

CASE STUDY ON WHITE PAPER RECYCLING AT
OKLAHOMA STATE UNIVERSITY

PATRICIA LYNN BROWN

Bachelor of Science

Oklahoma State University

2004

Submitted to the Faculty of the
Graduate College of
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
July, 2007

CASE STUDY ON WHITE PAPER RECYCLING AT
OKLAHOMA STATE UNIVERSITY

Thesis Approved:

Dr. Lowell Caneday

Thesis Advisor

Dr. Sarah Kimball

Dr. Donald French

Dr. A. Gordon Emslie

Dean of the Graduate College

ACKNOWLEDGMENTS

I would like to thank the members of my committee, Dr. Sarah Kimball and Dr. Donald French, for their time and guidance during the years spent on this project. Special thanks to my committee chair, Dr. Lowell Caneday, for his patience, support and unyielding sense of calm. To the entire committee, I am grateful for the opportunity you provided me to design and work on this study.

This study would not have been possible without the technical support of Aarond Graham and Sheila Dohman. Thank you to the Family, Bullit Farris, Sandra Rodriguez, and Talya Henderson who gave so much encouragement or a friendly smile when needed most.

Finally, a special thanks to my husband, Justin. With you, I would travel thick, I would also travel thin, and all the spaces in between, I would travel with you. You're my sweet one.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
OSU White Paper Recycling Program History	4
Scope and Limitations	7
II. LITERATURE REVIEW	9
The University Role in Sustainability and Environmental Stewardship	10
Waste Stream Analysis	12
Electronic Survey of Recycling Knowledge, Attitudes and Behaviors	14
Previous Oklahoma State University White Paper Recycling Studies	16
Current OSU Recycling Policy	19
Recycling in the Big 12	22
III. METHODOLOGY	28
PURPOSE OF THE STUDY	28
RESEARCH DESIGN	29
Waste Stream Analysis	29
Electronic Survey of Recycling Knowledge, Attitudes, and Behaviors	35
IV. RESULTS	38
Waste Stream Analysis	38
<i>Paper Purchasing Procedures</i>	42
<i>Recycled Paper Collection Protocol</i>	42
<i>Recycling Opportunity</i>	43
<i>Custodial Staff Interviews</i>	44
Survey of Knowledge, Attitudes, and Behavior of Recycling	47
V. DISCUSSION	55
Waste Stream Analysis	55
Survey of Knowledge, Attitudes, and Behavior of Recycling	60
Recommendations	64
REFERENCES	68
APPENDICES	74
APPENDIX A: Association of University Leaders for a Sustainable Future The Talloires Declaration 10 Point Action Plan	75
APPENDIX B: Survey Questionnaire (Focht, 1992)	78
APPENDIX C: Oklahoma State University Physical Plant Program Mission and Program Goals	82
APPENDIX D: Oklahoma State Recycling Procurement Act	83
APPENDIX E: Texas Recycling Mandates	87
APPENDIX F: Custodial Staff Interview	88

Chapter	Page
<i>Interview Consent Form</i>	88
<i>Interview Questions</i>	89
APPENDIX G: Recycling Attitudes and Beliefs Survey (Jennings, 2004).....	90
APPENDIX H: Survey Cover Letter and Questionnaire (modified version).....	91
<i>Survey Cover Letter/Consent Form</i>	91
<i>Survey of OSU Faculty, Staff and Graduate Student Knowledge, Attitude and</i> <i>Behavior on Recycling</i>	92
APPENDIX I: Open-ended Survey Responses.....	96
APPENDIX J: Institutional Review Board (IRB) Research Approval.....	99
APPENDIX K: Oklahoma Recycling Markets/Companies.....	100

LIST OF TABLES

Table	Page
I. Waste Produced Annually by the Average U.S. Citizen	2
II. Comparison of Big 12 Universities: Populations & Recycling Programs Breakdown (all values approximate; recycling weights FY 2006)	23
III. Categories of material from Waste Stream Analysis	38
IV. Total amount of waste (lbs.) sampled and categorized from each type of building	39
V. Frequency and Percentage for Each Demographic Variable	48
VI. Response Percentages for Current Newsprint Recycling Behavior at Home; $\alpha=.05$, $\chi^2=0.021$	50
VII. Response Percentages for Belief that Aluminum Should Be Recycled at Home; $\alpha=.05$, $\chi^2<.001$	50
VIII. Response Percentages for Belief that Glass and Plastic Containers Should Be Recycled at Home; $\alpha=.05$, $\chi^2=.006$	51
IX. Response Percentages for Belief that Paper Should Be Recycled at the Office; $\alpha=.05$, $\chi^2<.001$	52
X. Response Percentages for Belief that Newsprint Should Be Recycled at the Office; $\alpha=.05$, $\chi^2<.001$	52
XI. Response Percentages for Belief that Plastic and Glass Should Be Recycled at the Office; $\alpha=.05$, $\chi^2<.001$	52
XII. Response Percentages of Desire for More Recycling Information According to Building; $\alpha=.05$, $\chi^2=.006$	53
XIII. Response Percentages for Knowledge of What Materials Go in the Different Recycling Bins; $\alpha=.05$, $\chi^2=.009$	53

LIST OF FIGURES

Figure	Page
I. Academic Building Waste Stream Composition (%)	40
II. Administrative Building Waste Stream Composition (%)	40
III. Mixed-Use Building Waste Stream Composition (%)	41
IV. Academic Building Waste Composition (%)	41
V. Administrative Building Waste Composition (%)	41
VI. Mixed-Use Building Waste Composition (%)	41
VII. Material Composition Entire Sampled Waste Stream (%)	42
VIII. Academic Building Floor Plan, basement through 4 th floors; vending machines noted; red star denotes white paper receptacle; red "A"=aluminum receptacle.	45
IX. Administrative Building Floor Plan, 2 nd and 4 th floors; vending machines noted; red star denotes white paper receptacle; red "A"=aluminum receptacle.	46
X. Mixed-Use Building Floor Plan, 1 st floor; vending machines noted; red "A"=aluminum receptacle, red "P"=plastic receptacle, red "G"=glass receptacle.	46

CHAPTER ONE

INTRODUCTION

In the fall of 2005, the Oklahoma State University (OSU) President and System CEO, Dr. David Schmidly, requested a report from the Graduate Professional Student Government Association (GPSGA) that contained a “top ten” list of suggestions for improving graduate and professional education at OSU. In the list, GPSGA requested University support for including a sustainability policy into the University master plan. Inspired by the sustainability definitions and goals of the World Commission on Environment and Development’s report, *Our Common Future*, and the United Nations Millennium Development initiative, the GPSGA report recommends adopting a policy that embraces university system-wide support of environmental protection, social responsibility, and economic viability (Vincent, 2005). Further, the report suggests that University inclusion in the *Talloires Declaration* would support university leaders in creating a leading institution in environmental education, research, policy, and communications (Appendix A). The *Talloires Declaration* is an agreement and pledge by university officials and leaders to foster opportunities to become global leaders in sustainability. Created in 1990, the declaration was the first official statement for a commitment to environmental sustainability in higher education. It has been signed by over 300 universities in over 40 countries, including 106 universities from the U.S. (ULSF, n.d.). OSU currently is not an institutional signatory.

In a time when global sustainability is at the forefront of the American environmental movement, waste reduction is an important aspect of protecting and providing for environmental stability and quality. OSU directly plays a role in achieving state and national waste reduction goals by participating in a campus-recycling program. Recycling is a valuable practice for reducing the amount of waste that must be placed in a landfill and incinerated. Recycling requires the use of fewer natural resources than virgin materials, and recycling creates markets such as those for paper, glass, and metal (Crawford, 1996; ODEQ, n.d.; U.S.EPA, 1998). The benefits of recycling are diverse and include reducing air and water pollution, diverting landfill waste, reducing litter and illegal dumping, converting solid waste into new products, reducing consumer costs, reducing industrial environmental impact, and conserving energy and natural resources (ODEQ).

Table 1 Waste Produced Annually by the Average U.S. Citizen

Type of Waste	Glass Bottles	Aluminum cans	Steel/Tin Cans	Plastic Bottles	Paper
Trashcans Full	5	1	5	1	25

According to a recent study conducted by the U.S.EPA (Table 1), the average person only needs to spend 2 minutes a day to recycle the 5 trashcans full of glass bottles, 1 trashcan full of aluminum beverage cans, 5 trashcans full of steel/tin food cans, 1 trashcan full of plastic bottles, and 25 trashcans full of paper that he or she produces annually (ODEQ, n.d.). Current estimations state that the average U.S. citizen produces 4.6 pounds of solid waste daily. Approximately 40% of the total waste stream is paper, which is equivalent to about 88 million tons annually. Further, current estimates show that U.S. office workers throw away nearly 85% of their office paper, equaling 12 million

tons, every year. Paper makes up the greatest proportion of the waste stream, therefore, presents the greatest opportunity for recycling. Recycling office paper alone can save 33% of the energy needed to make paper from trees, as well as save thousands of gallons of water (ODEQ).

In the United States, recognition of the importance of recycling is evident. Federal and state laws and the doubling of the rate of recycling over the past 15 years with Americans recycling 28% of its waste (ODEQ, n.d) exemplify interests in achieving greater environmental standards. Twenty years ago, only 1 curbside-recycling program existed in the U.S., but today over 9,000 such programs exist with another 12,000 drop-off centers in operation throughout the country. Today the United States recycles roughly 40% of its paper, and plastic, and about 50% of its aluminum, steel, and major appliances (ODEQ).

The American Campus Recycling movement has seen a similar trend in participation rates. Although recycling programs on most university campuses are limited to office waste and white paper (Crawford, 1996), each year for the past 15 years, the number of campuses supporting the movement has increased. In 1990, UCLA and Washington University conducted a national campus recycling survey and more than 78% of campuses had well-established recycling programs (Keniry, 1995). Imagine what that percent is today with over 15 years of student involvement and pressure to achieve recycling goals.

OSU can be a leader in the national and state recycling initiatives. OSU provides the force and framework for future professionals to teach and lead in all sectors of our society. OSU plays a critical role in creating and sharing knowledge, skills and values of

our society and thus, the power to lead our society into a sustainable future by preparing the campus community to achieve sustainability goals (Crawford, 1996; Second Nature, n.d.).

OSU White Paper Recycling Program History¹

In 1989, a coalition named the Solid Waste Environmental Action Project (SWEAP) formed on the OSU campus. Its purpose was to investigate the feasibility of creating and sustaining an organized campus-wide recycling program. SWEAP compiled a comprehensive report that assisted university officials in initiating a campus-recycling program. Included in the report was an opinion survey that SWEAP created and administered by mail to a random sample of university faculty, staff, and graduate students (Appendix B). The main objectives of the survey were to measure willingness to participate in a recycling program, opinions regarding university involvement in recycling and purchase of recycled products, and current and previous experiences in recycling (Focht, 1992). As a result of SWEAP's report, the Campus Recycling Committee was formed in 1990, chaired by the director of the Physical Plant Administration. The OSU campus officially began its white paper recycling program in 1991 under the direction of the Physical Plant director, John Houck (OSU Physical Plant Recycling, n.d.).

Since its inception, the campus white paper recycling program has seen several advancements. Following recommendations from an OSU white paper feasibility report in 2002, the Physical Plant launched a pilot program for paper recycling that was to last for 1.5 years. The Physical Plant purchased a baler for paper and cans in February 2002 and the purchase of the baler led to a cooperative effort between the Physical Plant,

¹ For the purpose of this study, "OSU" refers to the Stillwater campus.

student-run, grass-roots environmental organization ECO-OSU, and the Campus Recycling Committee to distribute white paper bins in all buildings throughout campus. In addition to the distribution of paper bins, an educational program was launched to train the custodial staff on recycling procedures including where recycled paper should be taken. Included in this program was the “lights off at night” campaign that, through posted signs, reminded classroom and office users to turn off their lights at night in order to conserve energy and keep energy costs down. In February 2004, ECO-OSU petitioned the university for the use of recycled paper on campus, the purchase and use of 2-sided printers, and an on-campus recycling drop-off center (ECO-OSU, n.d.; Physical Plant, n.d.). The results of this petition are unknown.

ECO-OSU is still an active student operated group pursuing a host of environmental issues and activities including the initiation of a voluntary dormitory recycling program in 2006. The Physical Plant still oversees the recycling program, but the recycling coordinator believes that resources to strengthen the program are lacking (M. Burnett, personal interview, August 2005). As for the fate of the Campus Recycling Committee, it is a group that has “squandered away” according to Mr. Burnett, Campus Recycling Coordinator (personal conversation February 3, 2006). Although the Campus Recycling Committee reactivated in 2000, the Physical Plant no longer plays a leadership role in the organization.

There are several programs in place on campus. At the end of the 2005 spring semester, the OSU campus participated in its first successful “Campus Castoff” in which unwanted/unused clothes, health and beauty supplies, and other various items were pooled together from residence halls and redistributed for reuse. Across campus, many

departments “surplus” unused office supplies and furniture for reuse in other offices and take part in a phone directory-recycling program. There is some vending machine recycling that takes place, but the success and efficiency of that program has not been determined. On a larger scale, building materials from demolished or redesigned buildings have been collected for their reuse in local businesses and charities (S. Kimball, personal interview fall 2005).

There has not been any report on how well the white paper recycling program operates. The OSU Recycling Web page does offer a glimpse into the program with photographs of shredded and baled white paper, aluminum cans, and wooden pallets. According to the Web page, paper and wooden pallets are sold at auction; however, there is no mention of the quantity of recovered materials. The site does mention that the recycling processing center is run by students, but there is not information about the professional aspects of the processing facility such as if the student positions are paid positions, work study positions, or if any processing employees are trained and/or certified. Many questions exist regarding the 15-year-old program:

- Who is recycling?
- What is being recycled?
- How much is being recycled?
- Is recycled paper being purchased?
- What are the current markets for recycling?
- What are the opinions, attitudes, and perceptions about recycling by those who have the greatest opportunity to recycle?
- Are state and federal paper recycling and purchasing mandates followed?

- What makes other recycling programs better?
- What is the standard or best practice?

To move forward with the campus white paper recycling initiative these questions are important to explore. This report will attempt to describe the current state of recycling at OSU and if the university has met the Oklahoma State Paper Recycling Act's expectations as well as the goals and objectives outlined by OSU's white paper recycling policy.

Scope and Limitations

The nature of this study is to describe the condition of the OSU, Stillwater campus, paper recycling program and to determine the output of white paper into the waste stream. Since I will focus on how much paper is thrown away versus how much paper is recycled, some limitations exist. The first limitation is to determine exactly how much paper enters the waste stream. For example, it is possible that a substantial amount of paper leaves the building without being thrown away or recycled. This could occur through several situations including diversion through re-use. Even with purchasing statistics, the fate of all paper may be unknown. A second limitation is that I will only be able to look at a fraction of the total waste produced on campus; however, I will be able to provide general information on the types and quantities of waste produced. Representative samples of the campus waste stream will provide important properties of the whole waste (Crawford, 1996).

In addition, the scope of this study extends to a survey of general knowledge, attitudes and opinions of campus personnel related to recycling and waste disposal, with the H_0 =there is no difference between groups and all responses follow a normal

distribution. A limitation associated with surveys is non-response bias. Non-response bias refers to the bias created when demographic or attitudinal variables differ between respondents and non-respondents and it can be looked at in terms of total non-response and item non-response (Sax, Gilmartin, & Bryant, 2003). Individual characteristics can have an affect on the type of person that is likely to respond to any given survey. Characteristics such as personal interest in the study topic, age, gender, disposition of survey methods, or a belief that one has no stake or impact regarding the research can all lead to non-response (Lyness & Kropf, 2007; Sax, Gilmartin, & Bryant).

CHAPTER TWO

LITERATURE REVIEW

The goal of this review is to establish a preliminary set of references and background information in support of 5 areas of discussion:

- 1) The role of the university in sustainability and environmental stewardship;
- 2) The importance of Waste Stream Analysis;
- 3) Electronic Survey of Recycling Attitudes and Behaviors;
- 4) Oklahoma State University white paper recycling studies;
- 5) Current OSU recycling policy and what 3 other universities in the Big 12 are doing.

The first section will discuss how and why universities play an important role in achieving sustainability goals. The second section will address the importance and process of conducting a waste stream analysis. The third section describes a method for electronically surveying the general recycling knowledge, attitudes, and behaviors of members of the campus community. The remainder of my review will examine past white paper recycling studies completed at and for Oklahoma State University. I will also examine the current recycling policy and report on the recycling programs employed by other universities. The literature review is in support of compiling tangible information regarding the current state of OSU's recycling program.

The University Role in Sustainability and Environmental Stewardship

Universities play a special role in our global ecology and sustainability. Higher education directly generates and disperses the knowledge, skills, and values of our society. Not only can they be leaders in educating our citizens about environmental issues, but they can also be leaders in setting environmental standards through policies and actions (Keniry 1995; Smith, 1993). Universities and colleges prepare the professionals that will influence our society in many sectors: management, development, education, and policy. These higher education institutions are in the position to create greener, environmentally sound campuses and communities (Keniry; Second Nature, n.d.).

Colleges and universities have the ability to foster an atmosphere where their communities think about their ecological responsibilities in this world. Many of these institutions have realized the challenges and rewards that come with the effort to protect natural resources and reduce the ecological footprint created by modern society. An example of this realization is evolution of the University of Colorado's recycling program. Created in 1976, the program began to flourish in 1984 when a CU graduate created and found funding for his own position as a full-time recycling coordinator. Two years later CU was one of four universities known to have an established recycling program with funding, office space, and dedication for greening their campuses (Keniry). By 1987, the university's president had declared April Campus Recycling month, and in 1989 a solid waste management task force was created that later became the Solid Waste Advisory Board. The 1990's brought the building of an intermediate processing building, the CU Green Team reaching out to the community to create and improve recycling

programs, and distinguished awards including NRC's Recycler of the Year, Outstanding School Recycling Program, and the EPA Climate Protection Award. In 1999, the Office of the Federal Environmental Executive selected CU Recycling as the nation's Model Campus Recycling Program (University of Colorado, 2005).

