	1264	$1,248	1506	$862	1117	$257	1150
1759	Gerig Hall Bldg	$88	87	$289	54	$106	359	$378	337	$353	373	$391	364	$371	417	$310	39	$496	543	$457	553	$352	446	$97	412
1760	Olson Hall Bldg	$184	76	$277	122	$354	885	$1,099	929	$1,231	2214	$2,712	4668	$4,759	5369	$3,974	501	$3,896	4530	$2,966	3477	$1,872	2461	$323	1261
1761	Sammy Morris Hall Bldg	$1,050	777	$1,612	747	$435	1870	$2,331	2016	$2,800	5797	$638	3242	$6,316	6189	$4,737	597	$5,273	6184	$1,273	4988	$395	1886	$451	1990
1762	Swallow Robin Hall Bldg	$1,876	398	$470	194	$262	478	$572	363	$443	547	$642	831	$893	1067	$800	101	$226	883	$524	77	$1,475	375	$116	358
1763	Wengatz Hall Bldg	$3,896	684	$724	244	$334	1288	$1,586	1750	$2,614	3077	$3,403	4976	$4,942	5565	$4,118	519	$964	4693	$3,251	3886			$328	1558
1771	Guest House Bldg																								
1773	263 Wright																								
1774	Cleveland House	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0
1775	Judd Hse 233 Wright																								
1781	Grill Bldg	$22	7	$27	5	$41	0	$25	19	$81	231	$309	524	$561	680	$508	64	$435	495	$320	362	$246	311	$35	72
1782	Dining Commons Bldg	$3,972	310	$4,971	3361	$5,110	7104	$6,723	6790	$8,953	10019	$9,088	9539	$6,805	7390	$8,606	11428	$13,726	2793	$9,295	7439	$5,122	725	$0	0
1786	Bookstore Building	$5	0	$5	3	$10	0	$8	10	$47	154	$246	511	$616	746	$625	79	$545	584	$211	32	$126	21	$5	1
	Total	$22,210	7009	$16,199	$7,700	$10,519	19623	$21,240	20067	$28,313	39082	$41,024	60345	$69,354	77333	$64,716	20462	$53,392	56731	$45,029	48051	$27,369	23121	$3,852	13003
	Admin/Book/Grill/Union/Heat	100	33	124	24	186	1	115	86	369	1052	1403	2381	2550	3090	2309	291	1977	2248	1456	1645	1120	1415	157	329
	Security/Rediger Chapel	46	0	46	31	92	0	77	90	423	1398	2237	4649	5596	6783	5681	716	4952	5305	1918	288	1146	192	48	11
	Bergwall/Hodson DC	4317	337	5403	3653	5554	7722	7307	7380	9731	10890	1155	9336	7397	8033	9354	12422	14920	3036	10103	8086	5567	788		
	Sickler Wm. Taylor	439	174	232	133	72	116	141	115	143	163	223	419	472	614	460	58	104	410	277	311	151	180	22	23
	Rupp/ Modelle	1229	634	2139	698	603	1688	1846	1603	2293	2151	3383	4799	6737	7039	6880	867			4634	4311	2351	2431	419	1364
	Kesler/Odle	679	530	804	387	384	762	1098	1294	1458	2786	4497	5509	7527	7606	7411	934	6001	5506	3657	3373	2225	2292	330	981

F. Appendix F: List of Contacts

This is a list of the names and titles of those who were contacted for indicator information.

	Contacts	Titles
1	Amy Stucky	Associate Athletic Director / PHP Faculty
2	Barb Michael	Assistant to the Dean of the School of Natural & Applied Sciences
3	Becky Taylor	Environmental Science Program Assistant
4	Beth Miller	Academic Technology Program Assistant
5	Bob Bournique	AEP Account Manager
6	Brent Maher	Director of Assessment & Quality Improvement
7	Chip Long	Upland Town Manager
8	Connie Lightfoot	Dean, School of Professional & Graduate Studies
9	Dan Hammond	Professor of Chemistry Chair / Compliance
10	David Gray	Supervisor of Housekeeping
11	Dick Squiers	Graduate Chair of MES / Professor of Environmental Science
12	Donna Boatwright	Director of Conferences & Special Events
13	Erika Mortland	Visual Arts Office Assistant
14	Faye Checkowich	Professor of Christian Educational Ministries, Dean of Faculty Development
15	Gary Friesen	Director of Academic Technology
16	Greg Eley	Director of Facilities Services
17	Gregg Holloway	Director of Purchasing & Contract Management
18	Hartford City Paper	Recycler
19	Jane Breedlove	Operations Manager Admissions
20	Janet Shaffer	University Registrar
21	Jee Hwan Lee	Graduate Student
22	Jeff Wallace	Director of Campus Safety
23	Jim Garringer	Director of Media Relations
24	Julie Hutson	Secretary-Facilities Services
25	Kathy Thornburgh	Catering Manager
26	Kevin Crosby	Coordinator of Stewardship and Sustainability
27	Kristin Goldman	Off-campus Programs Graduate Assistant
28	Laura Brocker	Manager of On-Campus Recruitment (Admissions)
29	Linda Jefferies/Reneau	Administrative Assistant (Business & Finance)
30	Linda Mealy	Assistant to the Dean of the School of Liberal Arts
31	Lori Slater	Residence Life Housing Coordinator/Assistant
32	Mark Biermann	Dean, School of Natural & Applied Sciences
33	Mary Mahan	Program Assistant for Art
34	Matt Gin	Director of the Taylor Fund
35	Megan Miller	community garden organizer
36	Megan Updike	EPA Compliance Student Worker
37	Michael Guebert	Professor of Geology & Environmental Science

38	Nathan Maurer	Assistant Director of Dining Services
39	Paul Lightfoot	Superintendent of Grounds
40	Randall Gruendyke	Campus Pastor
41	Rita Puckett	Secretary-Facilities Services
42	Robert Craton	Information Resource Coordinator
43	Ron Sutherland	VP for Business & Finance
44	Scott Bragg	Superintendent of Maintenance
45	Shawnda Freer	Director of New Student Programs
46	Sherri Blair	Assistant to the Dean of the School of Professional & Graduate Studies
47	Steve Austin	Associate Dean of Student Leadership & Director of Student Programs
48	Steve Curtis	ETC Operations Manager and Media Specialist
49	Steve Dayton	Institutional Research Analyst
50	Steve Morley	Director of Residence Life / Associate Dean of Students
51	Steve Neideck	Director of University Press
52	T.J. Higley	Director of Client Services (I.T.)
53	Tim Ziegler	Media Services Resource Coordinator
54	Tom Jones	Dean, School of Liberal Arts
55	Toni Newlin	Director, HR Operation
56	Trudy Gowin	Assistant to the Coordinator of Off-Campus Programs
57	Vickie Rhodes	Grille Manager

G. Appendix G: Indicator Brainstorm List

- **A.** Economic
  - **a.** Endowment
    - **i.** Growing or shrinking?
  - **b.** Purchasing standards
    - **i.** Do they exist? Are they stringent?
- **B.** Social
  - **a.** Mission
    - **i.** In mission or other statement
  - **b.** Education
    - **i.** GE
      1. Is sustainability a requirement?
      2. What percent of students take a class that teaches sustainability?
    - **ii.** Are there opportunities to be involved in practical projects?
  - **c.** Faculty
    - **i.** Encouraged to pursue sustainability research outside of their traditional discipline?
  - **d.** Community
    - **i.** Does the university work with community groups on sustainability issues?
  - **e.** Every department
    - **i.** Are initiatives taken by each (including non-academic) departments?
  - **f.** Spiritual
    - **i.** Is stewardship integrated with spiritual life through campus ministries?
- **C.** Environmental
  - **a.** Food Services
    - **i.** Is local food used when possible?
    - **ii.** Are vegetarian and/or vegan options offered at every meal?
    - **iii.** Are reusable utensils used for catering and special events?
    - **iv.** Are certified organic foods purchased?
    - **v.** Are condiments and other foods purchased in bulk to reduce packaging?
    - **vi.** How much water is used?
    - **vii.** How much waste is generated?
    - **viii.** Is any leftover food donated?
    - **ix.** Is the dining commons trayless?
  - **b.** Athletics
    - **i.** [Included in transportation and landscaping.]
  - **c.** Built environment
    - **i.** Is indoor air quality measured – how good is it?
    - **ii.** Does all new construction meet LEED certification requirements?
    - **iii.** Are Green Seal certified cleaning products used?
  - **d.** Landscape
    - **i.** How much water is used to irrigate?
    - **ii.** Are native plants used as much as possible?
    - **iii.** How much fertilizer and other lawn amendments are used?
  - **e.** Energy
    - **i.** Electricity