Ecodemia: Campus Environmental Stewardship (Keniry, 1995) is a tool to assist college communities in creating and sustaining environmentally sound campuses by addressing and responding to today's major environmental issues and providing recommendations and success stories from campuses across the country. *Ecodemia* references the CU Recycling Program because of nine key steps the program followed in order to transform its solid waste into a valuable service. These steps include:

- Publicity for the recycling program
- Strong partnership between students and staff
- Recruitment of administrators with a working knowledge of federal, state, and local legislation
- Cost-effective balance of student-staff involvement
- Recycling procedural training for administrators, staff, and students
- Custodial staff involvement in negotiations, planning processes, and custodial incentives
- Marketing competitive requests for proposals and contracts
- Program development including buying recycled products, minimizing wastes, designing/re-designing buildings to accommodate recycling
- Funding from student fees, the administration, avoided costs, and resale of materials

Waste Stream Analysis

Historically, waste stream analyses have been used to describe municipal solid waste. In fact, the U.S. EPA has used waste stream analyses since 1960 to characterize the national waste stream. Essentially, waste stream analysis refers to the site-specific, hand separation and characterization of solid waste. While the U.S. EPA does not outline strict procedures for conducting a waste stream analysis, it suggests that identifying the components of a waste stream is a key step in addressing and managing the issues associated with municipal solid wastes (U.S. EPA, 1998, 2005). Crawford (1996) and Smith (1993) have adapted the U.S. EPA recommendations for much smaller scales: universities rather than municipalities.

College campuses generate a large amount of waste that could be recycled, reused, or composted. In addition, college campuses use huge amounts of chlorine-based bleached paper products that have the potential to contaminate the waste stream. By identifying what items are thrown away, it is possible to make inferences and raise questions, about what kind of waste the campus is generating, collection practices, and identify what items should be targeted for diversion (Crawford; Smith). The most effective way to determine the efficiency of a recycling program is to “know your trash” (Crawford, 1996; Keniry, 1995; Smith, 1993). By assessing the waste stream through manual separation, or to “know the trash,” it is possible to determine what types of wastes OSU produces and how the university can save on resources and disposal costs. Given that the OSU program’s original purpose was to create a viable white paper recycling initiative, a waste stream analysis is an important tool to assess the successes and weaknesses of the 15-year-old program.

Smith (1993) suggests that the key to starting or improving upon a campus recycling program is to perform an environmental audit or “progress report.” Some recommended questions are:

- Who is in charge of solid waste disposal?
- What are the costs of disposal?
- Where is the campus waste going?
- How involved is OSU’s campus recycling program in waste disposal?
- How much of the waste is recyclable?
- What source reduction programs exist on campus?

Conducting a waste stream analysis will provide an excellent look at what is in the school’s waste stream and what kinds of waste are being produced (Smith, 1993). Characterizing the components of the waste stream is essential in determining the effectiveness of OSU’s white paper recycling program (Crawford, 1996). By identifying the sources, characteristics, and quantities of waste produced by campus, it is possible to see how closely OSU models state and federal standards, as well as the goals and objectives outlined by the university recycling program, and form generalizations on the effectiveness of the program. The information gathered from the waste stream analysis can also contribute to the general body of knowledge about the program to assist the campus administration as well as those who participate in the program (Crawford).

Crawford (1996) conducted a study aimed at testing the effectiveness of manual sorting methods for characterizing university waste streams. The waste stream analysis samples were drawn over 2 semesters and included waste generation sites such as residence halls, academic/administrative buildings, and university apartments. The waste

stream data were combined with university landfill diversion data and U.S. EPA estimates for municipal solid waste composition. Crawford based the evaluation on the ability to predict mean percentage by weight for each category of waste within a $\pm 2\%$ error. Crawford found that when using a sampling model with fewer than 30 samples it was possible to predict the mean percentage weight of all but 3 types of wastes: food, newspaper, and other organics. Crawford concluded that manual sorting provides a “highly acceptable” means for describing and estimating the components of a waste stream within a university setting. Further, dividing the waste stream into distinct waste generation sites (residence halls, academic/administrative, university apartments) allowed for the use of a fewer number of samples to achieve accurate waste characterization.

Electronic Survey of Recycling Knowledge, Attitudes and Behaviors

Before any recommendations can be made for creating or improving upon an existing recycling program, it is important to understand how and why recycling behaviors are created (Morgan and Hughes, 2006; Schultz, Oskamp, Mainieri, 1995). A widely accepted method of describing such characteristics is through administering surveys that address issues such as recycling knowledge, attitudes, and behaviors (Crawford, 1996; Lee, De Young, Marans, 1995; Morgan and Hughes, 2006).

There are several options for conducting a survey. The first is to conduct interviews with sample populations from each group. This would be time consuming so the number of responses most likely would be small and may not offer enough insight to the questions at hand. The second option would be a mail survey. This method would be considerably more costly, but the number of responses may be greater. Electronic surveys

are an option as well. Administering surveys via e-mail could potentially yield a high response but because of SPAM and other electronic annoyances, the number of responses may be limited. The major advantages of electronic surveys include low research and data processing costs and time, raw data that are “computer-ready,” possible higher response rates, standardization (Kiesler & Sproull, 1986; Schaefer & Dillman, 1998; Sproull, 1986), and the adaptability of electronic surveys to many types of research including case studies and attitude surveys (Kiesler & Sproull). Most important, electronic surveys will reduce the use of resources that would otherwise be necessary to conduct a traditional mail survey.

Based on the advantages and disadvantages of each option, this study was conducted as an electronic survey using the OSU e-mail system. Schaeffer and Dillman (1998) conducted an experimental test of e-mail surveys and compared their methodology and results to that of standard mail surveys. The survey target groups included one in which 1) a group received an electronic pre-notice in addition to an e-mail survey, 2) a group that received a paper notice in addition to a paper survey, 3) a group that received a paper survey only, and 4) a group that received an electronic survey only. Overall, the response rate for e-mail surveys with pre-notice was greater than that of the paper surveys and the electronic survey alone. There was not a significant difference in response rates between the paper survey group and the e-mail only group. Generally, the E-mail surveys yielded higher quality responses with the 69.4 percent of the electronic respondents completing 95 percent of the survey, while only 56.6 percent of paper respondents completed 95 percent of the questions (Schaefer & Dillman). The response time for the electronic surveys was much more desirable than the response time

for paper surveys. The average completion time for e-mail surveys was 9.16 days and average completion time of the paper survey was 14.39 days. Further, over fifty percent of completed e-mail surveys were returned before the first paper survey was returned (Schaefer & Dillman).

There are some possible limitations to consider in designing an electronic survey. The first case is that an e-mail survey is restricted to members of the study group who have functional e-mail access (Kiesler & Sproull, 1986; Schaefer & Dillman, 1998). A second case is creating a format that will appear the same for all users, is not cumbersome, and is easy to navigate (Schaefer & Dillman). Despite these concerns, the convenience, low cost, response time, and response quality of electronic surveying make it a viable choice.

Previous Oklahoma State University

White Paper Recycling Studies

The history of OSU's white paper recycling program began in 1989. The Reverend Mendle Adams of the United Ministry, OSU Professor Dr. Theodore (Ted) Mills, director of the Center for Environmental Education, and Will Focht, graduate student and President of the Society of Environmental Scientists, combined their efforts and formed SWEAP, or the Solid Waste Environmental Action Project (Focht, 1992). The purpose of this union was to study the feasibility of a campus-wide recycling program and to assist OSU's administration officials in convincing the university that a recycling program was in their best interest (Focht).

Central to the report was a recycling opinion survey administered to university faculty, staff, and graduate students, who were the most likely to inhabit office spaces

and generate solid waste (Appendix B). The survey was mailed randomly to approximately 400 individuals. The survey included 15 questions focused on four key areas:

- 1) Current and past recycling experience;
- 2) Opinion concerning personal and university involvement in recycling and the purchase of recycled paper;
- 3) Suggestions on how recycling might be conducted; and
- 4) Reservations or objections (Focht, 1992).

The results showed that approximately 1/3 of respondents felt that there should be a mandatory recycling program while approximately 2/3 of respondents felt that a recycling program should be voluntary. Three-quarters of the respondents were willing to participate in a program even if it were somewhat inconvenient to recycle and just over 2/3 of respondents felt that the university should encourage, but not mandate, the purchase of recycled goods (Focht, 1992). Focht concluded there was widespread support for a recycling program. The suggestions offered by respondents and results from office recycling questions included creating sufficient space to store recyclables in offices, a general willingness to separate recyclable materials, and general unwillingness to transport recyclables to a central collection location. Open-ended questions that addressed concerns and reservations about recycling clearly showed that the major areas of concern were convenience, space, esthetics, education, and cost (Focht).

As a result of SWEAP's report the Campus Recycling Committee was formed in 1990, chaired by the director of the Physical Plant Administration, John Houck, and

officially began its white paper recycling program in 1991(OSU Physical Plant Recycling, n.d.).

The next document concerning OSU's white paper recycling program is a feasibility study conducted in 2002. A group of undergraduates in Agricultural Economics developed the report to determine the best method for expanding the economic effectiveness of the recycling program (Burkhalter, E., DeHaas, L., Echalk, L., & Reid, J., 2002). They reported that the major barriers to the recycling program were insufficient storage space, insufficient funding, and lack of educational materials.

Burkhalter et al. (2002) analyzed the total volume of paper purchased by OSU using purchasing data from each department on campus. They also acquired information from the Physical Plant on the amount of white paper being recycled and researched available markets and the types of equipment for efficient storage and processing of white paper. At the time OSU was purchasing 324 tons of white paper, recycling approximately 50 tons of mixed paper annually, and operating at a loss due to the resale of mixed paper, rather than more valuable white paper, and heavy equipment charges for hauling the paper (Burkhalter et al.). The study recommended that OSU create or obtain a facility for paper sorting and storage and purchase a paper baler to obtain the best financial gain from the resale of white paper.

The study concluded that expanding the white paper recycling program would be economically feasible. Further, the report suggested that, if OSU were to set a goal to recycle 80% of its total volume of white paper, it could generate \$33,670 (Burkhalter et al., 2002).

Following the recommendations, in 2002 the Physical Plant launched a pilot program for paper recycling that was to last for 1.5 years. The Library Annex was secured as the new campus recycling storage center and the Physical Plant purchased a baler for paper and cans in February 2002. The purchase of the baler led to a cooperative effort between the Physical Plant, ECO-OSU, and the Campus Recycling Committee to distribute white paper bins in all buildings throughout campus (ECO-OSU, n.d.; OSU Physical Plant Recycling, n.d.).

Current OSU Recycling Policy

Currently white paper recycling is coordinated and implemented by the Physical Plant. According to the OSU Recycling Coordinator, Mr. Mike Burnett, all funding for the recycling program comes from a university allocation. Although there is revenue generated from the sale of recycled and baled paper, the money returns to a university general fund and not directly back into the recycling program (personal communication February 3, 2006; personal communication May 23, 2007).

The recycling program's mission statement, goals, and objectives outlined on the Physical Plant Web site (Appendix C). The university states that:

“The primary mission of the Physical Plant Recycling Program is the institutionalization of a coordinated, self-supporting, campus-wide paper recycling program. Establishment of this program will satisfy the mandates of the Oklahoma State Paper Recycling Act which sets forth the policy that all State institutions should implement a paper recycling program to recycle paper ‘to the greatest extent feasible’.”

A few of the goals and objectives outlined in the program specifically mention:

- comply with the provisions of the Oklahoma State Paper Recycling Act, recycling as much paper as is feasible while maximizing return from the sale of recycled paper, maximizing savings on waste disposal, and conserving landfill capacity and natural resources
- establish a procurement program by purchasing and using as much recycled paper as is feasible and increasing the demand for recycled products
- establish an educational program within the campus community that will familiarize the university with the Oklahoma statute, increase recycling awareness, and foster an environmental ethic in order to establish our university as a leader in “environmentally sensitive programs”
- establish a source reduction and reuse program to decrease the amount of virgin paper used and wasted (OSU Physical Plant, n.d.)

The Oklahoma statute with which the program strives to comply with is formally known as Article IV: Oklahoma State Recycling and Recycled Materials Procurement Act, Sections 946-951 (Appendix D). The act applies to state agencies, which includes state universities; therefore OSU is required by law to comply with the Act. The OK State Paper Recycling Act states that by the year 1999:

“The Purchasing Division and any state public entity not subject to the Central Purchasing Act shall ensure, to the greatest extent economically practical and possible, that the recycled or recovered content of all paper purchased by the Division or agency, measured as a proportion, by weight, of paper products

purchased in a calendar year, is not less than the following... forty percent (40%) of all purchased paper.”

Further, the Act holds that:

“...state public entity shall incorporate requirements relating to the recyclability and ultimate disposition of products and, wherever possible, shall write the specifications so as to minimize the amount of solid waste generated by the state. All specifications under this section shall discourage the purchase of single-use, disposable products and require, whenever practical, the purchase of multiple-use, durable products... The Purchasing Division shall review the procurement specifications currently used by the Department of Central Services in order to eliminate, wherever economically feasible, discrimination against the procurement of recycled paper and other products manufactured with recycled materials (Section 248)... The Division shall establish purchasing practices which, to the maximum extent economically feasible, assure purchase of recycled paper products” (Section 249).

Essentially, the Act holds that all state agencies will create a paper recycling program, take part in procurement practices that encourage and support solid waste reduction as well as support the procurement of recycled products. In addition to following the state standard and paper diversion goal of 40%, state agencies must report to the state Department of Central Services the amount of recycled paper and goods sold during the previous year, the amount of procured recycled paper and other recycled goods, and the total amount of money gained and lost to implement the Oklahoma State Recycling and Recycled Materials Procurement Act.

Recycling in the Big 12

This following is based on comparison of policies and practices at 3 universities in the Big 12 Conference: Texas A&M, the University of Texas, and the University of Oklahoma. I chose these institutions based on accessibility of their data and their apparent successes in their recycling programs. I have focused on universities in the Big 12 Conference because of the regional connection created between the schools, demographically speaking, and specifically, similarity in the number of graduate students and faculty and staff numbers (Table 2). Public records show OSU has approximately 32,500 students, over 4,500 of which are graduate students (1,300 graduate assistants), and 4,500 faculty and staff members (OSU Public Records, n.d.). Texas A&M's student body is approximately 46,000, about 4,800 of which are graduate students (1,100 graduate assistants), and roughly, 7,785 faculty and staff members (Texas A&M Public Records, n.d.). The University of Texas has a student body of approximately 48,000 with nearly 11,000 graduate students, 16,500 faculty and staff members (University of Texas Public Records, n.d.). The University of Oklahoma has an estimated student body of 30,000, 3,575 graduate students (1,600 graduate assistants), 5,900 faculty and staff members (University of Oklahoma Public Records, n.d.).

Like OSU, Texas A&M operates their recycling program under the direction of their Physical Plant. Since 1991, the program has been a campus-wide program operating in 135 buildings and collecting 60 tons of recyclables monthly (Texas A&M, n.d.). A campus recycling group, "Aggies for a Clean Tomorrow," is responsible for the collection, separation, storage, and processing of:

- white paper,

- mixed paper,
- office mix (post-consumer),
- printer's mix (pre-consumer),
- newspaper,
- cardboard,
- aluminum cans and
- used computer ink cartridges.

Table 2 Comparison of Big 12 Universities: Populations & Recycling Programs Breakdown (all values approximate; recycling weights FY 2006)

	Oklahoma State University	Texas A&M	University of Texas	University of Oklahoma
Number of Students	32,500	46,000	48,000	30,000
Number of Graduate Students	4,500 (1,300 graduate assistants)	4,850 (1,100 graduate assistants)	11,000	3,575 (1,600 graduate assistants)
Number of Faculty	1,302	3,875	2,500	2,000
Number of Staff	3,275	3,910	14,000	3,900
Recycling Program Department	Physical Plant	Physical Plant	Facilities Services	Physical Plant
Recycling Program Director	Coordinator	Full-Time Coordinator	Full-Time Coordinator	Full-Time Coordinator
Number of Full-Time Recycling Employees	0	3	5	3
Number of Part-Time Recycling Employees	4	14	0	0
Source of Recycling Funding	Revenue From Solid Waste Disposal System (University Allocation)	Physical Plant, Sale of Recycled Products	Sale of Recycled Products	Refuse Department, Sale of Recycled Products
Annual Recycling Budget	No Allocated Budget	\$321K	No Allocated Budget	No Allocated Budget
Annual Solid Waste Recycled (tons)	175	720	1,581	656
Annual White Paper Recycled (tons)	100	–	1,456	91

Since 2002, Texas A&M extended their recycling program to include 2 residence hall programs. Although there is no allocated budget, funding for the recycling program is through the physical plant and the sale of products to a variety of recycling centers.

The group “Aggies for a Clean Tomorrow” consists of 3 full-time employees who are responsible for the collection of recyclables from campus and distribution of containers all over the campus. The group also employs 14 student and temporary workers who are responsible for sorting and baling recyclables. There is an intern hired each semester to develop feasibility studies to organize the special projects throughout the year and research individual recycling and composting issues. In addition to their campus-recycling program, the Aggies hold special events such as “Move-In Cardboard Collection”, campus-wide educational displays, the celebration of America Recycles Day in November, clothing drives to benefit local charities, and the celebration of Earth Day in April (Texas A&M, n.d.; Lorrie Massie, personal communication July 28, 2006).

Texas A&M has a recycling hotline, a newsletter containing semester totals for recovered and recycled materials, and a very organized and updated website which includes working links to information including:

- Program overview
- Location/directions to TAMU recycling facility
- Recycling staff
- Community recycling
- What to recycle/Buy recycled/Waste prevention
- Special projects.
- Contact page, and
- Recycling links

Similar to OSU and Texas A & M, the University of Texas, Austin, runs their recycling program under the direction of their Physical Plant. The program was initiated

in 1993 to comply with Texas state standards, specifically, Texas Senate Bill 1340, 72nd Legislature, 1991 (Appendix E). The bill mandated the Texas Commissioner of Education to develop and promote environmental education programs in Texas (EIH, 2003). The goal of the bill was to recycle at least 40% of the state's total waste stream by 1994.

UT's program began as a pilot program for white paper recycling in just a few buildings, but today the program operates in 171 buildings across campus. Items that are recycled at UT include:

- cardboard,
- colored paper,
- newsprint,
- "Post-It Notes",
- magazines,
- glossy paper,
- paper,
- hardback books,
- spiral notebooks,
- envelopes, and
- folders

What makes the UT recycling program unique and effective is their membership and cooperation with the Austin Area Corporate Recycling Council and the Clean Texas Star program. The program has won several awards including:

- First place in the Recycling and Waste Minimization Program (2000);

- First place for the “State of Texas Comprehensive Program”(1999);
- Environmental Vision Award (1999);
- Keep Austin Beautiful- First Place for Recycler of the Year (1996),
- Third Place for Education Awareness (1996), and
- Balcones Recycling Benchmark Award (1995).