1. How much used?
    a. How much per student and employee?
2. Is there an official usage reduction policy?

ii. Natural Gas
1. How much used?
    a. How much per student and employee?
2. Is there an official usage reduction policy?

f. Water
i. How much used?
1. How much per student and employee?

ii. Is there an official usage reduction policy?
iii. Does runoff go to water treatment plant or into local steams?
iv. Is there a bottle water purchasing ban or reduction plan?

g. Waste
i. Is there an end-of-the-year program to donate unwanted items?
ii. How much is landfilled?
1. How much per student and employee?

iii. Recycling
1. What is the diversion rate?
2. How much and what percentage of each of the following are recycled: paper, cardboard, metal, plastic, electronics, and hazardous materials?

h. Air pollution
i. Climate change
1. What is the carbon footprint of the campus?
    a. What is this per student of staff member?

ii. Transportation
1. How many miles are driven in cars by working staff members?
2. How many miles are driven in cars by students?
3. How far do students travel to school from home?
4. How far do faculty and staff commute to work?
5. How many miles to professors travel to conferences?
6. How many air miles are flown by students on mission trips?
7. How many staff and students commute by alternative means?
8. Is there a program on campus to support bicycle usage?

H. Appendix H: Campus Consortium for Environmental Excellence

C2E2's mission statement and a list of its member institutions is below (Balf, 2009).

Mission Statement

The mission of the Campus Consortium for Environmental Excellence (C2E2) is to support the continued improvement of environmental performance in higher education through environmental professional networking, information exchange, the development of professional resources and tools, and the advancement of innovative regulatory models. Environmental performance includes campus regulatory compliance, environmental management, and sustainability initiatives.

Our mission is carried out through bi-monthly meetings, active workgroups, and projects identified by the consortium's membership.

Members

Boston College	Carnegie Mellon University	Columbia University
Cornell University EHS	Cornell Environmental Compliance Office	Emory University
Georgetown University	Harvard University	Massachusetts Institute of Technology
Northeastern University	Rhode Island School of Design	Rutgers University
Trinity College, Hartford, CT	Tufts University	University of Alaska Risk Services
University of Connecticut	University of Massachusetts - Amherst	University of Pennsylvania
Michigan State University	University of Vermont	Vanderbilt University
Washington University in St. Louis	Wellesley College	Williams College
Worcester Polytechnic Institute	Yale University	

I. Appendix I: SOC Recycling Audit Documents

Information to be included on the recycling signs

Created by Kevin Crosby for SOC on November 22, 2009
Email soc@taylor.edu with questions

General/background information and instructions

The new 8.5"x11" signs will be placed above the bins, at eye level. So take that into account when planning the text and image sizes. The primary purpose of the signs is to be efficiently informative (no one should ever need to look it for more than a few seconds) and let people know exactly what they should be recycling. The secondary purpose is to be attractive and make people feel good about recycling. The signs are not intended to educate people about why they should recycle or contain random facts about the benefits of recycling. That will be done in our awareness/educational campaign in the spring and does not belong on these permanent and highly visible signs.