The recycling program also posts on their website their general services refuse and recycling statistics for each fiscal year, making all information public. Over the past several years, the university has been successful in attempting to meet its recycling percentage goal of 40%. Since 2002, the university recycled an average of 38.4% of its solid waste. In the 2005-2006 fiscal year, the university earned over \$137,000 in paper recycling and other recycling rebates. Currently, the program does not have an allocated budget (University of Texas, n.d.; Kenneth Limbrick, personal communication May 23, 2007).

The University of Oklahoma began its recycling program as a pilot program in 1990 for white and green bar office paper. By 1991 the president of the university proclaimed, “As part of its educational mission, the University of Oklahoma can lead in efforts to preserve the environment and raise the level of awareness about the benefits of recycling” (University of Oklahoma, n.d.). As a result of this proclamation, individual collection containers were distributed to every department. By 1998, the program had successfully expanded to include the residence halls. Until 1998 volunteers collected, sorted, and delivered recyclable materials to nearby recycling centers. In 1999, the university had acquired a larger facility, purchased a baler and forklift, accepted a new contract for baled paper products, and accepted a new contract for baled aluminum and

plastic. In 2000, “Oklahoma City Earth Day” recognized OU’s program with an “Environmental Excellence” award (University of Oklahoma).

Today OU’s success is marked by high support and cooperation from the custodial staff on campus and housekeepers in the residential buildings and the “recycling program crew”. Custodians and housekeepers operate in a relay fashion, collecting recyclables from the different departments and areas on campus, and transferring the materials to larger collection sites, where the recycling program crew picks them up. The recycling program crew is equipped with trailers pulled behind department trucks and they transport the recyclables to the material recovery facility on campus. Finally, the materials are baled and sold to various vendors. Over 80 buildings have various recycling receptacles on campus and the program currently accepts:

- aluminum cans,
- #1 and #2 plastic,
- white paper,
- mixed paper, and
- cardboard.

The funding for OU’s recycling program comes through the sale of recycled products and funds drawn from the Refuse Department. Like Texas A & M University and the University of Texas, there is not an allocated budget for OU’s recycling program. In 2005-2005, the university recycled a total of 656 tons of refuse, 91 tons of paper alone (University of Oklahoma Recycling, n.d.; Recycling Program Coordinator, personal communication January 17, 2007).

CHAPTER THREE

METHODOLOGY

PURPOSE OF THE STUDY

The purpose of this study is to report on and describe the solid waste production and management at Oklahoma State University, Stillwater campus. I provide information on the current state of the campus recycling program that combined with information from other successful recycling programs could provide valuable insight into what factors positively or negatively affect campus recycling programs. Not only did I seek insight on the effectiveness of the campus program, but also I looked at how closely OSU meets Oklahoma state recycling goals and mandates. I collected data on:

- the disposal of white paper,
- amount of paper recycled,
- purchase of recycled paper products,
- participation in the current recycling program by faculty, staff, and graduate students, and
- perceptions and attitudes of faculty, staff, and graduate students to recycling.

I focused on white paper because the primary mission of OSU's recycling program is to sustain a white paper recycling program, in accordance with the Oklahoma State Recycling and Recycled Materials Procurement Act (OSU Physical Plant, n.d.).

Because of limitations in gaining knowledge about the fate of all paper that is purchased and entered into the waste stream, my study focused on the output of the waste stream and what materials makeup that waste.

In addition, this study includes an assessment of the attitudes and opinions of campus personnel regarding recycling and waste disposal, with the H_0 =there is no difference between the groups and all responses follow a normal distribution.

RESEARCH DESIGN

Waste Stream Analysis

The first question I explored was if the OSU campus recycling standards were being followed and implemented as of the 2007 spring semester. Specifically, the OSU recycling program objectives (Appendix C) important to look at and evaluate were:

- Comply with the provisions of the Oklahoma State Paper Recycling Act
- Recycle as much paper as is feasible
- Conserve landfill capacity and natural resources
- Reduce, as much as possible, the quantity of virgin paper used and paper waste generated by maximizing efficient paper use and reuse
- Purchase and use as much recycled paper as is feasible
- Establish an educational program designed to increase pollution prevention awareness within and beyond the university community
- Adapt the recycling, reuse, reclamation, waste minimization, source reduction, and procurement programs developed for paper management to as many other solid wastes as possible

The most effective way to determine the efficiency of a recycling program is to “know your trash” (Crawford, 1996; Keniry, 1995; Smith, 1993). To “know your trash” is to manually sort through and identify what types of wastes the campus discards and determine what types of wastes can be recycled. Since the OSU program’s original purpose was to create a viable white paper recycling initiative, a waste stream analysis is an important tool to assess the successes and weaknesses of the 15-year-old program. By identifying what items are thrown away, it is possible to make inferences and raise questions about what kinds of wastes the OSU campus is generating, collection practices, and identify what items should be targeted for diversion (Crawford; U.S. EPA, 2005).

For this report, the pool of subjects for the waste stream analysis was OSU’s faculty, staff, and graduate students and the waste generated in their respective work places. The subjects were assumed to have campus offices and therefore would likely be participating in the campus-recycling program. To my knowledge, the only completed waste stream analysis was at the onset of the recycling program (M. Burnett, personal interview, August 2005). The campus Physical Plant was responsible for the analysis, which focused on white paper in the waste stream and the feasibility of a white paper recycling program. According to Mr. Burnett, no reports similar in nature have been completed in some time.

I conducted the waste stream analysis based on the *Campus Ecology* guide (Smith, 1993) and modified site-specific waste characterization suggestions outlined by the U.S. Environmental Protection Agency (U.S. EPA). Smith’s methodology follows the U.S. EPA recommendations that state that site-specific, manual sorting, and weighing the individual components of the waste stream is useful in defining the local waste stream

(U.S. EPA, 1994, 1998, 2005). Materials I used for the analysis included a pick-up truck bed as a make-shift sorting table, a scale for weighing the waste, separate garbage bags for plastics, paper, newsprint, metal, glass and compost (fruit and vegetable scraps) found in the waste, protective clothing, a calculator, and data sheets.

The sites of waste collection for the study were 3 areas on campus that represent distinct office waste-generation areas and did not include areas that may contain hazardous materials, such as chemistry and biological laboratories. I chose 3 buildings to study because I felt it was a realistic amount of waste to sort through in a reasonable amount of study time. In addition, each building has a designated use (academic, administrative or mixed-use) which may provide valuable insight to waste and recycling behaviors associated with different office environments, each type of building could have distinct waste and recycling related characteristics. The 3 buildings I studied were Willard Hall, Whitehurst Hall, and the Colvin Recreation Center. Although the primary use of Willard Hall is that of an academic building and the primary use of Whitehurst Hall is that of an administrative support services building, they provide a large number of faculty and/or staff occupying office space. Specifically, during the 2006-2007 school year, Willard Hall potentially had 354 office occupants adding to the waste stream and Whitehurst potentially had 226 people contributing. The Colvin Recreation Center is a mixed use building including classrooms, academic offices, laboratories, and a large student services physical activity space. Although the Colvin Recreation Center had a smaller number of faculty and/or staff (potentially 37 individuals adding to the waste stream), I was interested in the building because of a voluntary recycling program that existed, established and operated by graduate students. I wanted to see if the existing

program had an effect on the waste stream, attitudes, and perceptions of those occupying office spaces in the Colvin Recreation Center, and if greater environmental awareness and stewardship existed as a result of the effort. Although each building may have multiple uses, primary uses do include classroom and office use and do not include any known hazardous activities.

In order to sample waste that reflected an average amount of activity, it was important to conduct the waste stream analysis as close as possible to mid-semester, mid-week. I carried out the waste stream analysis over a one-week period, March 26, 2007 through April 3, 2007, or week 11 of a 16 week semester. The timing was just past mid-semester status because of the timing of the university's spring break for students. I felt it was important to avoid any waste that had potential association with atypical campus activities. In this case, it may have been an influx of waste as individuals cleaned out their offices in preparation for the break. Alternatively, the waste stream may have been lesser in weight and volume due to the absence of the students from campus altogether. Through personal investigation and the Physical Plant waste pick-up schedule, I determined that the dumpsters were at their fullest capacities Tuesday and Wednesday mornings, therefore, I collected the garbage bags on those days during the collection period. I chose to collect 5 garbage bags from each building because of the amount of volunteers I could recruit (1) and, again, to complete the study in a reasonable amount of time. In addition, according to Crawford (1996) and Keniry (1995), 3 to 6 campus areas that represent distinct waste generation sites, and the collection of at least 5 bags from these sites, will provide a good estimate of the major components of the waste stream.

My volunteer and I selected garbage bags from the dumpsters through systematic-

random sampling (Crawford, 1996). In other words, we considered the different strata created within the dumpsters due to differing weights of waste. Ultimately, my assistant and I collected garbage bags from the bottom, middle, and top sections from each of the dumpsters and labeled the bags accordingly. My assistant and I transported all 15 garbage bags to an empty parking lot in the northwest section of campus and sorted by hand each bag into categories. The categories of waste included: White Paper, Mixed Paper, Newsprint, Aluminum, Plastic (#1 & #2), Cardboard, Glass, Other Metals (tin & steel), Compost (fruit & vegetable scraps), and Other (non-recyclable). The bags collected from the dumpsters were standard 35-50 gallon garbage bags and it took approximately 1 hour to sort by hand and categorize the waste of 1 bag. If heavily soiled recyclable materials were found in the samples, they were considered non-recyclable and placed into the “other” category for disposal. Any liquids in containers and lids on glass and plastic beverage containers were disposed of properly. To avoid exposure to harmful or hazardous substances in the waste, my assistant and I wore Suregrip™ latex gloves, facial HEPA filters, and used Vionex™ disinfectant at the conclusion of the sorting process. The only seemingly potentially harmful waste that we encountered was that of restroom waste. Once it was determined that a bag contained bathroom waste, sorting of that bag ended and the waste was added to the “other” category of waste for weighing and disposal.

Once each building had its representative waste characterized, the categorized waste was taken to University Mailing Services to be weighed on a scale that weighed in increments of hundredths of pounds. My assistant and I calculated total weights of waste as well as separated material weights from each building and recorded the information on

data sheets. In order to compare the waste generated from each building, I calculated the material category percentages by dividing the weight of each material category by the total weight of waste for each building. By using percentages, comparison between the buildings was less ambiguous due to differing weights of waste materials. My assistant and I attempted to calculate approximate volumes for each category of waste generated per building. However, because of the variation and compressibility of the different materials, we assumed our calculations were inaccurate. After the analyses were complete, all waste was disposed of properly. All recyclable materials were taken to a Stillwater recycling drop-off center. My analysis was limited in that I was only able to look at a fraction of the total waste produced on campus; however, I was able to provide general information on the types and quantities of waste produced (Smith, 1993). An important question to consider is how I knew that the sample I had chosen accurately represents the whole. The answer to this question lies in the assumption that similar offices across campus have similar sizes and functions, therefore similar waste streams.

In addition to the waste stream analysis, I met with the purchasing agent for each department within each building to learn about the whitepaper purchasing procedures. I also communicated with the university's recycling coordinator to discuss the protocol for collecting recyclable paper throughout campus, the subsequent fate of the paper deposited for recycling, and to determine how much paper is recycled campus-wide. I also determined what waste reduction services were available and in use in each building as well as waste collection practices and waste collection points. To determine available services, I examined the halls and common meeting/kitchen areas of each building and mapped on a campus-generated floor plan the recycling receptacles present throughout

each building. I also noted the proximity of the receptacles to vending machine sites. The final aspect of my analysis involved looking at the waste removal and recycling training of the custodial staff. After gaining written consent, I informally interviewed 6 total members of the custodial staff from the 3 study buildings. I asked the staff questions regarding their awareness of and training on the campus recycling procedures, what types of wastes are collected, and the frequency of collection of waste by the custodial staff. Please see Appendix F for consent form and interview questions.

Electronic Survey of Recycling Knowledge, Attitudes, and Behaviors

The second component of this study was a survey of the recycling experience and participation of faculty, staff, and graduate students. I used two prior studies as models to create the survey instrument: the Focht (Appendix B) and Jennings (Appendix G) questionnaires aided in the creation of a survey instrument that addressed the general recycling knowledge, attitudes, and behavior of the population of 3 buildings on campus, the same buildings in which the waste stream analyses were completed. In addition to the survey questions, a small section at the conclusion of the survey addressed the demographic breakdown for each survey respondent. For example, campus occupational classification (graduate student, staff, or faculty), level of education, gender, age, and campus address (to ensure respondents are members of the target group) were considered for analysis. Please see Appendix H for an example of the modified survey. The survey and the methodology were approved by the Institutional Review Board (IRB) at Oklahoma State University (Appendix J). To strengthen validity and reliability, a pilot

survey was administered to 10 people. The pilot jury responded to the survey questions similarly and reported an average completion time of 5 minutes.

I used a modified version of the Schaeffer and Dillman (1998) method of administering a survey by sending emails to the entire study population twice. Each email contained a hyperlink to the survey that was created and maintained through a FrontPage Website. The second electronic mailing was sent 2 weeks subsequent the first mailing and served as a reminder that survey participation was still possible, but the study period was near its end. The reminder served as an attempt to achieve a greater response rate, as was observed in the Schaffer-Dillman study.

I obtained the email addresses of all faculty, staff, and graduate students that were reported to occupy office space in Willard and Whitehurst Halls, and the Colvin Recreation Center. The information was compiled from departmental lists submitted to the OSU Office of Public Information and the university Office of Human Resources.

I sent emails containing a hyperlink to the survey Website to the target groups who were the entire office populations of Whitehurst Hall, Willard Hall, and the Colvin Recreation Center. This aspect of the study served as a census of each building's office occupants. Compiling a census allowed for a chi-square goodness-of-fit analysis to determine if the observed responses among and between groups arose by chance or if the responses represented a true difference between groups (Shavelson, 1988). Further, the use of contingency tables answered the question as to whether there was any relationship between any two variables in the data. I designated the groups based on demographic information such as age, gender, level of education, classification of position, and campus/office address. The designation of groups in this manner presents the null

hypothesis that there is no difference between groups and all responses follow a normal distribution. For the purposes of this study, the level of significance (α) has been set at .05.

CHAPTER FOUR

RESULTS

Waste Stream Analysis

Ten material categories were used to characterize the waste. As the sorting process progressed, subcategories became apparent. Table 3 shows a breakdown of each category.

Table 3 Categories of material from Waste Stream Analysis

1)White Paper	2)Mixed Paper	3)Newsprint	4)Aluminum	5)Plastic
Shredded Paper	Mixed Office			#1
	Magazine/Glossy			#2
	Junk Mail			
	Other			
6)Cardboard	7)Glass	8)Other Metals	9)Compost	10)Other /non-recyclable
	Brown	Tin	Fruit/Vegetable Scraps	
	Green	Steel		
	Clear			

A total of 15 samples were characterized from the Oklahoma State University waste stream for a combined total of 151.01 pounds. The 3 buildings sampled for the waste stream analysis represent distinct office waste generation areas as well as distinct office functions. For this study, Willard Hall was designated as the academic waste stream representative, Whitehurst Hall was designated as an administrative support services representative, and the Colvin Recreation Center was designated as a mixed-use

representative. Table 4 shows the total amount of waste sampled from each type of building as well as the total weight in pounds of categorized materials.

Table 4 Total amount of waste (lbs.) sampled and categorized from each type of building

	Academic	Administrative	Mixed-Use	Total
White Paper	16.25	14.95	5.2	36.4
Mixed Paper	8.36	5.65	5.6	19.61
Newsprint	3.15	1.15	5.75	10.05
Aluminum	0.6	0.3	0.7	1.6
Plastic	3.2	0.7	4.6	8.5
Cardboard	2.6	2.35	2.6	7.55
Glass	0.65	-	-	0.65
Other Metals	0.1	-	0.35	0.45
Compost	0.45	0.95	1.5	2.9
Other	14.65	10.75	37.9	63.3
Total	50.01	36.8	64.2	151.01

From each of the samples obtained, it was clear that office waste was contained within the samples as each of the 15 large garbage bags sampled contained smaller garbage bags typical of office waste baskets. The academic and mixed-use buildings had 1 large garbage bag of shredded white paper disposed of in the general waste stream, while the administrative waste stream contained 2 large bags of shredded paper. As displayed in Figure 1 through Figure 3, the percentages of white paper, including shredded paper, found in the representative waste streams are as follows: 32.53% of the academic building waste stream, 40.63% of the administrative building waste stream, and 8.1% of the mixed-use building waste stream. The percentages of all recyclable office paper in the representative waste streams are as follows: 49.2% of the academic building waste stream, 56% of the administrative building waste stream, and 16.8% of the mixed-use building waste stream. If newsprint is included in the calculations, the percentages of all recyclable paper products in the representative waste streams are as follows: 55.5% of

the academic building waste stream, 59% in the administrative building waste stream, and 25.8% of the mixed-use building waste stream. Figures 4 through 6 show the calculated percentages of all recyclable waste found in the representative waste streams as compared to the total waste stream; Figure 7 illustrates each type of material as a percentage of the entire waste stream sampled. All calculated values were rounded to the nearest tenth of a percent.