The signs will for sure be used for the recycling bins in all of the dorms and apartment buildings in our current recycling initiative. The second phase of our project involves improving the recycling on the rest of campus as well, so we will also need new signs for those bins. Ideally the signs that you create will be used for all campus buildings for consistency's sake. However, if you come up with a design that is great for the dorms, but not appropriate for academic and administrative buildings we are fine with using two sets of signs. We will be printing and laminating at least a hundred of each of the main three signs. In order to keep costs down we would like to print them in b&w on colored paper. If that stifles your creativity too much, feel free to use color. In either case there needs to be a way to immediately differentiate between the signs, such as printing each type on a different color (feel free to advise us on what colors we should use).

The general layout of the signs should probably be the type of recycling in large letters (paper, plastic, aluminum cans, or glass) with the details and maybe some images below. Whatever works, as long as it tells people exactly what to recycle in each bin. More detailed information about the specific types of recycling is below.

1. **All**
    a. Have someone in small font near the bottom that questions/concerns/comments can be directed to the TU maintenance department. I believe that phone number is x85307 (765-998-5307).
    b. Probably include the SOC logo somewhere. (it can be found here)
2. **Paper**
    a. Basically anything that is pure paper or cardboard can be recycled, and everything else should be left out.
    b. Stuff not to include
        i. Anything with any level of food or other waste
            1. Pizza boxes with oil or cheese (although the best thing to do is just to rip off the contaminated section and recycle the rest).

2. Paper cups or plates
3. Used paper towel or tissues

ii. Cardboard with wax on it (cups and some food wrappers)
iii. Freezer boxes: cardboard boxes that are used for frozen (or sometimes refrigerated) foods usually have some sort of foil lining in them that is not recyclable. I was told that it isn't a big deal, but that was because they recycling company knows it is confusing and they figure they will have to sort/sift them out anyway.
iv. Laminated paper
v. …

c. What to include
   i. Any and all office paper no matter what color it is or how much writing/printing it has on it
   ii. Paperboard (thin cardboard used for stuff like cereal boxes)
   iii. Corrugated cardboard
   iv. Stapled paper
   v. Magazines
   vi. Newspaper
   vii. Envelopes with those little plastic windows in them
   viii. …

3. Aluminum

a. Soft drink cans are really the only aluminum item that students are going to recycle. No aluminum foil.
b. The sign should probably indicate that no other types of metal should be put in the bin (tin cans or steel aerosol/spray paint containers for example). Taylor does recycle all types of metal, but it must be brought out to the recycling facility between the maintenance sheds.

4. Plastic

a. Only #1 & #2
   i. #1 is Polyethylene Terephthalate (PETE) and includes 2 liter and small soft drink bottles, peanut butter jars, …
   ii. #2 is High Density Polyethylene (HDPE) and includes milk bottles, juice and water bottles, shampoo bottles, hula-hoops, …
b. *NOT* #3-7
   i. The old signs say "IF IT DOESN'T HAVE A #1 OR #2 SYMBOL ON THE BOTTOM OF IT, THROW IT AWAY!" I suppose that works, but those items can still be recycled, just not at Taylor. For example most big grocery stores now accept plastic bags for recycling.
   ii. Look online to find examples of items that aren't #1 or #2.

c. It is better if they are rinsed out but it is not a huge deal.
d. Bottle & milk caps are not recyclable (they are #5), but it is not the end of the world if they are left on.

5. **Glass**
    a. We do not currently have anyone to purchase our glass, but the maintenance department assured me that we will again soon.
    b. I believe all colors of glass will be accepted but I am not sure.
    c. We might want to wait on this one until we find out for sure. There are only a few glass recycling bins left on campus right now anyway.

Recycling Bin Selection

SOC Recycling Committee
Fall, 2009

We have many recommendations of desirable characteristics for the universities future recycling bins. Most of them are listed below:

1. **Uniformity across campus and between bin types.** It is most important that the same recycling bins and colors are used in all residence halls and ideal all campus buildings. For aesthetic reasons it is also important that all four types of recycling bins come from the same product line so that they look consistent. It would be idea if trash can were also purchased from the same line because they will very often be placed together.

    a. **Two-tiered system**. The only possible exception to this is if we decide to go with a two-tiered system where very nice places on campus would receive a higher class recycling bin. Examples of these locations include the chapel, theater, Ayers, theater, and Helena lobbies.

2. **Low cost.** It is more important to uniformly cover all of campus than have a really neat looking recycle bin. However, we do need something durable and functional.

3. **Durable & timeless design.** These need to last a very long time.

4. **Rectangular**. This will allow them to fit against walls and next to each other and take up minimum space. They should be modular so that they can be configured differently or placed independently in some situations.

5. **Color coordinated by type.** We need to do everything possible to make it easy for people to know what and where to recycle. This should also eliminate some of the problems with items contaminating whole batches of recycling because they were placed in the wrong bins.

    a. **Item name in large letters** . There will be signs with each bin but they also need to have labels on the bins themselves. These could be added by us late if necessary.

    b. **Cut out openings**. Different shaped openings also aid in reducing cross-contamination.

6. **Always place a trash can next to recycling.** Students and other people often place trash in recycling bins if there is no trash can in sight or vice-versa.

7. **Fits a standard trash bag.** These bins also need to be convenient for our housekeepers to use.

8. **Waist high**. It needs to be very easy for people to access these bins. We do not know of top or front loading is preferable.

9. **Made out of recycled material.** This is preferable to demonstrate commitment to recycling, but is not necessary.

With limited knowledge of purchasing possibilities, this is our current favorite: http://www.recycleaway.com/Kaleidoscope-Collection-Recycling-Containers--18-Gallon_p_4.html