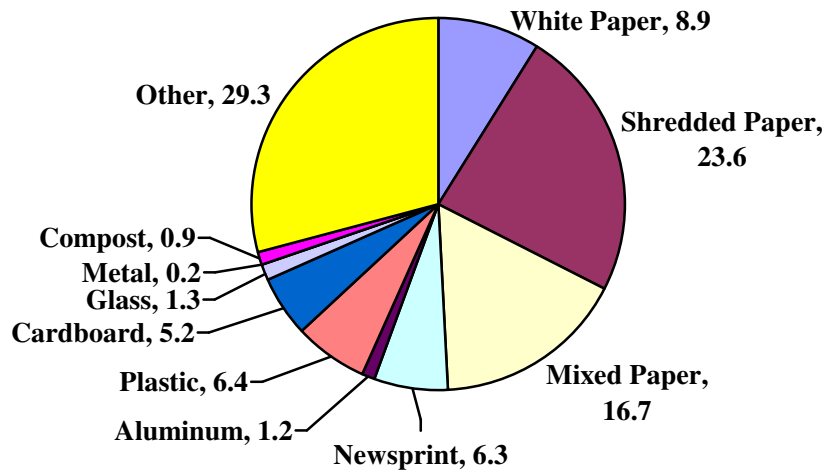


Figure 1 Academic Building Waste Stream Composition (%)

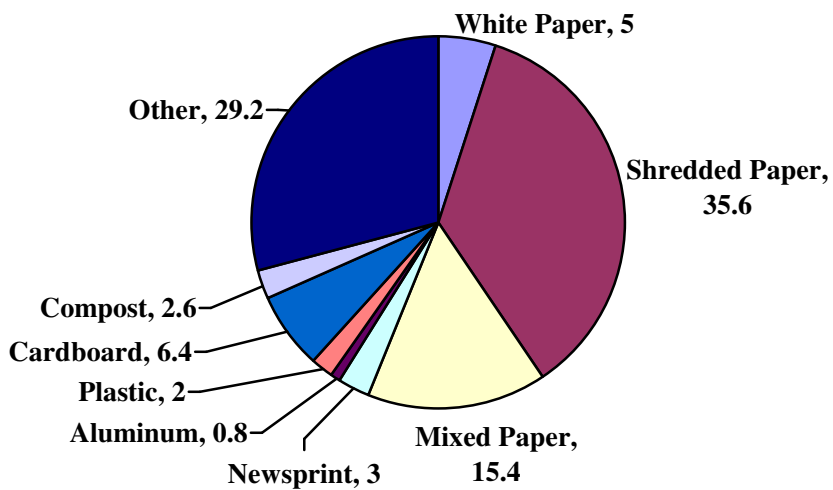


Figure 2 Administrative Building Waste Stream Composition (%)

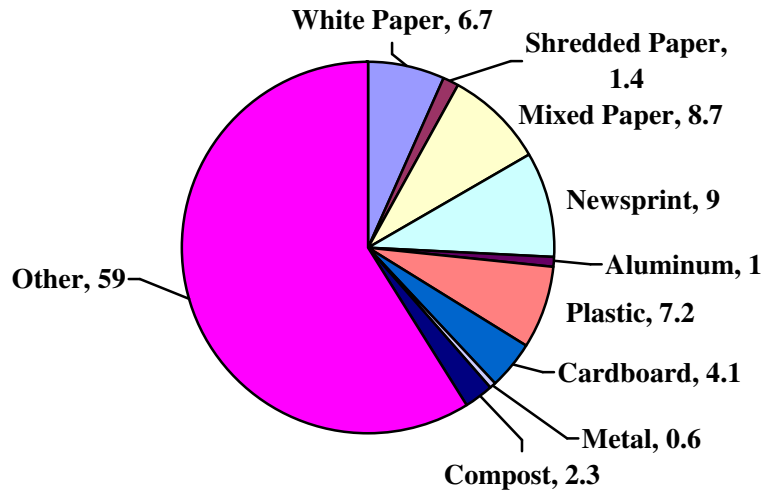


Figure 3 Mixed-Use Building Waste Stream Composition (%)

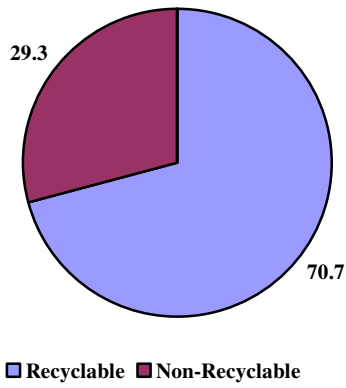


Figure 4 Academic Building Waste Composition (%)

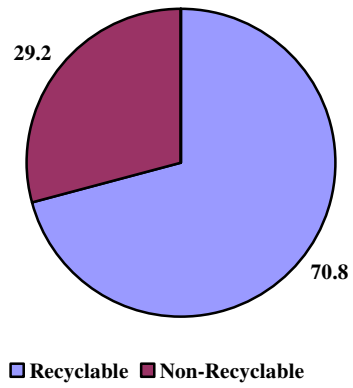


Figure 5 Administrative Building Waste Composition (%)

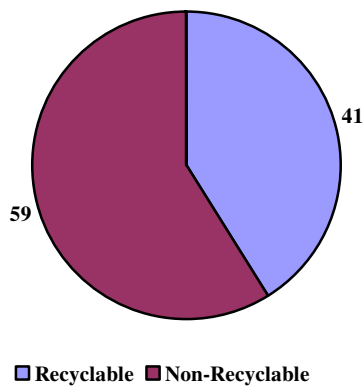


Figure 6 Mixed-Use Building Waste Composition (%)

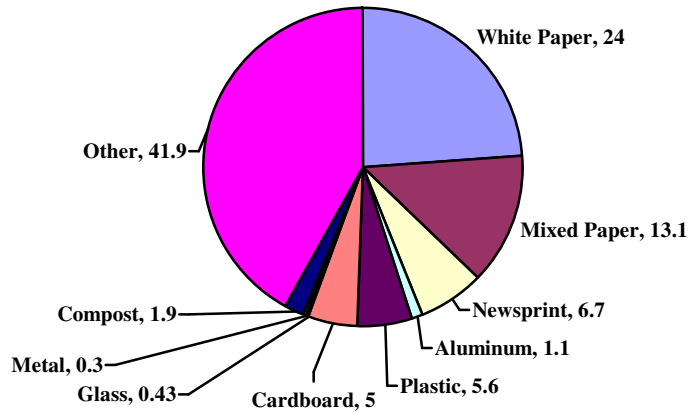


Figure 7 Material Composition Entire Sampled Waste Stream (%)

Paper Purchasing Procedures

For each building studied, the procurement of office paper is at the discretion of individual departments. Other than the goals and objectives outlined by the university white paper recycling program, there are no university policies pertaining to the purchase of office paper. The general trend for paper procurement by departments is purchase through the vendor offering the “best deal”.

Recycled Paper Collection Protocol

Per Mr. Mike Burnett, OSU Recycling Program Coordinator:

“The basic structure of the white paper program is for each staff member to deposit their waste office paper into a collection box in the hall of each floor in university buildings. Custodial staff then collects the paper and takes it to a central location in the building or to one of the white paper refuse containers located on campus. At this point, the papers are either picked up by a student employee or taken to our baling station, or the refuse container is serviced by our recycling compactor truck and taken to the baling station. In general, it is collected when custodial staff notifies us their location is full or an office will call for a special pick-up.”

Mr. Burnett described the fate of the paper deposited for recycling:

“All material that we recycle goes to our area at the Library Annex for processing and storage. When we have a minimum of a semi-truck of a product, paper, cardboard, or pallets, we contact vendors for a faxed hard quote of what they are willing to pay for the material. We sell to the highest quote. (Vendors include) HEW, National Waste, Recycle America, Pallet World, AAA Pallet.” (Personal communication May 23, 2007).

There are no official records of the amounts of waste processed for recycling but, Mr. Burnett reports that the university recycles an average of 130 ton of paper products, 100 tons of which are white paper, and another 45 tons of materials including wooden pallets and miscellaneous materials (Personal communication February 3, 2006; May 23, 2007).

Recycling Opportunity

The recycling opportunities, in this case presence of recycling receptacles, were different for each building. The academic building had the most opportunities for recycling white paper with receptacles on 4 out of 5 floors, and in all but 1 hallway within those 4 floors. There were vending machines that dispensed plastic and aluminum beverage containers on the basement, 1st and 4th floors with aluminum receptacles near the machines (Figure 8). The administrative building had 2 opportunities for recycling: a white paper receptacle on the 2nd floor in the copy room and an aluminum receptacle on the 4th floor in a kitchen near a vending machine that dispensed plastic and aluminum beverage containers (Figure 9). The mixed-use building had 2 opportunities for recycling: white paper receptacles within individual offices for those who participated in that building’s voluntary recycling program, and receptacles for plastic, aluminum, and glass

near a vending machine that dispensed plastic and aluminum beverage containers (Figure 10). A commonality among all buildings was the presence of white paper receptacles in computer labs and departmental offices, essentially anywhere there were one or more functional copy machines.

Custodial Staff Interviews

Four out of 6 custodial staff members were unaware of any university white paper recycling policies. One staff member reported that they knew recycling took place, but they were unaware of any procedures for doing so. One staff member believed there was a recycling policy for computer labs only. All of the custodial staff answered questions similarly in that all staff members had not ever received training on the university recycling practices, nor were they directly responsible for the collection, sorting, or disposal of any recyclables. Three of the 6 staff members interviewed believed the ultimate fate of paper deposited for recycling was the trash.

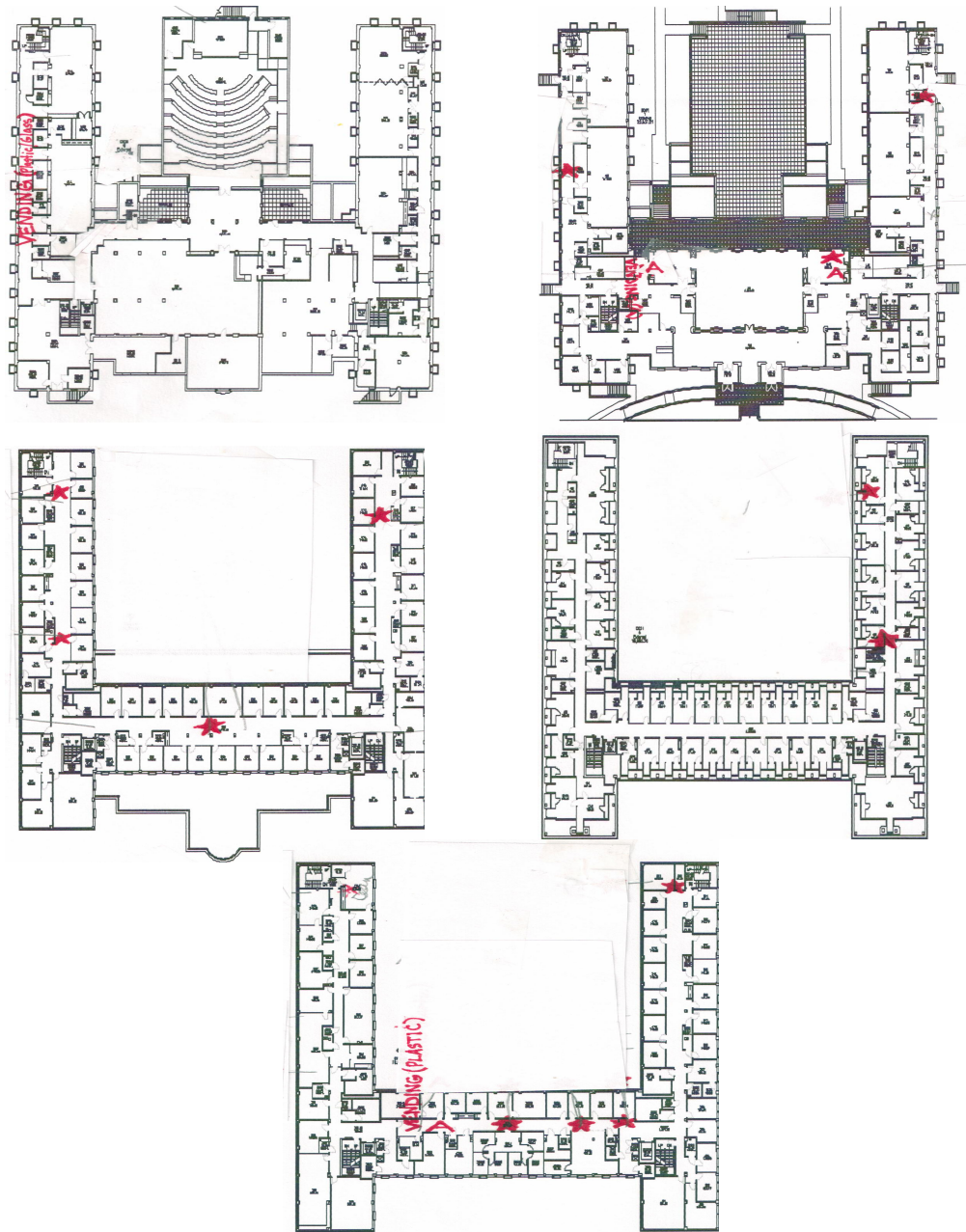


Figure 8 Academic Building Floor Plan, basement through 4th floors; vending machines noted; red star denotes white paper receptacle; red “A”=aluminum receptacle.

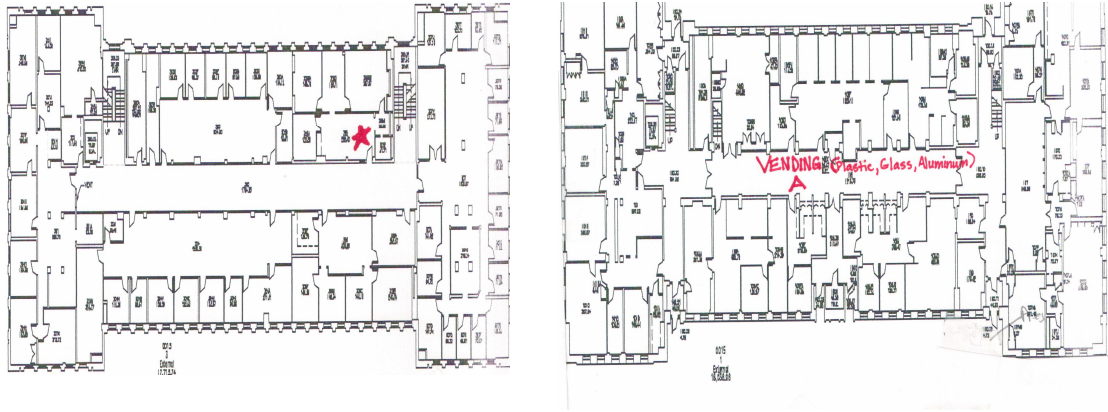


Figure 9 Administrative Building Floor Plan, 2nd and 4th floors; vending machines noted; red star denotes white paper receptacle; red “A”=aluminum receptacle.

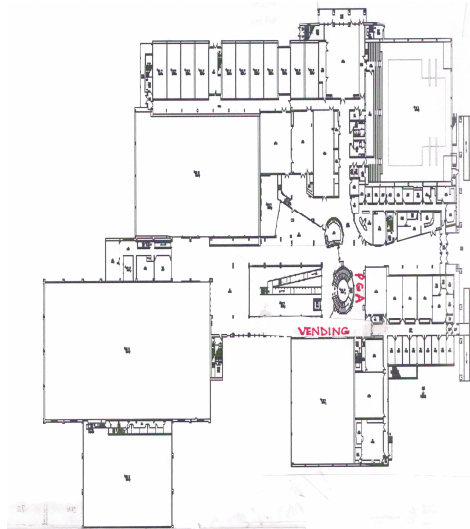


Figure 10 Mixed-Use Building Floor Plan, 1st floor; vending machines noted; red “A”=aluminum receptacle, red “P”=plastic receptacle, red “G”=glass receptacle.

Survey of Knowledge, Attitudes, and Behavior of Recycling

The population for this study consisted of 620 faculty, staff, and graduate students from an academic building, an administrative support services building, and a mixed-use building. A total of 191 surveys were returned yielding a 30.8% response rate with approximately 28.4% of submissions occurring within the first week that the survey was administered. The second solicitation for responses produced an additional 15 returned surveys, increasing the response rates another 2.4%.

Table 5 includes the frequencies and percentages of demographic variables of the respondents that were obtained through the survey instrument. Overall, more women responded with a percent of 68.3, a male respondent percent of 31.7, and one respondent chose not to indicate classification on sex. Age and level of education of the respondents were categorized as follows: 24.3 % age less than 30, 16.4% age 30 to 39, 18.5% age 40-49, 30.2% age 50-59, 10.6% age 60 and above. One respondent chose not to answer the age question. Two and one tenth (2.1) percent had an education level of high school or less, 4.8% vo-tech or professional, 6.3% some college, 23.8% baccalaureate degree, 63% graduate level or above. One respondent chose not to answer the level of education question. Position classification was as follows: 19.9% of respondents were student employees, 23.7% classified staff, 32.3% A&P, 21.5% faculty, and 2.7% were classified as "other". Four respondents chose not to answer the question. Thirty-nine and six tenths (39.6) percent of the respondents were from an academic building (Willard Hall), 43.3% from an administrative support services building (Whitehurst Hall), 8.6% from a mixed-

use building (Colvin Recreation Center), and 8.6% from a building not classified. Three respondents chose not to respond to the office location question.

Table 5 Frequency and Percentage for Each Demographic Variable

		Frequency	%
Sex	Female	129	68.3
	Male	60	31.7
Age	Less than 30	46	24.3
	30 to 39	31	16.4
	40 to 49	35	18.5
	50 to 59	57	30.2
	60 and Above	20	10.6
Level of Education	High School or Less	4	2.1
	Vo-tech or Professional	9	4.8
	Some College	12	6.3
	Baccalaureate Degree	45	23.8
	Graduate or More	119	63
Position Classification	Student Employee	37	19.9
	Classified Staff	44	23.7
	A&P	60	32.3
	Faculty	40	21.5
	Other	5	2.7
Office Location	Willard Hall	74	39.6
	Whitehurst Hall	81	43.3
	Colvin Rec. Center	16	8.6
	Other	16	8.6

The range of responses for each question was tabulated using a Likert-like scale. For example, the array of choices for a question may have included “Strongly Agree,” “Agree,” “Disagree,” or “Strongly Disagree.” As the participants submitted their surveys, their responses were automatically entered into and saved in an Excel.csv file. The Excel file was imported into an SPSS contingency table (cross-tab analysis) which calculated chi-squared goodness of fit values and allowed for comparisons of the observed frequencies to the expected frequencies associated with H_0 : there is no relationship

between any 2 variables in the data. The independent variables were demographic attributes such as age, gender, level of education, classification of position, and campus/office address, while the dependent variables were responses to the survey questions. With a level of significance (α) set at .05, eight groups of observed survey responses for questions 1, 2, 4, and 5 were significant. Specifically, in all but 2 of the 8 cases, there was a relationship between level of education and reported recycling behaviors (question 1) and attitudes (questions 2 and 4). The last 2 cases showed a relationship between office location (building) and recycling knowledge (question 5). Results of the chi-square goodness of fit analyses are provided in Tables 6 through 11.

For each significant cross-tab analysis, cells within the tables contained expected values that were less than the minimum expected count, or less than 5. For analytical purposes, the cells were collapsed vertically, combining the independent variable of level of education into fewer categories or classes. The vertical collapse created 2 categories for level of education: “baccalaureate degree or less” and “graduate or more.” The goal of creating 2 categories with expanded class widths was to increase the expected frequency of cells that previously had inadequate values. The collapse resulted in just one of the original significant outcomes remaining significant. A small sample size most likely resulted in the confounding results. Although collapsing the tables resulted in fewer results that were significant, it can be generalized that the responses regarding recycling behaviors and attitudes versus level of education are still valid. It is also important to mention that on the original survey instrument questions pertaining to current recycling behaviors and recycling attitudes had the option of choosing “Not Applicable” for each type of material. This category of responses was not included in the cross-tab analysis.

The category was deemed meaningless data because if the items were not applicable, then logically, respondents would not have behaviors or attitudes concerning those items.

The pre-collapsed responses to the question regarding respondents' current newsprint recycling behaviors at home (question 1) versus their educational level produced a chi-square value of 29.392, $p=0.021$. There was a high non-recycling behavior reported by those with a high school education or less; there was a high pro-recycling behavior reported by those with a graduate degree or more. This indicates that as educational level increased, so did the reported behavior of recycling newsprint at home (Table 6).

Table 6 Response Percentages for Current Newsprint Recycling Behavior at Home (question 1); $\alpha=.05$, $\chi^2=29.392$, d.f.=16, $p=0.021$

Response Percentage					
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
Education					
High School or Less	50	0	0	25	25
Vo-tech or Professional	33.3	33.3	22.2	0	11.1
Some College	41.7	25	0	16.7	16.7
Baccalaureate Degree	31.7	22	2.4	14.6	29.3
Graduate or More	24.1	20.4	0.9	9.3	45.4

Table 7 Response Percentages for Belief that Aluminum Should Be Recycled at Home (question 2); $\alpha=.05$, $\chi^2=45.508$, d.f.=16, $p<.001$

Response Percentage					
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
Education					
High School or Less	0	25	25	0	50
Vo-tech or Professional	0	0	0	44.4	55.6
Some College	0	9.1	9.1	9.1	72.7
Baccalaureate Degree	2.3	2.3	2.3	20.5	72.7
Graduate or More	.9	0	0	15.9	83.2

Table 8 Response Percentages for Belief that Glass and Plastic Containers Should Be Recycled at Home (question 2); $\alpha=.05$, $\chi^2=33.419$, d.f.=16, $p=.006$

Education	Response Percentage				
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
High School or Less	0	25	50	0	25
Vo-tech or Professional	0	11.1	11.1	33.3	44.4
Some College	0	0	8.3	25	66.7
Baccalaureate Degree	0	4.5	4.5	22.7	68.2
Graduate or More	.9	1.7	2.6	18.1	76.7

Questions 2 and 4 considered attitudes regarding recycling and yielded significant responses. The questions addressed types of materials that respondents felt they *should* recycle at home or in their campus offices. The type of pre-collapsed attitudinal responses observed for recycling at home (question 2) included: aluminum, chi-square value of 45.508, $p<.001$ (Table 7), plastic and glass containers, chi-square value of 33.419, $p=.006$ (Table 8). Pre-collapsed attitudinal responses for recycling on campus (question 4) included: paper, chi-square value of 45.201, $p<.001$ (Table 9), newspaper, chi-square value of 49.46, $p<.001$ (Table 10), and plastic and glass containers, chi-square value of 48.541, $p<.001$ (Table 11). There were high non-recycling attitudes reported by those with a high school education or less; there were high pro-recycling attitudes reported by those with a graduate degree or more. As level of education increased, so did the reported pro-recycling attitudes.

Table 9 Response Percentages for Belief that Paper Should Be Recycled at the Office (question 4); $\alpha=.05$, $\chi^2=45.201$, d.f.=16, $p<.001$

Response Percentage					
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
Education					
High School or Less	0	0	0	0	100
Vo-tech or Professional	0	11.1	11.1	22.2	55.6
Some College	8.3	0	0	16.7	75
Baccalaureate Degree	0	0	4.8	14.3	81
Graduate or More	0	0	0	15.5	84.5

Table 10 Response Percentages for Belief that Newsprint Should Be Recycled at the Office (question 4); $\alpha=.05$, $\chi^2=49.46$, d.f.=16, $p<.001$

Response Percentage					
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
Education					
High School or Less	0	0	66.7	0	33.3
Vo-tech or Professional	0	22.2	11.1	22.2	44.4
Some College	0	10	20	20	50
Baccalaureate Degree	2.6	0	2.6	23.1	71.8
Graduate or More	1.9	1.9	1.9	17.5	76.7

Table 11 Response Percentages for Belief that Plastic and Glass Should Be Recycled at the Office (question 4); $\alpha=.05$, $\chi^2=48.541$, d.f.=16, $p<.001$

Response Percentage					
	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes
Education					
High School or Less	0	0	100	0	0
Vo-tech or Professional	0	28.6	14.3	28.6	28.6
Some College	0	9.1	0	54.5	36.4
Baccalaureate Degree	0	0	25	25.6	66.7
Graduate or More	2.8	5.6	5.6	16.8	69.2

Two sets of pre-collapsed responses that addressed general recycling knowledge (question 5) resulted in significant results. The question regarding the belief that more information regarding recycling would be useful resulted in a chi-square value of 23.172, $p=.006$ (Table 12). Because of the high response percentage for the administrative building participants, it appears there is a relationship between the administrative

building's occupants and a desire to receive more information about recycling at OSU. If all statements of agreement are taken into consideration, regardless of strength of agreement, it can be generalized that respondents from the academic building desire more information regarding recycling as well. The question that dealt with the respondents' knowledge of what types of materials should be put into each of the different recycling bins on campus (question 5) produced a pre-collapsed chi-square value of 22.062, $p=.009$ (Table 13). It can be generalized from the high response percentage of the academic building participants that those occupants felt they had knowledge of what to put in the different recycling receptacles. Because of the lower administrative and mixed-use response percentages, it can be generalized that the administrative and mixed-use building occupants may not fully understand what materials to put in the different recycling bins on campus.

Table 12 Response Percentages of Desire for More Recycling Information According to Building (question 5); $\alpha=.05$, $\chi^2=23.172$, d.f.=9, $p=.006$

Response Percentage				
	Strongly Agree	Agree	Disagree	Strongly Disagree
Building				
Academic	35.1	52.7	9.5	2.7
Administrative	30	63.8	5	1.3
Mixed-Use	12.5	50	37.5	0
Other	53.3	26.7	20	0

Table 13 Response Percentages for Knowledge of What Materials Go in the Different Recycling Bins (question 5); $\alpha=.05$, $\chi^2=22.062$, d.f.=9, $p=.009$

Response Percentage				
	Strongly Agree	Agree	Disagree	Strongly Disagree
Building				
Academic	15.3	52.8	30.6	1.4
Administrative	16	35.8	39.5	8.6
Mixed-Use	25	37.5	37.5	0
Other	13.3	53.3	6.7	26.7

All other responses pertaining to recycling knowledge, attitudes, and behavior in relation to demographic characteristics produced insignificant chi-square values. Please see Appendix H for frequencies of responses to all survey questions. Without looking at strength of agreement or disagreement, it can be said from the raw data that questions addressing recycling knowledge had approximately 70% of respondents agreed they know how to sort recyclable materials from the waste, and they know what materials they can recycle on the OSU campus. Approximately 60% of respondents agreed that they know what to put in each type of recycling bin. Approximately 69% of respondents disagreed with the statement, “It is easy to recycle at OSU,” 88% disagreed with the statement, “I have received enough information about recycling at OSU,” and 87% agreed with the statement, “Information about recycling at OSU would be useful to me.” While approximately 94% of respondents agreed that it is important to recycle at OSU, approximately 67% disagreed that recycling bins on campus are clearly marked, and 72% disagreed that recycling bins are easily located on campus.

Survey questions that addressed attitudes (questions 2 and 4) showed frequencies where the majority believed all types of materials should be recycled at home and on campus. Approximately 88% of respondents reported the desire to recycle more than they do now. Questions that addressed behavior (questions 1 and 3) showed approximately half of the respondents report that they recycle almost all listed materials at home and in their offices.

CHAPTER FIVE

DISCUSSION

Waste Stream Analysis

The first purpose of this study was to describe the waste stream associated with Oklahoma State University. As the literature suggests (Chapter II), defining the waste stream is an important step in addressing and managing the issues associated with waste management and recycling programs. Three buildings that represented distinct areas of waste generation were sampled: an academic building, an administrative support services building, and a mixed-use building. The goals were to characterize how much and what kinds of materials each type of building throws away and identify possible materials for diversion through recycling. The samples for this study were sorted by hand into 10 main categories of waste, weighed, and each building's waste stream was compared to the others. Focus was placed on the life cycle of white paper, as it is the focal point of the university's recycling program goals and objectives. White paper alone comprised 32.5% of the academic building waste, 40.6% of the administrative building waste, and 8.1% of the mixed-use building waste. Overall, white paper comprised 24% of the entire waste sampled. In 2 out of 3 sample sites, paper products comprised more than 55% of the waste streams. Further, they comprised 43.8% of the entire waste sampled. Consider the following goals and objectives outlined by the university:

- Recycle as much paper as is feasible

- Reduce, as much as possible, the quantity of virgin paper used and paper waste generated by maximizing efficient paper use and reuse
- Comply with the provisions of the Oklahoma State Paper Recycling Act
- Purchase and use as much recycled paper as is feasible

OSU has failed for several years to complete the state mandated annual paper recycling and procurement report so it is difficult to gauge whether or not OSU is meeting state and federal paper recycling goals. It is probably safe to say that the university is not meeting state-paper procurement goals, nor are departmental purchasing agents informed and complying with state laws, because of the lack of a defined university procurement policy. The lack of policy has led to the ability of many individual departments, and in some cases individual offices, to purchase paper from any vendor who offers the “best deal.” Since recycled paper products can be slightly more expensive, they are most likely excluded from purchasing decisions. Non-compliance with state mandates and lack of a procurement policy make it difficult to gauge accurately the input of paper into the university waste stream. Considering the output of paper into the waste stream, it appears OSU is not meeting the paper procurement and recycling goals and objectives outlined by the university.

Diverting materials from the waste stream has several benefits: conservation of energy and natural resources, reducing air and water pollution, reducing litter and illegal dumping, converting solid waste into new products, reducing consumer costs, reducing environmental impact, and reducing disposal fees. The decision to divert materials should be based on the amount of recyclable materials in the waste stream, ease in collecting and storing materials, and available recycling markets (Crawford, 1996). Based on the waste

stream analysis, 70.7% of the academic building's waste was recyclable, 70.8% of the administrative building's waste was recyclable, and 41% of the mixed-use building's waste was recyclable. Are these percentages representative of the entire university waste stream? Statistically speaking, this question cannot be answered from this study. An important consideration is the assumption that similar offices across campus have similar sizes and functions, therefore similar waste streams. With that assumption in mind, the results of the waste stream analysis suggest potential for the university to capitalize on the many benefits of recycling. As for storage facilities and available markets (Appendix K), the university already has a storage facility (Library Annex) and the number of recycling companies in Oklahoma for each type of material is as follows: 8 paper, 4 plastic, 32 aluminum, 13 glass, 4 steel, 13 tin, 5 newsprint, 7 cardboard, and 2 magazines (Recyclingmarkets.net, 2007). With these numbers, OSU has the potential to achieve the following university recycling program goals and objectives:

- Conserve landfill capacity and natural resources
- Adapt the recycling, reuse, reclamation, waste minimization, source reduction, and procurement programs developed for paper management to as many other solid wastes as possible.

Currently, compared to 3 other Big 12 universities OSU is recycling less material. One of the factors contributing to the fact that OSU lags behind other universities is recycling opportunity (Ludwig, Gray, & Rowell, 1998; Morgan and Hughes, 2006; Pike et al., 2003; Schultz, Oskamp, and Mainieri 1995). For instance, recycling services are available in 135 buildings across the Texas A&M University campus, 171 buildings on

the University of Texas campus, and 80 buildings on the University of Oklahoma campus. Throughout each building are bins that accept the following items for recycling:

- cardboard, (TAMU, UT, OU)
- white paper (TAMU, UT, OU)
- colored paper, (TAMU, UT, OU)
- newsprint, (TAMU, UT, OU)
- magazines, (TAMU, UT, OU)
- glossy paper, (TAMU, UT, OU)
- hardback books, (UT)
- spiral notebooks, (UT)
- aluminum cans (TAMU, OU)
- #1 and #2 (PET, HDPE) Plastic (OU)
- printer ink cartridges (TAMU)

Research has shown that when people have access to recycling receptacles, they can and will drastically reduce the waste stream (Ludwig, Gray, & Rowell, 1998; Pike et al., 2003). Research has also suggested that effort and convenience are strong forces on recycling attitudes and behaviors (Ebreo and Vining, 2000; Schultz, Oskamp, and Mainieri 1995; Schultz and Oskamp, 1996; Hansmann et al., 2006). As documented in this study, the opportunity to recycle in each building studied varied tremendously (Chapter IV, Figures 8-10). It is important to note in this section that approximately 72% of the survey respondents felt that recycling bins are not easily located across campus; approximately 67% believed recycling bins are not clearly marked, and approximately 69% of respondents felt that it is not easy to recycle on campus. Although white paper

receptacles were present where printers were in use, 2 of the 3 buildings had no other paper recycling opportunities. The academic building had the most opportunity for recycling paper, yet white paper comprised 32.5% of the waste stream. Included in the percentage was 1 bag of shredded white paper. This suggests that the recycling opportunities in place are not convenient. Further, the presence of a bag of shredded paper is consistent with custodial staff interviews that they have received no training on, nor are they responsible for, separating and properly storing recyclable waste. These behaviors can also be associated with perceived convenience. The administrative building had similar implications. Recycling opportunity was considerably less (1 opportunity for paper), the amount of white paper (40.6%) and the presence of 2 bags of shredded paper in the waste stream suggest that recycling is inconvenient in that building as well. These results are consistent with Crawford's (1996) findings that academic and administrative units discard the largest amount of paper products, making them the most important focus for paper recycling programs.

The mixed-use building presents the most interesting case. The building had a volunteer recycling program in place in which students periodically picked-up recyclable white paper from offices in the building. The in-house program not only provided recycling opportunity, but opportunity that is very convenient. Only 8.1% of the building's waste stream was comprised of white paper.

A second point to consider is the fact that close to 60% of this building's waste was categorized as "other," or non-recyclable. The bulk of this category was that of discarded bathroom waste (i.e. paper towels), a product of the restroom use associated with the large athletic facility within the building. Because of the type and amount of

materials found in the mix-use building's waste, specific reduction strategies for restroom waste are important to consider. Further, any building on campus with unique and multiple uses may require specific waste reduction strategies.

Survey of Knowledge, Attitudes, and Behavior of Recycling

The second purpose of this study was to identify and describe university recyclers. I accomplished this through administering an electronic survey that addressed issues such as recycling knowledge, attitudes, and behaviors. For this study, university recyclers were those who occupied office space and theoretically should have direct involvement in the campus white paper recycling program. The study population included office occupants (faculty, staff, and graduate students) in the academic, administrative, and mixed-use buildings. Responses to the survey questions were scored using a Likert-like scale and imported into a contingency table (cross-tab analysis) for chi-square goodness-of-fit analysis. Although small cell size proved to be problematic for the rigor of the chi-square analysis, eight groups of observed survey responses had important results. Specifically, in all but 2 of the 8 cases, there was a relationship between level of education and reported recycling behaviors and attitudes. The last 2 cases showed a relationship between office location (building) and recycling knowledge. There were no relationships observed for the independent variables of age and gender on recycling behavior and attitudes. This is consistent with the literature that provides support in many directions on the affect of those variables on behavior and attitudes (Morgan & Hughes, 2006; Schultz, Oskamp, & Mainieri, 1995). It appears more recent

research focuses on the effect of gender and age on environmental altruism, motivation, and activism (Dietz, Kalof, & Stern, 2002; Tindall, Davies & Mauboules, 2003; Wright, Caserta, & Lund, 2003; Zelezny, Chua, & Aldrich, 2002).

The responses to the question regarding respondents' current newsprint recycling behaviors at home versus their educational level produced a pre-collapsed significant chi-square value indicating that as educational level increased, so did the reported behavior of recycling newsprint at home. Similar relationships were observed for respondents' attitudes regarding recycling the following materials at home: aluminum, plastic and glass containers. Pre-collapsed attitudinal responses for recycling on campus produced significant chi-square values for the following materials: newsprint, plastic and glass containers (Chapter IV, Tables 6-11).

When considering the effect of level of education on recycling behaviors and attitudes, it has been generalized that education provides a person with the opportunity to experience a wide range of ideas and beliefs, which in turn fosters social responsibility (McMillan, Hoban, Clifford and Brant, 1997). Along with social responsibility comes a holistic view of the natural environment and how natural resources should be considered from a disciplinary standpoint (Ewert and Baker, 2001). The perspective supports the findings of this study that as educational level increased, so did the reported newsprint recycling behaviors at home. Pro-recycling attitudes related to the belief that paper aluminum, plastic and glass should be recycled at home, and paper, newsprint, plastic, and glass should be recycled in campus offices, followed the same trend. Although collapsing the tables resulted in fewer results that were significant, I believe that a small sample size confounded the results and it can be generalized that the responses regarding

recycling behaviors and attitudes versus level of education are still valid. While some of the observed frequencies were too small for the vigor of the chi-square analysis, the responses were legitimate and deserve mention.

Two accounts, although not statistically significant, may hold some social importance. First, the survey questions pertaining to current recycling behaviors and attitudes (questions 1-4) gave respondents the option of choosing “Not Applicable” for each type of material. For the purpose of the chi-square analysis, these responses were deemed meaningless data and not included in the cross-tab analysis; however, it is important to consider the reasons why respondents may have selected those options. The “Not Applicable” option was chosen most frequently when describing recycling behaviors and attitudes regarding the “Other” category of recyclable materials, both at home and in the office. This material category was essentially left open for the respondents to interpret as they wished. For instance, if a survey participant selected the “Other” option, they had the opportunity to describe or explain what “Other” entailed. While a small number of respondents provided open-ended responses that included things such as ink cartridges, tin, magazines, fabric/clothing, and motor oil (Appendix I), a somewhat high percentage chose the “Not Applicable” option. Specifically, 34.1% of respondents chose “Not Applicable” when given the choice to describe any current recycling behaviors at home not already listed. When given the choice to describe any behaviors that *should* be taking place in the home, 37.2% chose NA. Similarly, 56.2% of respondents claimed “other” recycling opportunities were not available on campus, and when given the choice to describe any “other” behaviors that *should* be taking place on campus, 48.1% of respondents reported such opportunities were not applicable. This

pattern could suggest a lack of knowledge that such recycling opportunities exist in the respondents' communities and on campus. It may also suggest that respondents have no perceived need or responsibility to recycle such less-common items. Simpler explanations may be that respondents were unable to recall at time of survey participation any "other" materials they do or should recycle, or respondents may have become complacent and lazy with the surveying process, choosing not to expand on their thoughts and behaviors.