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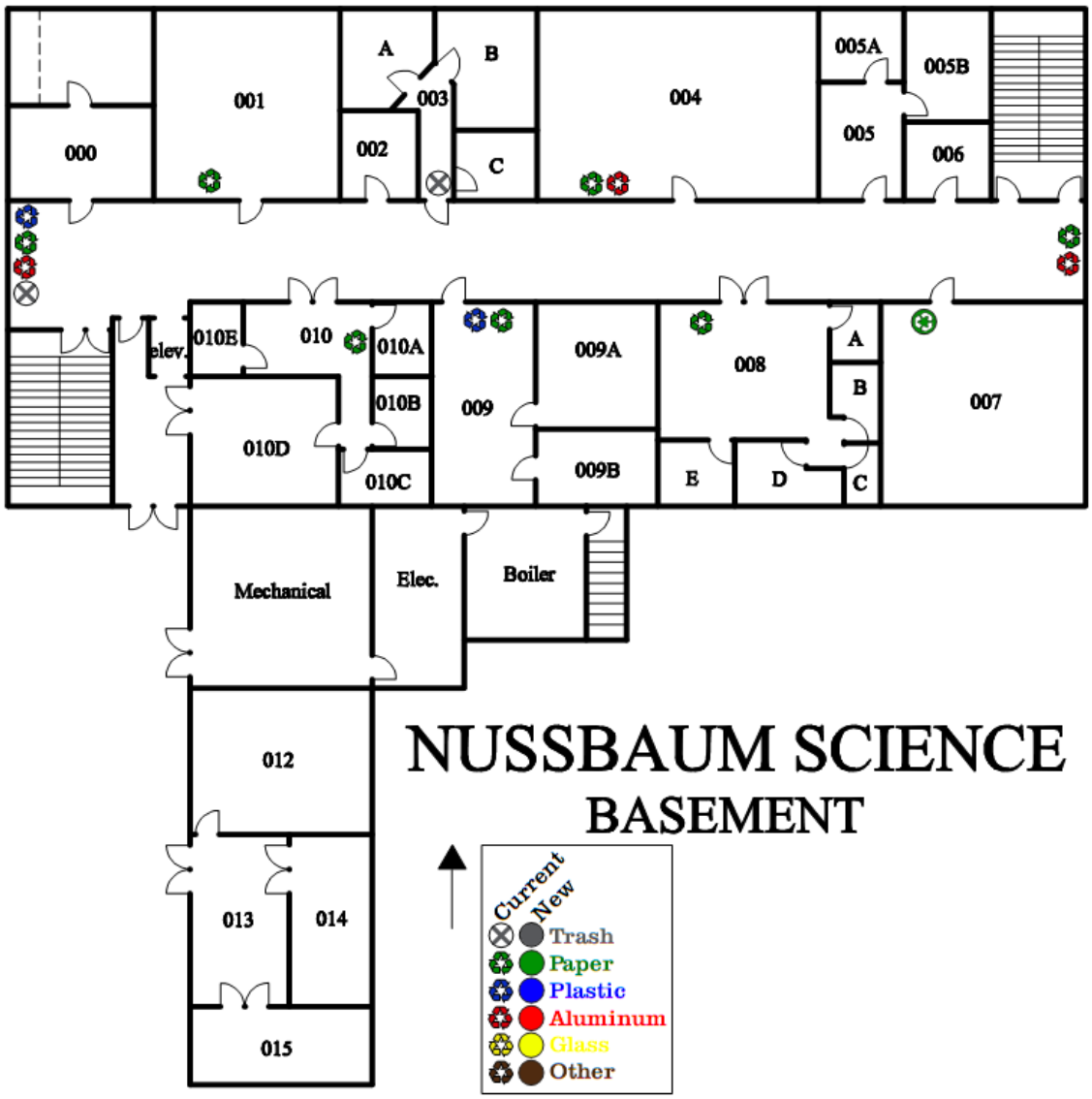
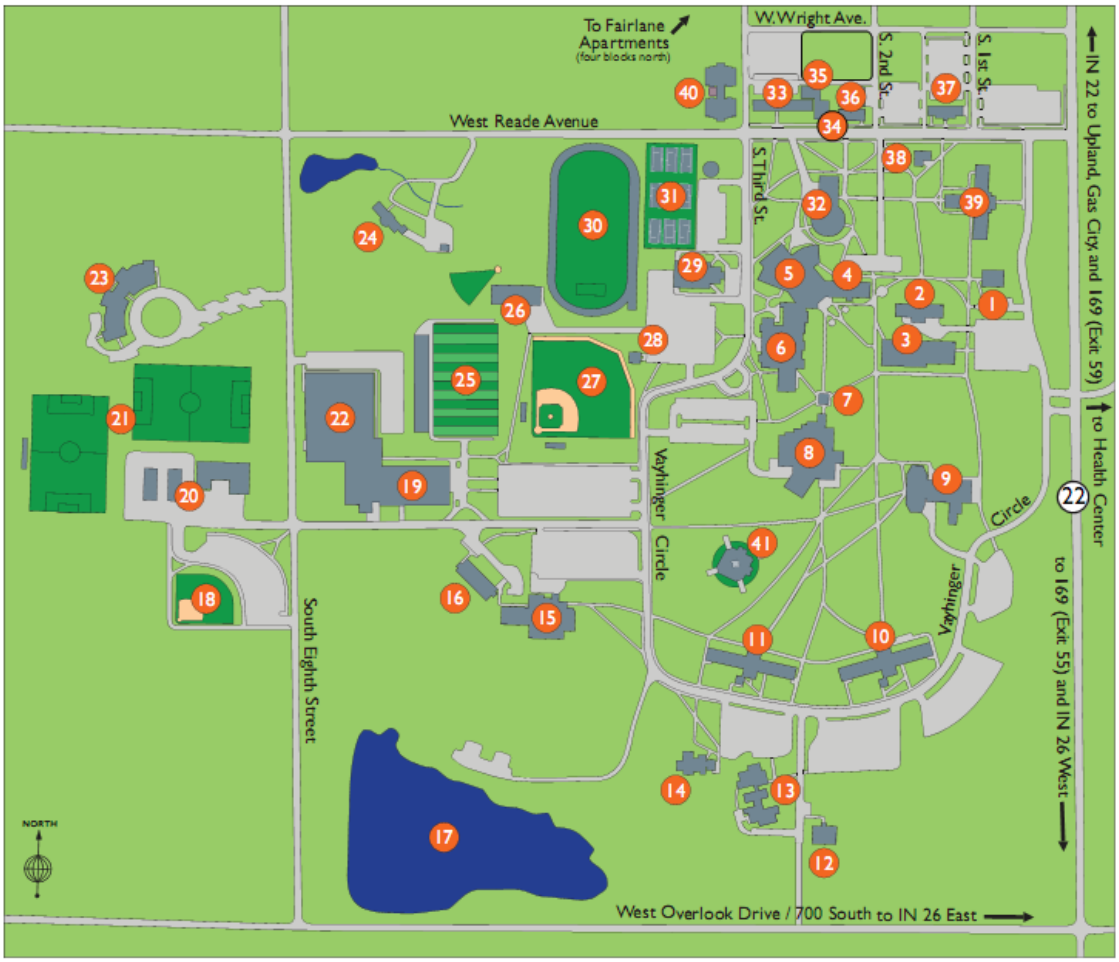
		Current						Recommended additional						#	#	#
Category	Building	trash	paper	plastic	aluminum	glass	batteries	trash	paper	plastic	aluminum	glass	batteries	classrooms	offices	dorm rooms
Academic	Ayres	6	4	2	3	0	0	0	2	2	1	0	0	6	22	0
Academic	Chapel	2	2	1	1	0	0	2	5	3	3	0	0			0
Academic	Metcalf	9	2	2	2	0	0	2	3	3	3	0	0			0
Academic	Nussbaum	7	13	6	9	0	0	0	1	0	0	0	0			0
Academic	Randall	2	2	2	2	1	1	0	0	0	0	0	0	8	10	0
Academic	Reade	7	7	4	7	0	0	1	1	4	1	0	0			0
Academic	Rupp	5	1	0	0	0	0	3	5	5	5	0	0			0
Academic	Smith	4	1	0	0	0	0	0	2	3	2	0	0			0
Admin	Atterbury		2	1	1	0	0	0	0	0	0	0	1	0		0
Admin	Boyd	2	1	1	1	0	0	1	1	0	0	0	1	0		0
Admin	Campus Police	6	1	1	0	0	0	0	0	0	1	0	1	0	3	0
Admin	Freimuth	1	7	4	1	0	0	0	0	1	1	0	1	0		0
Admin	Helena		6	0	0	0	0	0	0	0	0	0	1	0		0
Admin	Sickler		3	2	0	0	0	0	0	0	1	0	1	0		0
Dorms	Berg	8	4	5	5	0	0	0	2	1	1	1	1	4	3	78
Dorms	Campbell	3	1	1	1	0	0	1	4	1	1	0	1			15
Dorms	English	17	9	8	8	7	0	0	-1	0	1	1	1			170
Dorms	Fairlane	5	2	2	1	0	0	0	0	0	0	1	1	0	0	
Dorms	Gerig	4	5	4	4	1	0	0	0	0	0	0	1			51
Dorms	Haak	1	1	1	1	0	0	0	0	0	0	1	1		0	6