The second account to consider is the "Neutral" option for questions pertaining to current recycling behaviors and attitudes relevant to recyclable materials. As in the case above, it is important to consider the reasons why respondents chose those options. Again, the responses may suggest the perception of a lack of need or responsibility to recycle less-common items. And perhaps, the respondents are simply unaware that such opportunities exist.

When analyzing the final 2 groups of important responses it is appropriate to consider the following recycling program objective outlined by the university:

- Establish an educational program designed to increase pollution prevention awareness within and beyond the university community.

Two questions that addressed general recycling knowledge resulted in pre-collapsed significant responses: a question regarding knowledge of what to put in the different recycling receptacles (Chapter IV, Table 13), and a question regarding belief that more information regarding recycling would be useful (Chapter IV, Table 12).

It can be generalized that the academic building occupants felt they had knowledge of what to put in the different recycling receptacles while the administrative

building occupants generally did not know what materials to put in the different recycling bins on campus. This is consistent with the analysis that showed the administrative building's occupants desire to receive more information about recycling at OSU. If all statements of agreement are taken into consideration, regardless of strength of agreement, it can be generalized that respondents from the academic building desire more information regarding recycling as well. Overall, 88% of respondents felt they had not received enough information about recycling at the university, and 87% felt more information would be beneficial. Additionally, the results of the waste stream analysis for both the academic and administrative buildings are consistent with the survey results in that over 70% of both buildings' waste was recyclable. From the data pertaining to the significant responses, in addition to the waste stream analysis results, and the previously mentioned social implications, it is clear that educational objective has not been met.

Recommendations

In order to recommend a plan of action for improving upon the current recycling program, it is important to look at what factors perpetuate failure and success. When comparing OSU to other Big 12 Universities, several key barriers to success stand out for OSU:

- Lack of full-time employees and full-time coordinator for waste recycling program
- Lack of annual program progress report
- Lack of compliance with state goals and legislation
- Lack of consistent campus-wide education campaign
- Lack of public relations

- Lack of unified support between the university Administration, Physical Plant, custodians, and housekeepers
- Lack of recycling opportunity
- Lack of funding from re-sale of recyclable materials

The strengths of the recycling program rest in the hands of the people and their desire for change. In this study, most demographic variables had no effects on reported behaviors and attitudes, which is promising since such variables cannot be changed. According to the results of this study, respondents generally were divided in their recycling behaviors. For all materials recycled in the home, with the exceptions of paper and “other” materials, approximately half of the respondents report they recycle, and approximately half report they do not. For all materials recycled on campus, with the exception of paper and “other” materials, approximately half of respondents report pro-recycling behaviors and approximately half do not. What is encouraging, although not statistically significant, is the social significance in the fact that 94% of the survey respondents agreed that it is important to recycle at OSU and 88% want to recycle more than they do now. Again, the desires of the people to learn about and participate in a recycling program are the driving forces for change.

If a simplified measure of program effectiveness were considered, measured through recycling participation and diversion of waste, then change in the direction of success is very conceivable. Informing and educating the campus community about the university recycling program, its goals, and the community’s role in the program, can have positive impacts on participation. It is reasonable to conclude that since level of education has a positive impact on recycling behavior and attitudes, then increasing the

recycling educational opportunities for all members of the university community will lead to higher participation rates. When considering diversion of waste through recycling as a measure of success for the university's program, OSU has the potential to capitalize on the benefits from recycling. The high percentage of recyclable materials in the waste stream presents an opportunity for OSU to play a larger role in the recycling market.

Addressing and managing the issues associated with waste management and recycling programs are critical steps in creating and maintaining effective programs. Realization of the ability to alter the variables that affect the success of such programs is integral for creating change. This study provides a base line description of the state of recycling at Oklahoma State University well as a starting point for identifying those variables for change. More research in this area is desired and recommended:

- Conduct campus-wide waste stream analyses during each semester of the school year to gain better insight into the university's annual solid waste production.
- Conduct a campus-wide recycling survey to address the recycling knowledge, attitudes, and behaviors in more sectors of the university community.
- Determine the best methods to increase the opportunities for recycling education and participation for all university community members.

In reflection of the purpose, methodology and results this study, there are 2 adjustments that I would have made if given the chance to do again. First, I would have increased the number of times that waste was sampled from each representative building for the waste stream analyses. For example, I would have sampled each building's waste during the fall, spring and summer semesters. I feel that increasing the number of samples would have more accurately described the amount and type of waste that each

type of building generated during the 2006-2007 school year. Second, I would have determined the actual amount of white paper found in the *recycling* stream and compared it to the waste stream. This adjustment would have provided a more detailed comparison between how much white paper is discarded versus how much white paper is recycled. Both modifications would strengthen the study and provide a more comprehensive look at the state of white paper recycling at Oklahoma State University.

REFERENCES

- Burkhalter, E., DeHaas, L., Echalk, L., & Reid, J. (2002). *Oklahoma State University white paper recycling feasibility study*. From OSU, Agricultural Economics course documents.
- Crawford, M. (1996). University waste characterization using manual sorting methods: A Michigan State University case example. *Dissertation Abstracts International*, UMI No. 9706470.
- Dietz, T., Kalof, L., & Stern, P. (2002). Gender, values, and environmentalism. *Social Science Quarterly*, 83(1), 353-364.
- Ebreo, A. & Vining, J. (2000). Motives as predictors of the public's attitudes toward solid waste issues. *Environmental Management*, 25(2), 153-168.
- ECO-OSU Meeting Minutes Archives. (n.d.). Retrieved November 2005, from:
<http://www.orgs.okstate.edu/ecosu/about.html#eco-o>
- Environmental Institute of Houston (EIH). (2003). Conference panel discussion: Texas Environmental Education Advisory Committee. Retrieved July 23, 2006 from:
<http://www.eih.uh.edu/conference/balance/spotlight2.htm>
- Ewert, A. & Baker, D. (2001). Standing where you sit: An exploratory analysis of the relationship between academic major and environment beliefs. *Environment and Behavior*, 33, 687-707.
- Focht, W. (1992). *Survey of faculty, staff, and graduate assistant opinion on solid waste recycling at Oklahoma State University*. From OSU, STAT 5043, Sample Survey

Methods course documents.

- Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P., & Scholz, R. (2006). Justifications and self-organization as determinants of recycling behavior: The case of used batteries. *Resources, Conservation and Recycling, 47*, 133–159.
- Jennings, M. (2004). *An instrument to measure the recycling attitudes and beliefs of undergraduate students at a large northeastern university*. (ERIC Document Reproduction Service No.ED490679)
- Keniry, J. (1995). *Ecodemia: Campus environmental stewardship at the turn of the 21st century*. Washington, D.C.: National Wildlife Federation.
- Kiesler, S. & Sproull, L. (1986). Response effects in the electronic survey. *The Public Opinion Quarterly, 50*(3), 402-413. Retrieved April 2006 from JSTOR archive.
- Lee, Y., DeYoung, R., & Marans, R. (1995). Factors influencing individual recycling behavior in office settings: A study of office workers in Taiwan. *Environment and behavior, 27*(3), 380-403.
- Ludwig, D., Gray, T., & Rowell, A. (1998). Increasing recycling in academic buildings: A systematic replication. *Journal of Applied Behavioral Analysis, 31*(4), 683-686.
- Lyness, K. & Kropf, M. (2007). Cultural values and potential nonresponse bias: A multilevel examination of cross-national differences in mail survey response rates. *Organizational Research Methods, 10*(2), 210-224.
- McMillan, M. (1997). Social and demographic influences on environmental attitudes. *Southern Rural Sociology, 13*(1), 89-107.

- Morgan, F. & Hughes, M. (2006). Understanding recycling behavior in Kentucky: Who recycles and why. *Journal of Minerals, Metals, & Materials*, 58(8), Retrieved May 4, 2007 from ProQuest database.
- Oklahoma Department of Environmental Quality Recycling Fact Sheet. (n.d.). Retrieved October 2005, from: <http://www.deq.state.ok.us/factsheets/land/recfact.pdf>
- Oklahoma State University Physical Plant Recycling Department. (n.d.) Retrieved July 2005, February 2006, from Recycling Web site: <http://www.pp.okstate.edu/recycle/>
- Oklahoma State University Public Records. (n.d.) Retrieved January 13, 2007, from: <http://grad.okstate.edu>; <http://emm.okstate.edu/factsheet2005-4.php>
- Oklahoma State Recycling and Recycled Materials Procurement Act. (n.d.). Retrieved February 10, 2006, from: http://www.sde.state.ok.us/law/law_2005/Chapter_9/C_9-A_IV.htm
- Pike, L., Shannon, T., Lawrimore, K., & McGee, A. (2003). Science education and sustainability initiatives: A campus recycling case study shows the importance of opportunity. *International Journal of Sustainability in Higher Education*, 4(3), 218-229.
- Oklahoma recycling markets. Retrieved May 2007 from: Recyclingmarkets.net.
- Sax, L., Gilmartin, S., & Bryant, A. (2003.) Assessing response rates and nonresponse bias in web and paper surveys. *Research in Higher Education*, 44(4), 409-432.
- Schaefer, D. & Dillman, D. (1998). Development of a standard E-mail methodology: Results of an experiment. *The Public Opinion Quarterly*, 62(3), 378-397. Retrieved April 2006 from JSTOR archive.

- Schultz, P. & Oskamp, S. (1996). Effort as a moderator of the attitude-behavior relationship: General environmental concern and recycling. *Social Psychology Quarterly*, 59(4), 375-383.
- Schultz, P., Oskamp, S., & Mainieri, T. (1995). Who recycles and when? A review of personal and situational factors, *Journal of Environmental Psychology*, 15, 105-121.
- Second Nature: Education for Sustainability*. (n.d.) Retrieved July 2005, February 2006, from Second Nature Web site: <http://www.secondnature.org/efs/efs.htm>
- Shavelson, R.J. (1988). *Statistical reasoning for the behavioral sciences*. Needham Heights, Massachusetts: Simon & Schuster.
- Smith, A. (1993). *Campus ecology: A guide to assessing environmental quality & creating strategies for change*. Venice, California: Living Planet Press.
- Sproull, L. (1986). Using electronic mail for data collection in organizational research. *The Academy of Management Journal*, 29(1), 159-169. Retrieved April 2006 from JSTOR archive.
- Talloires Declaration*. (n.d.) Retrieved December 2005 from University Leaders for a Sustainable Future (ULSF) Web site: http://www.ulsf.org/programs_talloires.html
- Texas A&M University Public Records. (n.d.) Retrieved January 13, 2007 from: <http://www.tamu.edu/home/aboutam/amfacts/facultyfacts.html>;
<http://ogs.tamu.edu/OGS/choseATM.htm>
- Texas A&M University Recycling. (n.d.) Retrieved July 2005, February 2006, from: <http://recycle.tamu.edu/>

Texas Commission on Environmental Quality (2006). Retrieved July 23, 2006 from:

[http://www.deq.state.ms.us/MDEQ.nsf/pdf/Recycling_TexasRM/\\$File/TexasRecyclingMandates.pdf](http://www.deq.state.ms.us/MDEQ.nsf/pdf/Recycling_TexasRM/$File/TexasRecyclingMandates.pdf)

Tindall, D., Davies, S., & Mauboules, C. (2003). Activism and conservation behavior in an environmental movement: The contradictory effects of gender. *Society and Natural Resources*, 16, 909–932.

University of Colorado Recycling. (2005). Retrieved April 2006, from

<http://recycling.colorado.edu/index.html>;

http://recycling.colorado.edu/cu_recycling/about_cu_recycling/index.html

University of Oklahoma Public Records. (n.d.) Retrieved January 13, 2007, from:

<http://www.ou.edu/publicaffairs/OUFacts1.shtml>

University of Oklahoma Recycling. (n.d.) Retrieved July 2005, February 2006, from

http://www.physicalplant.ou.edu/mod.php?mod=userpage&menu=17&page_id=2

University of Texas Public Records. (n.d.) Retrieved January 13, 2007, from:

<http://www.utexas.edu/academic/oir/cds/03-04/CDS2003-I.pdf>;

<http://www.utexas.edu/opa/pubs/facts/overview.php>

University of Texas Recycling. (n.d.). Retrieved July 2005, February 2006, from

<http://www.utexas.edu/physicalplant/general/recycling/>

U.S. Environmental Protection Agency (U.S.EPA). (2005). *Municipal solid waste in the*

United States: 2005 facts and figures. (Report No. EPA530-R-06-011). Retrieved

April 12, 2007, from <http://www.epa.gov/garbage/pubs/ex-sum05.pdf>

- U.S. Environmental Protection Agency (U.S.EPA). (1998). *Characterization of municipal solid waste in the United States*. (Report No. EPA530-R). Retrieved January 13, 2007, from: <http://www.epa.gov/garbage/pubs/98charac.pdf>
- U.S. Environmental Protection Agency (U.S.EPA). (1994). *How to start or expand A recycling collection program*. (Report No. EPA530-F-94-007). Retrieved January 13, 2007, from: <http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/pubs/howtopdf.pdf>.
- Vincent, S. (2005, September). *The GPSGA top ten list for improving graduate and professional education at Oklahoma State University*. List published for Society of Environmental Scientists officers from:
<https://sharepoint.ad.okstate.edu/EI/SES/default.aspx>
- Wright, S., Caserta, M., & Lund, D. (2003). Older adults' attitudes, concerns, and support for environmental issues in the new west. *International Journal of Aging and Human Development*, 57(2), 151-179.
- Zelezny, L., Chua, P., & Aldrich, C. (2002). Elaborating on gender issues in environmentalism. *Journal of Social Issues*, 56(3), 443-457.

APPENDICES

APPENDIX A: Association of University Leaders for a Sustainable Future The Talloires
Declaration 10 Point Action Plan

We, the presidents, rectors, and vice chancellors of universities from all regions of the world are deeply concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources.

Local, regional, and global air and water pollution; accumulation and distribution of toxic wastes; destruction and depletion of forests, soil, and water; depletion of the ozone layer and emission of “green house” gases threaten the survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, the security of nations, and the heritage of future generations. These environmental changes are caused by inequitable and unsustainable production and consumption patterns that aggravate poverty in many regions of the world.

We believe that urgent actions are needed to address these fundamental problems and reverse the trends. Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation, and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature.

Universities have a major role in the education, research, policy formation, and information exchange necessary to make these goals possible. Thus, university leaders must initiate and support mobilization of internal and external resources so that their institutions respond to this urgent challenge.

We, therefore, agree to take the following actions:

1) Increase Awareness of Environmentally Sustainable Development

Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

2) Create an Institutional Culture of Sustainability

Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.

3) Educate for Environmentally Responsible Citizenship

Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.

4) Foster Environmental Literacy For All

Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.

5) Practice Institutional Ecology

Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

6) Involve All Stakeholders

Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

7) Collaborate for Interdisciplinary Approaches

Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.

8) Enhance Capacity of Primary and Secondary Schools

Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

9) Broaden Service and Outreach Nationally and Internationally

Work with national and international organizations to promote a worldwide university effort toward a sustainable future.

10) Maintain the Movement

Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

1994 Updated Version

Creators and Original Signatories

Jean Mayer, President

Tufts University, U.S.A.

(Conference Convener)

Pablo Arce, Vice Chancellor

Universidad Autonoma de Centro America, Costa Rica

L. Ayo Banjo, Vice Chancellor

University of Ibadan, Nigeria

Boonrod Binson, Chancellor

Chulalongkorn University, Thailand

Robert W. Charlton, Vice Chancellor & Principal

University of Witwatersrand, Union of South Africa

Constantine W. Curris, President

University of Northern Iowa, U.S.A.

Michele Gendreau-Massaloux, Rector

l'Academie de Paris, France

Mario Ojeda Gomez, President

Colegio de Mexico, Mexico

Adamu Nayaya Mohammed, Vice Chancellor

Ahmadu Bello University, Nigeria

Augusto Frederico Muller, President

Fundacao Universidade Federal de Mato Grosso, Brazil

Calvin H. Plimpton, President Emeritus

American University of Beirut, Lebanon

Wesley Posvar, President

University of Pittsburgh, U.S.A.

T. Navaneeth Rao, Vice Chancellor
Osmania University, India

Moonis Raza, Vice Chancellor Emeritus
University of New Delhi, India

Pavel D. Sarkisov, Rector
D. I. Mendeleev Institute of Chemical Technology U.S.S.R.

Stuart Saunders, Vice Chancellor & Principal
University of Cape Town, Union of South Africa

Akilagpa Sawyerr, Vice Chancellor
University of Ghana, Ghana

Carlos Vogt, President
Universidade Estadual de Campinas, Brazil

David Ward, Vice Chancellor
University of Wisconsin-Madison, U.S.A.

Xide Xie, President Emeritus
Fudan University, People's Republic of China

**SURVEY OF OSU FACULTY AND STAFF OPINION
ON SOLID WASTE RECYCLING**

PART I. Experience

For items 1 through 5, please mark the appropriate boxes or fill in the blanks, as necessary.

1. Are you currently participating in a recycling program?

Check all that apply.

No (skip to item 4)

Yes, at my office on campus (answer item 2)

Yes, at a campus location other than my office (answer item 2)

Yes, off campus (answer item 3)

2. If you are currently participating in an ON-CAMPUS recycling program, please answer the following questions. Otherwise skip to item 3.

a. Identify the type(s) of wastes that are being recycled. Check all that apply.

Paper

Metal

Glass

White bond

Colored bond

Plastic

Rubber

Newspaper

Magazines

Other (please specify)

b. Who is/are sponsoring the program(s)? Check all that apply.

Self

Group(s) or Organization(s)

(please specify)

I don't know

c. How often are the wastes picked up?

d. What are your responsibilities in the program(s)?

3. If you are currently participating in any OFF-CAMPUS recycling program, please answer the following questions. Otherwise, skip to item 4.

a. Identify the type(s) of wastes that are being recycled. Check all that apply.

Paper Metal Glass
White bond Colored bond Plastic
Rubber Newspaper Magazines
Other (please specify)

b. Who is/are sponsoring the program(s)? Check all that apply.

Self
Group(s) or Organization(s)
(please specify)
I don't know

c. What are your responsibilities in the program(s)?

4. Had you ever participated in a recycling program previously (other than the program(s) in which you may be currently participating)? Check all that apply.

No
Yes, at OSU
Yes, but not at OSU

5. Other than program(s) in which you are now participating, are you aware of any recycling effort(s) on campus?

No (skip to Part II) -
Yes (answer the questions below)

a. Identify the type(s) of wastes that are being recycled. Check all that apply.

Paper Metal Glass
White bond
Colored bond Plastic Rubber
Newspaper Magazines
Other (please specify)

b. Who is/are sponsoring the program(s)? Check all that apply.

Self
Group(s) or organization(s)
(please specify)
I don't know

c. In what building(s) is/are the program(s) located?

PART II. Opinion Survey

To each question below, choose the one answer that best expresses your opinion.

- 6.** *With regard to the university's involvement in solid waste recycling on campus, OSU should:*
- institute a mandatory recycling program, if it is shown to be feasible
 - encourage voluntary recycling, by providing assistance if necessary
 - neither encourage nor discourage recycling; it should be left up to each office or department
- 7.** *With regard to my personal involvement in solid waste recycling on campus, I am:*
- not willing to participate in a recycling program
 - willing to participate in a recycling program, but only if it is not inconvenient to me
 - willing to participate in a recycling program, even if it is somewhat inconvenient to me

PART III. Suggestions

Please answer the following questions regarding suggestions on how solid waste recycling might be conducted at your office.

- 8.** *Do you have space on or near your desk for boxes or other receptacles into which you could place solid waste to be recycled? Please describe.*
- 9.** *Would you be willing to segregate recyclable solid wastes, such as different grades of paper, and place each type in a separate receptacle? Please describe.*
- 10.** *Would you be willing to walk a short distance to a centralized collection point to deposit recyclable wastes? Please describe.*
- 11.** *Other suggestions?*

PART IV. Reservations or Objections

- 12.** *What reservations or objections, if any, do you have concerning the establishment of a solid waste recycling program at OSU?*

13. What reservations or objections, if any, do you have concerning your personal participation in a solid waste recycling program at OSU?

14. Any other comments?

APPENDIX C: Oklahoma State University Physical Plant Program Mission and Program Goals

Mission Statement

The primary mission of the Physical Plant Recycling Program is the institutionalization of a coordinated, self-supporting, campus-wide paper recycling program. Establishment of this program will satisfy the mandates of the Oklahoma State Paper Recycling Act which sets forth the policy that all State institutions should implement a paper recycling program to recycle paper "to the greatest extent feasible."

Program Goals

1. Establish a campus-wide recycling program

Objective: Comply with the provisions of the Oklahoma State Paper Recycling Act

Objective: Recycle as much paper as is feasible

Objective: Maximize return from the sale of recyclable paper

Objective: Maximize savings on waste disposal charges

Objective: Conserve landfill capacity and natural resources

2. Establish a recycled paper products procurement program

Objective: Purchase and use as much recycled paper as is feasible

Objective: Increase the demand for recycled paper products

Objective: Conserve limited landfill capacity and natural resources

3. Establish an educational program designed to increase pollution prevention awareness within and beyond the university community

Objective: Familiarize the university community with the provisions of the Paper Recycling Program

Objective: Increase awareness of the importance and methods of pollution prevention

Objective: Foster an environmental ethic and a sense of environmental responsibility

Objective: Transmit knowledge gained from this program to the citizens of Oklahoma via extension

Objective: Establish Oklahoma State University as a leader in the institutionalization of environmentally conscious programs

4. Establish a paper reuse, waste paper minimization and source reduction program

Objective: Reduce, as much as possible, the quantity of virgin paper used and paper waste generated by maximizing efficient paper use and reuse

Objective: Maximize savings on waste disposal charges

Objective: Conserve landfill capacity and natural resources

5. Expand the paper management program to other solid waste streams

Objective: Adapt the recycling, reuse, reclamation, waste minimization, source reduction, and procurement programs developed for paper management to as many other solid wastes as possible

Objective: Conserve landfill capacity, natural resources and energy

Objective: Increase the demand for recycled products

Objective: Reduce, as much as possible, the amount of solid waste generated

Objective: Reuse as much solid waste as possible before discarding

Objective: Maximize savings on waste disposal charges and new purchase costs

Objective: Foster an environmental ethic among faculty, staff and students

6. Establish a materials substitution and alternative use program

Objective: Replace the acquisition and use of hazardous material with environmentally safe materials, as much as possible

Objective: To the extent that satisfactory substitutes cannot be found, minimize the quantities purchased and used

Objective: Reduce the quantity discarded by seeking alternate uses before discarding

APPENDIX D: Oklahoma State Recycling Procurement Act

ARTICLE IV: OKLAHOMA STATE RECYCLING PROCUREMENT ACT

- 946. Oklahoma State Recycling and Recycled Materials Procurement Act - Definitions.
- 947. Rules and Regulations.
- 948. Requirements for State Public Entities.
- 949. Miscellaneous Provisions.
- 950. Management Practices and Annual Report.
- 951. Clearinghouse, Cooperative Buying and Uniform Specifications.

Section 946. Oklahoma State Recycling and Recycled Materials Procurement Act - Definitions.

As used in the Oklahoma State Recycling and Recycled Materials Procurement Act:

1. "Department" means the Department of Central Services;
2. "Paper recycling" means the processing of scrap paper or other such recoverable waste paper into reusable products. Such collection and recycling of recoverable waste paper shall be done in an environmentally acceptable manner;
3. "State public entity" means the State Legislature, any bureau, agency, board, commission, or authority of the state, the office of the Governor, the judiciary, or any state university, school district, or county of the state which is supported in whole or in part by state funds;
4. "Recoverable waste paper" generated by businesses or consumers, which has served its intended use and has been separated from solid waste for purposes of collection and recycling, shall include, but is not limited to, such paper as computer cards, computer print-out papers, copy paper, white office papers, colored office papers, corrugated boxes, newspapers, envelope coatings, bindery trimmings, printing scrap and butt rolls. Mill broke repulped internally within a paper manufacturing facility shall not be considered recoverable waste paper;
5. "Director" means the Director of Central Services;
6. "Division" means the Purchasing Division of the Department of Central Services;
7. "Recycled paper products" means all paper products manufactured from recoverable waste paper with not less than ten percent (10%) of their total weight consisting of waste paper;
8. "Products manufactured with recycled materials" means products that contain at least a minimum percentage of specified materials recovered from the recycling of post-consumer products as defined in rules and regulations promulgated by the Division;
9. "Recyclable materials" means materials or products which are capable of being recycled, including but not limited to paper, glass, plastics, metals, automobile oil, and batteries. Refuse-derived fuel or other material that is destroyed by incineration is not a recyclable material; and
10. "Uncoated" means not coated with plastic, clay, or other material used to create a glossy finish. **(74-85.51)**

Section 947. Rules and Regulations.

A. It is the intent of the Legislature that all state public entities comply with the provisions of the Oklahoma State Recycling and Recycled Materials Procurement Act. All political subdivisions of this state are encouraged to collect and recycle recoverable waste paper and recyclable materials to the greatest extent possible. The Department of Central Services shall adopt such rules, regulations, and orders as are necessary for the implementation of the Oklahoma State Recycling and Recycled Materials Procurement Act. The rules and regulations at a minimum shall establish procedures for:

1. The identification, handling, hauling, storing, safety factors, and disposition of recoverable waste paper and recyclable materials;

2. The separation of recoverable waste paper and recyclable materials from solid waste generated by state public entities;

3. A system for the collection of recoverable waste paper and recyclable materials from solid waste generated by state public entities;

4. Assuring that the recoverable waste paper and recyclable materials are made available to private industries for collection and recycling at the greatest economic value and to the greatest extent feasible. The Department may execute multiple contracts as necessary for purposes including but not limited to serving other government entities and different geographic areas of the state. In addition to the preference provisions of Section 85.53 of this title, rules and regulations governing availability of recyclable materials shall give preference to private recyclable materials industries that operate in Oklahoma, and that will employ residents of the state to handle, transport and sort such materials;

5. The purchase of uncoated office paper and printed paper whenever practicable; and

6. Separating for the purpose of recycling all recyclable materials including but not limited to lead acid batteries, waste oil and major appliances that are generated as solid waste by state public entities.

B. All state public entities shall comply with the procedures and systems established pursuant to the Oklahoma State Recycling and Recycled Materials Procurement Act.

C. 1. The Director may exempt any single activity or facility of any state public entity from compliance with rules promulgated pursuant to the Oklahoma State Recycling and Recycled Materials Procurement Act if the Director determines there is a lack of market availability or that it is not economically feasible to follow and comply with the procedures and systems established by the Director.

2. The exemption shall be for a period not in excess of one (1) year, but additional exemptions may be granted for periods not to exceed one (1) year.

3. The Director shall make public all exemptions together with the reasons for granting such exemptions. (74-85.52)

Section 948. Requirements for State Public Entities.

A. It is the intent of the Legislature that all state public entities procure products or materials with the recycled content levels required or specified by rules promulgated pursuant to the provisions of this section when such products or materials are available.

B. By July 1, 1993, the Division when accepting bids for state purchases of supplies, equipment and materials shall give preference to the suppliers of paper products or products manufactured with recycled materials if:

1. The price for the recycled products and materials is not substantially higher than the price for nonrecycled products and materials. The Department of Central Services shall establish by rule the annual percentage over and above the price of nonrecycled products and materials which will be allowed for the purchase of recycled products and materials; and

2. The quality and grade requirements are otherwise comparable.

C. By July 1, 1993, any state public entity not subject to the Central Purchasing Act when accepting bids for purchases of supplies, equipment and materials, shall give preference to the suppliers of recycled paper products and products manufactured from recycled materials if:

1. The price for recycled products and materials is not substantially higher than the price for nonrecycled products and materials. The price paid for recycled products and materials shall not exceed the percentage over the price for nonrecycled products and materials established by the Department; and

2. The quality and grade requirements are otherwise comparable.

D. The Purchasing Division and any state public entity not subject to the Central Purchasing Act shall ensure, to the greatest extent economically practical and possible, that the recycled or recovered content of all paper purchased by the

Division or agency, measured as a proportion, by weight, of paper products purchased in a calendar year, is not less than the following:

1. By 1995, ten percent (10%) of all purchased paper;
2. By 1997, twenty-five percent (25%) of all purchased paper; and
3. By 1999, forty percent (40%) of all purchased paper.

E. 1. By July 1, 1993, the Division shall promulgate rules and implement a program for extending state procurement specifications to products manufactured with recycled materials and identifying recycled products.

2. By July 1, 1993, any state public entity not subject to the Central Purchasing Act shall implement a program for extending agency procurement specifications to products manufactured with recycled materials.

F. In writing specifications under this section, the Department and any other state public entity shall incorporate requirements relating to the recyclability and ultimate disposition of products and, wherever possible, shall write the specifications so as to minimize the amount of solid waste generated by the state. All specifications under this section shall discourage the purchase of single-use, disposable products and require, whenever practical, the purchase of multiple-use, durable products.

G. For materials that are not otherwise recycled, the Division and each state public entity not subject to the Central Purchasing Act shall, to the extent practicable, enter into agreements to purchase products made from recyclable materials from vendors who agree to purchase like materials separated from solid waste generated by the state for reuse or use as a raw material in manufacturing. **(74-85.53)**

Section 949. Miscellaneous Provisions.

A. The Purchasing Division shall review the procurement specifications currently used by the Department of Central Services in order to eliminate, wherever economically feasible, discrimination against the procurement of recycled paper and other products manufactured with recycled materials.

B. The Division shall establish purchasing practices which, to the maximum extent economically feasible, assure purchase of recycled paper products.

C. The Director of Central Services shall review and incorporate, where appropriate, guidelines published in the Federal Register.

D. The Director shall promulgate rules to encourage recycling and conservation of purchased products. **(74-85.54)**

Section 950. Management Practices and Annual Report.

A. Each state public entity whether or not subject to the Central Purchasing Act shall:

1. Be subject to the rules promulgated by the Purchasing Division regarding the purchase of recycled products;
2. Establish management practices in accordance with the provisions of the Oklahoma State Recycling and Recycled Materials Procurement Act;
3. Report by November 1 of each year to the Director of Central Services the following:
 - a. the total amount of waste paper and other recyclable materials sold during the previous fiscal year,
 - b. the amount of procured recycled paper products and other products manufactured with recycled materials, and
 - c. the total amount of monies collected and expended to implement the Oklahoma State Recycling and Recycled Materials Procurement Act; and

4. The Director shall coordinate the information provided by state public entities and report and submit such information to the Governor, the President Pro Tempore of the Senate, and to the Speaker of the House of Representatives on or before January 15 of each year.

B. It is the intention of the Legislature that all state public entities and other governmental subdivisions of this state aggressively pursue procurement practices that encourage solid waste reduction and development of markets for recyclable materials and compost and shall, whenever practical, procure products containing recycled materials. **(74-85.55)**

Section 951. Clearinghouse, Cooperative Buying and Uniform Specifications.

A. The Department of Central Services shall maintain a clearinghouse of information regarding products made from recycled paper products and products manufactured with recycled materials for purchase by state public entities. The clearinghouse shall include information concerning the availability, price and quality of products made from recycled paper products and products manufactured with recycled materials. The clearinghouse shall also include information concerning vendors and other persons willing to purchase recyclable materials from state public entities. The Department shall develop a mechanism to make this information available to all state public entities.

B. The Department may enter into agreements with purchasing agents of any other state, local governments, or the federal government under which any of the parties may agree to participate in, administer, sponsor or conduct purchasing transactions under a joint contract for the purchase of materials, supplies, equipment, permanent personal property, miscellaneous capital or contractual services consistent with this act.

C. The Department may cooperate with purchasing agents and other interested parties of any other state, local governments, or the federal government to develop uniform purchasing specifications on a regional or national level to facilitate cooperative interstate purchasing transactions. **(74-85.55a)**

APPENDIX E: Texas Recycling Mandates

RECYCLING AND WASTE MINIMIZATION PROGRAMS		
<i>Enabling Legislation: Senate Bill 1517, 71st Legislature; Senate Bill 1519, 71st Legislature; Senate Bill 1340, 72nd Legislature; Senate Bill 1051, 73rd Legislature; (All cites from Texas Health & Safety Code, V.A.C.S.)</i>		
Programs to Implement Mandates	Mandate	Description of Mandate
Recycling and Waste Minimization Assistance	§361.0151 (SB 1517) §361.422(a) (SB1340) (SB1051)	Requires the commission to establish and administer a waste minimization and recycling office that provides technical assistance to local governments concerning waste minimization and recycling. It is the state's goal to reduce by January 1, 1994, the amount of municipal solid waste disposed of in this state by at least 40 percent through source reduction and recycling.
Market Development Board	§361.423 (SB1340) (SB1051)	The chairman of the commission shall serve on the Recycling Market Development Board which is directed to provide technical assistance, establish a statewide strategy, identify incentives for market development, analyze potential markets, and a list of other initiatives.
Recycling Market Development	§361.0151(b) (SB1517)	The commission shall work in conjunction with the Texas Department of Commerce to pursue the development of markets for recycled materials, including composting products.
Composting Program	§361.428 (SB1340) (SB1051)	The commission shall put in place incentives for a composting program that is capable of achieving at least 15 percent reduction in the amount of the municipal solid waste stream that is disposed in landfills by January 1, 1994.
Composting Refund	§361.0135(a)-(f) (SB1051)	Plans for compost facilities must be submitted to the commission to be eligible for the compost refund. By September 1, 1999 the commission shall determine if compost markets still need the refund incentive.
TCEQ In-House Recycling • Agency P4 Team • P2 Week	§361.425 (SB1340)	Requires the commission to establish an in-house recycling program, evaluate the materials recycled, and establish educational and incentive programs to encourage maximum employee participation.
§361.426 (SB1340) §2155.445 - §2155.448		Requires state agencies to give preference to recycled products. State agencies shall give preference to recycled, remanufactured, or environmentally sensitive products, as those terms are defined by rule of the commission, in purchases made under this subtitle if the product meets state specifications regarding quantity and quality. Each state agency shall include in the report required by §2101.0115 (Annual Financial Report), the expenditures made during the preceding state fiscal year of recycled, remanufactured, or environmentally sensitive commodities or services.
Progress toward Reduction Goal (Rules)	§361.422(c) (SB1340)	The commission shall establish rules and reporting requirements through which progress toward achieving the established source reduction and recycling goals can be measured.
Specifications for Recycled Products (Rules)	§361.427 (SB1340)	The commission, in consultation with the State General Services Commission, shall promulgate rules to establish guidelines which specify the percent of the total content of a product which must consist of recycled material for the product to be a "recycled product."
Newsprint Recycling Program (Rules)	§361.430(c) (SB1340)	The commission shall promulgate rules and regulations which establish a newsprint recycling program for the state.
Composting Program (Rules & Standards)	§361.428(b) (SB1051)	The commission shall adopt rules establishing minimum standards and guidelines for the issuance of permits for processes or facilities that produce compost that is the product of material from the typical mixed solid waste stream generated by residential, institutional, commercial or industrial sources....the minimum standards must include end-product standards and a definition of beneficial reuse.
Recycling by Government Entities (Rules)	§361.425 (SB1340)	The commission shall adopt rules to administer mandated recycling programs by state agencies and governmental entities, including schools.
The commission shall exempt small school districts and cities from the requirement to establish an in-house recycling program if the commission finds that compliance is an economic hardship.		
State Solid Waste Plans	§361.020 (SB1519) (SB1051)	The commission shall develop a strategic state solid waste plan for all solid waste under its jurisdiction. The commission shall develop a strategic plan for the reduction of solid waste. Recycling related requirements include: • The plan shall reflect the state's preferred waste management methods as stated in Section 361.022 or 361.023. (1. Source reduction and waste minimization; 2. Reuse or recycling of waste). • The commission in developing a comprehensive statewide strategic plan shall consult with: (A) the agency's waste minimization, recycling, or reduction division; (B) the municipal solid waste management and resource recovery advisory council; (C) the pollution prevention advisory committee (SBEA coordinates PPAC)... The strategic plan shall be updated every four years beginning in 2000. The commission shall submit the comprehensive statewide strategic plan to the legislature on December 1 of each year.
Comprehensive MSW Management Strategic Plan	§361.0201 (SB1051)	The commission shall prepare a MSW Strategic Plan with the following recycling related requirements: • estimated amount of the total municipal solid waste to be recycled annually, according to previous rates and projected increases; • a goal for overall reduction in the amount of MSW consistent with Section 361.422 (related to the State Source Reduction and Recycling Goal); • the plan shall ensure that source reduction, reuse, recycling, composting, and resource recovery are all addressed; • the plan shall include a program of public education developed under Section 361.0202 (related to the development of education programs).
Office of Waste Exchange (Annual Report)	§361.0219(c) (SB1051)	Annually the office of waste exchange shall report to the legislature on progress (incorporated into OPPR Legislative Report).