Dorms	Morris	13	4	4	4	1	0	0	1	1	1	0	1			
Dorms	Olson	10	3	3	3	0	0	0	6	6	6	1	1		1	139
Dorms	Swallow	4	4	4	4	0	0	0	0	0	0	1	1			
Dorms	Wengatz	5	3	3	3	0	0	0	1	1	1	1	1			139
Outside	Baseball field	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Outside	Football stadium	5	0	0	0	0	0	0	1	2	2	2	0	0	0	0
Outside	Soccer field	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Outside	Softball field	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Outside	Taylor Lake	3	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Outside	Tennis Courts	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Other	Fieldhouse	7	1	0	1	0	0	0	1	1	1	0	0			0
Other	Dining Commons													0		0
Other	KSAC	4		1		0	0	0		3			0			0
Other	Library&Galleria		4	1	1	0	0		1	1	1	0	0			0
Other	Odle	3	1	1	2	0	0									0
Other	Post Office	2	4	0	0	0	0	0	0	0	0	0	1	0		0
Other	Prayer Chapel	1	0	0	0	0	0	0	0	0	0	0	0	0		0
Other	Union	4	2	1	1	0	0	0	1	2	2	1	0	0		0
Other	University Press	2	4	0	1	0	0	0	0	1	0	0	0	0		0
	Totals	**109**	**52**	**39**	**40**	**9**	**0**	**1**	**17**	**25**	**22**	**10**	**11**			
					Total new if replacing old:			**110**	**69**	**64**	**62**	**19**	**11**			

This is an example of floor plans that were made with existing and proposed recycling and trash bins.



J. Appendix J: Taylor University Campus Map

A map of the Taylor Upland campus (Taylor University, 2009c).



K. Appendix K: University Press Paper Data

This is the table of paper types used by the University Press in 2009.

2009 University Press Paper Purchases						
	Volume	**Unit**	**Weight (lbs)**	**Type of Paper**	**Content**	**Certified**
1	2,440,000	Sheets	24,400	20# White Multiuse	30% Recycled	SFI
2	1,005,000	Sheets	1,064	20# White Multiuse	NA	SFI & FSC
3	221,100	Sheets	3,617	Colored Paper	30% Recycled	Green Seal
4	20,900	Sheets	632	Paper	30% Recycled	NA
5	1,500	Sheets	87	Paper	15% Recycled	Green Seal
6	45,257	Sheets	1,391	Paper	NA	NA
7	10,450	Sheets	1,938	Paper	10% Recycled	SFI, FSC & PEFC
8	2,750	Sheets	185	Paper	15% Recycled	SFI, FCS & PEFC
9	98,375	Sheets	3,245	Paper	NA	SFI & FSC
10	77,050	Sheets	3,947	Paper	10% Recycled	SFI & FSC
11	19,000	Sheets	508	Paper	30% Recycled	SFI
12	287,825	Sheets	3,500	Paper	NA	SFI
13	2,000	Sheets	263	Paper	NA	PEFC & FSC
14	10,040	Sheets	564	Paper	100% Recycled	FSC
15	6,000	Sheets	214	Paper	10% Recycled	FSC
16	1,100	Sheets	88	Paper	25% Recycled	FSC
17	14,100	Sheets	1,114	Paper	30% Recycled	FSC
18	7,816	Sheets	482	Paper	30% Recycled	FSC & Green Seal
19	21,800	Sheets	1,355	Paper	NA	FSC
20	153,500	Envelopes	2,060	#10 Natural Envelopes	30% Recycled	Green Seal
21	75,300	Envelopes	798	#9 Colored Envelopes	30% Recycled	Green Seal
22	9,450	Envelopes	139	6 x 9 Natural Envelopes	30% Recycled	Green Seal
23	10,700	Envelopes	308	9 x 12 Natural Envelopes	30% Recycled	Green Seal
24	1,000	Envelopes	14	Envelopes	100% Recycled	NA
25	10,000	Envelopes	129	Envelopes	30% Recycled	Green Seal
26	215,000	Envelopes	3,025	Envelopes	NA	NA
27	1,000	Envelopes	11	Envelopes	30% Recycled	FSC & Green Seal
28	1,000	Envelopes	17	Envelopes	30% Recycled	SFI
29	2,750	Envelopes	34	Envelopes	10% Recycled	FSC
30	1,000	Envelopes	14	Envelopes	NA	FSC
31	7,000	Envelopes	74	Envelopes	NA	SFI & FSC
	487,700	Envelopes	6,623	Pounds	Total Envelopes for 2009	
	4,292,063	Sheets	48,594	Pounds	Total Sheets of Paper for 2009	