APPENDIX F: Custodial Staff Interview

Interview Consent Form

Dear Oklahoma State University Associate,

As a member of the university and someone who is trained in solid waste removal, you are being invited to participate in an informal interview as part of the thesis research project titled, *Case Study on White Paper Recycling at Oklahoma State University*. Tricia Brown, M.S., will be the primary investigator; Lowell Caneday, Ph.D. is the thesis committee chair.

The interview will help me better understand the recycling procedures for the building you work in. Your participation and input are crucial to the success of this study. I emphasize that participation is voluntary and that you can discontinue the research activity at any time without penalty.

The interview will last approximately ten minutes. The records of this study will be kept private. All information and responses will be analyzed anonymously. Your participation will remain strictly confidential. The records of this study will be kept private and for a time of no more than one year. Any written results will discuss group findings and will not include information that will identify you. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. The interview questions do not necessarily represent the views of the researchers, Tricia Brown and Lowell Caneday, PhD., as the purpose is to understand your experiences with recycling at OSU. There are no known risks associated with this project that are greater than those ordinarily encountered in daily life. Benefits may include participants gaining a better awareness of their personal role in the recycling program at OSU, which may in turn foster a change in attitudes and behaviors regarding recycling.

If you have any questions or comments please contact the researcher Tricia Brown at tricia.brown@okstate.edu or by calling 405.496.3654. If you have questions about your rights as a research volunteer, you may contact Dr. Sue C. Jacobs, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

I thank you in advance for your participation.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy of this form has been given to me.

Signature of Participant

Date

I certify that I have personally explained this document before requesting that the participant sign it.

Signature of Researcher

Date

Interview Questions

1. How often do you pick up waste materials in your assigned area?
2. Where are the wastes picked up?
3. Do you separate waste materials into various types? What type of separation?
4. Where is white paper waste from your work area disposed?
5. Is white paper collected and deposited at a central collection point?
6. As far as you know, is there a university white paper recycling policy?
7. Have you received training on recycling?
8. Is recycling inconvenient? Why or why not?
9. What do you think is the ultimate fate of recycled white paper?
10. Do you think recycling is important at OSU?

APPENDIX G: Recycling Attitudes and Beliefs Survey (Jennings, 2004)

Section 1

The first two questions "dorm" and "floor" were to determine out the location of student recycling bins: "a single central recycling center in dorm" versus "a center on each floor."

1.Dorm- Are there recycling bins in your dorm?

2.Floor- Are there recycling bins on your floor?

Section 2

The next items 3-14 were measured using a likert scale: Strongly Agree, Agree, Disagree, Strongly Disagree.

3.Decide- It is easy to decide what to recycle at UConn

4.Want- I want to recycle more than I do now.

5.Recycling_bins- Recycling bins are easily located on campus

6.Recycling_info- Information about recycling at UConn would be useful for me

7.Diff_bins- I know what to put in each of the different recycling bins

8.What can I- I know what I can recycle at UConn

9.Recycle at Uconn- It is important to recycle at Uconn

10.Time- Recycling is time consuming

11.Easy- It is easy to recycle at UConn

12.Sort- I know how to sort my recyclables

13.Marked- Recycling bins on campus are clearly marked

14.Info- I have received enough information about recycling at UConn

Section 3

The next items 15-22 were measured using a likert scale: Always, Usually, Sometimes, Never (#15/#22 duplicated)

15.Redeem1 - I _____ redeem cans, bottles, and containers outside Uconn for money

16. Paper- I _____ recycle paper products and newspapers

17. Friends- My friends _____ recycle

18. Cans_bottles- I _____ recycle cans, bottles and glass

19. Staples- I _____ remove staples from paper products before I recycle them

20. Trash- I _____ put recyclables in the trash

21. Find_bin- I can _____ find a recycling bin at UConn when I want to recycle

APPENDIX H: Survey Cover Letter and Questionnaire (modified version)

Survey Cover Letter/Consent Form

Dear Oklahoma State University Associate,

As a member of the university and someone who utilizes office space and materials, you are being invited to participate in an online survey as part of the thesis research project titled, *Case Study on White Paper Recycling at Oklahoma State University*. Tricia Brown, M.S., will be the primary investigator; Lowell Caneday, Ph.D. is the thesis committee chair.

The survey will help me better understand the opinions and views of people like you about your experience and participation in recycling programs. Your participation and input are crucial to the success of this study. I emphasize that participation is voluntary and that you can discontinue the research activity at any time without penalty.

The survey should take no more than five minutes. All demographic information and responses will be analyzed anonymously. Your participation will remain strictly confidential. The records of this study will be kept private and for a time of no more than one year. Any written results will discuss group findings and will not include information that will identify you. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. This survey does not necessarily represent the views of the researchers, Tricia Brown and Lowell Caneday, Ph.D., as the purpose is to understand your opinions and attitudes. There are no known risks associated with this project that are greater than those ordinarily encountered in daily life. Benefits may include participants gaining a better awareness of their personal role in the recycling program at OSU, which may in turn foster a change in attitudes and behaviors regarding recycling.

In order to participate, please follow the link below, fill out the survey and electronically submit your responses. The survey Webpage will have instructions that guide you through the process. Surveys will be accepted until May 6, 2007. If you have any questions or comments please contact the researcher Tricia Brown at tricia.brown@okstate.edu or by calling 405.496.3654.

If you have questions about your rights as a research volunteer, you may contact Dr. Sue C. Jacobs, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

I thank you in advance for your participation.

I have read and fully understand the consent form. By completing the survey and clicking the submit button at the end, I have assented to participation in this study.

Survey of OSU Faculty, Staff and Graduate Student Knowledge, Attitude, and Behavior on Recycling (with observed frequencies)

For question 1, according to the scale below, *CHECK* the box that best describes your current level of recycling at home. Then for question 2, *CHECK* the box that best describes the level at which you believe you should recycle at home.

1. Please identify those items that you currently recycle at home.

	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes	Not Applicable
Aluminum cans	51	31	3	25	69	11
Cardboard	55	49	4	24	51	7
Paper	56	57	5	23	42	5
Newsprint	49	38	4	19	65	13
Containers (Plastic or glass)	56	48	5	21	55	5
Other	25	19	11	7	27	46

2. Please identify those items that you believe you should recycle at home.

	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes	Not Applicable
Aluminum cans	2	3	3	32	141	6
Cardboard	2	8	13	44	111	4
Paper	1	5	10	41	128	1
Newsprint	1	3	7	36	132	5
Containers (Plastic or glass)	1	6	9	37	132	2
Other	3	2	9	8	32	32

For question 3, according to the scale, *CHECK* the box that best describes your current level of recycling in your on-campus office. For question 4, *CHECK* the box that best describes the level at which you believe you should recycle in your on-campus office.

3. Please identify those items that you currently recycle in your on-campus office.

	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes	Not Applicable
Aluminum cans	35	37	8	28	52	24
Cardboard	46	64	12	14	18	21
Paper	13	7	4	39	117	7
Newsprint	42	51	9	13	32	30
Containers (Plastic or glass)	51	65	11	6	15	27
Other	9	7	6	3	7	41

4. Please identify those items that you believe you should recycle in your on-campus office.

	Absolutely Not	Probably Not	Neutral	Probably Yes	Absolutely Yes	Not Applicable
Aluminum cans	3	3	2	32	133	14
Cardboard	5	4	7	41	113	12
Paper	1	1	3	28	150	4
Newsprint	3	5	8	31	117	18
Containers (Plastic or glass)	3	9	12	36	106	19
Other	2	2	6	8	24	37

5. Please check the response that most closely matches your agreement or disagreement with each of the following items.

	Strongly agree	Agree	Disagree	Strongly disagree
It is easy to decide what to recycle at OSU.	26	80	66	15
I want to recycle more than I do now.	89	77	21	1
Recycling bins are easily located on campus	8	42	95	42
Information about recycling at OSU would be useful for me	61	103	20	3
I know what to put in each of the different recycling bins	30	83	61	12
I know what I can recycle at OSU.	11	37	111	29
It is important to recycle at OSU.	107	70	8	2
Recycling is time consuming.	15	68	83	21
It is easy to recycle at OSU.	9	46	97	35
I know how to sort my recyclable items.	39	93	51	5
Recycling bins on campus are clearly marked.	9	50	94	33
I have received enough information about recycling at OSU.	5	15	112	55

The following items assist us in identifying the characteristics of individuals with differing attitudes and behaviors. Please respond to each of the following. The information is not personally identifiable, but will be used in aggregate form only.

Please check Age Group

46	Less than 30 years of age
31	30 to 39 years of age
35	40 to 49 years of age
57	50 to 59 years of age
20	60 years of age or above

Please check Sex or gender

129	Female
60	Male

Please check Highest level of education achieved

4	High school diploma or less
9	Vo-tech or professional school
12	Some college
45	Baccalaureate degree
119	Graduate or post-graduate degree

Please	
check	Position classification
37	Student employee (work study, graduate assistant, etc.)
0	Technical trades
44	Classified staff
60	A & P
40	Faculty
5	Other:

Please	
check	Campus Office Location
74	Willard Hall
81	Whitehurst Hall
16	Colvin Recreation Center
16	Other

APPENDIX I: Open-ended Survey Responses

Q7. Please identify those items that you currently recycle at home.

reuse of styrofoam, since it is not recyclable
Recycle ink cartridges,
Printer cartridges
magazines, catalogs, etc.
tin, magazines,
magazines, catalogs
My family recycle everything - including things not included in the top 5 items
Electronic equipment, hazardous liquids
ink cartridges from my printer, tin cans, glass bottles, packing supplies
magazines, tin cans, whatever they'll take at HEW
tin cans
We do not have recycling service at our home.
tin cans
pop-tops on aluminum cans
tin
tin cans
Ink jet cartridges
I don't sort or recycle, however I know people dig through the trash to find items to get
the CRV \$
clothes, housewares are taken to the thirft store.
motor oil
Oil from car
Stillwater does not recycle. Much of the materials separated at home end up in the dump.
I live in the country, have no garage and no place to put stuff.
magazines
I recycle as much as I can
didn't mean to answer "other"
tin cans, whatever else the recycling drop off will accept
magazines
Motor oil, yard clippings
fabric from clothing to make other items such as bags, shorts , etc.
motor oil
metal cans, plastic bags, paper bags
metal cans. also organic waste via vermicompost bins
household items to habitat restore
fabric from clothing to make other items such as bags, shorts , etc.

Q14. Please identify those item that you believe you should recycle at home.

electronic
other: magazines, steel cans

Magazines
printer cartridges
magazines, catalogs, etc.
magazines, catalogs
My family recycle everything - including things not included in the top 5 items
electronic equipment, hazardous liquids
absolutely yes we should be recycling and reducing and reusing whatever items we can
tin, styrofoam, motor oil, plant materials
everything should be recycled
tin
TIN cans
ink jet cartridges
Other to me means anything that is recyclable should be.
Let other people dig and sort my trash
containers for glass, plastic, cardboard & papers
whatever the recycling drop off will accept
magazines
motor oil
Anything that can be in Oklahoma
metal containers and organic waste (food, paper plates, etc)
Habitat restore
Plastic in addition to #1 & #2

Q21. Please identify those items you currently recycle in your on- campus office.

printer cartridges
magazines, catalogs, etc.
magazines, catalogs
same as question 1. I put the white paper in the bin in the hallway and carry the rest home
Ink and toner cartridges
clothes, housewares are taken to the thirft store.
Used printer cartridges
toner/printer cartridges, laser printer parts (drum kit, etc)
File Folder, campus mail envelopes
toner and ink cartridges
Rarely recycle available in offices
ink cartridges, computers

Q28. Please identify those items that you believe you should recycle in your on-campus office.

packing peanuts (styrofoam) should be reused (a site would need to facilitate this)
oops! won't let me 'undo'
magazines, catalogs, etc.
Toner and Ink-Jet Cartridges

magazines, catalogs
all kinds of paper, not just white
There are no white paper recycling bins near the copy machines
We need drop-off spots for recycling
ink and toner cartridges
Other = same as previous answer. Anything that is recyclable should be recycled.
Question 5 - items - not the best
ink/toner
Used printer cartridges
toner and ink cartridges
Anything that can be recycled in Oklahoma
metal containers and food waste
many office items
printer cartridges

Q45. Position Classification

A & P and Instructor
Administrative Assistant
Education Specialist with NASA Contract
classified/student
Off-site employee

APPENDIX J: Institutional Review Board (IRB) Research Approval

Oklahoma State University Institutional Review Board

Date: Tuesday, April 03, 2007
IRS Application No: GU078
Proposal Title: Case Study on White Paper Recycling at Oklahoma State University

Reviewed and Processed as: Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 4/2/2008

Principal Investigator(s)

Patricia Brown
6000 N. McDonald Rd. Choctaw,
Lowell Caneday
184 Colvin Center
Stillwater, OK 74075
OK 73020

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR46.

~The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,



Sue C. Jacobs, Chair
Institutional Review Board

APPENDIX K: Oklahoma Recycling Markets/Companies

Paper (all grades)

G.P. Gypsum Corp.
Georgia-Pacific Corp.
H.E.W. Waste Recycling Inc.
Incor/Swap
Midland Recycling
Orchid Paper Products
Republic Paperboard
Waste Management

Plastic

Alpha Industrial Products
Incor/Swap
Midland Recycling
Waste Management

Glass

Anchor Glass Container Corp.
Ball Pipe & Supply
Brockway Glass Co., Inc.
Garvin County Community Center
Grand Lake Recycling
Incor/Swap
Midland Recycling
Pepsi Company
Ponca Iron & Metal Inc.
Quikservice Steel Co.
QuikService Steel Co. of Oklahoma City
Yaffe Iron & Metal Co., Inc.
Yaffe Metals

Aluminum

Amer-I-Can
American Recycling Center
American Sales Co.
Associated Recycling Inc.
B & B Auto Parts & Salvage
B & B Supply Co.
Ball Pipe & Supply
Borg Compressed Steel Corp.
Commercial Metals Company
Coors Recycling Centers, Inc.
Garvin County Community Center
IMCO Recycling Inc.
Incor/Swap
Interstate Metals Corp.
Lawton Recycling
Oklahoma Metal Processing Co.
Pepsi Company
Ponca Iron & Metal Inc.
Quikservice Steel Co.
QuikService Steel Co. of Oklahoma City
Razien Metal Co.
Recyclers of Oklahoma
Roberts Salvage Inc.
Scrap Corp.
Standard Iron & Metal
Wabash Alloys
Washita Pipe & Steel Co.
Wheeler Metals
Wise Recycling
Wise Recycling
Yaffe Iron & Metal Co., Inc.
Yaffe Metals

Steel

American Recycling Center
American Sales Co.
Interstate Metals Corp.
Midland Recycling

Tin

American Recycling Center
Associated Recycling Inc.
Ball Pipe & Supply
Borg Compressed Steel Corp.
Lawton Recycling
Midland Recycling
Ponca Iron & Metal Inc.
QuikService Steel Co. of Oklahoma City
Roberts Salvage Inc.
Washita Pipe & Steel Co.
Yaffe Iron & Metal Co., Inc.

Magazines

Midland Recycling
Waste Management

Newsprint

Glencoe Manufacturing Co.
Midland Recycling
Republic Paperboard
Waste Management
Western Fibers Inc.

Cardboard

Atlas Roofing
G.P. Gypsum Corp.
Midland Recycling
Republic Paperboard
Waste Management
Western Fibers Inc.
Weyerhaeuser Co.

Vita

Patricia Lynn Brown

Candidate for the Degree of

Master of Science

Thesis: CASE STUDY ON WHITE PAPER RECYCLING AT
OKLAHOMA STATE UNIVERSITY

Major Field: Environmental Science

Education: Bachelor of Science, Wildlife & Fisheries Ecology, Oklahoma State University,
Stillwater, Oklahoma, July 2004

Completed the Requirements for the Master of Science Degree, Environmental
Science at Oklahoma State University, July 2007

Experience: Research Assistant, Oklahoma State University, Stillwater, OK, September
2006-present

Graduate Assistant, OSU Center for Environmental Education, Stillwater, OK,
August 2004-May 2006

Teaching Assistant, OSU Zoology Department, Stillwater, OK
August 2004-July 2005

Field assistant, OSU Department of Wildlife & Fisheries, Stillwater, OK,
2004-'05 Fall & Spring Semesters

Field Assistant, OSU Department of Wildlife & Fisheries, Stillwater, OK,
August 2001-August 2002

Professional

Memberships: Oklahoma Association for Environmental Education (OKAEE), 2003-
present; OSU Society of Environmental Scientists (SES), August 2004-
present, *Treasurer* 2005-2006, *Vice President* 2006-2007

Name: Patricia L. Brown

Date of Degree: July 2007

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: Case Study on White Paper Recycling at
Oklahoma State University

Pages in Study: 101

Candidate for the Degree of Master of Science

Major Field: Environmental Science

Scope and Method of Study: The purpose of this study was to describe the state of the recycling program at Oklahoma State University, Stillwater campus. A waste stream analysis was conducted for 3 buildings on campus that represented distinct areas of waste generation: an academic building, an administrative support services building, and a mixed-use building. I focused on white paper for the analysis because of the goals and objectives outlined by the university, however, other recyclable materials in the waste stream were also considered. The waste stream analysis results were reported in weights and percent composition for each type of material found in each representative waste stream. In addition, this study includes an assessment of the knowledge, attitudes, and opinions of campus personnel regarding recycling and waste disposal. The survey population included 191 office occupants from the academic, administrative, and mixed-use buildings. Chi-square goodness-of-fit analyses were used to test the relationship between demographic variables and recycling knowledge, attitudes, and behaviors.

Findings and Conclusions: The percentages of white paper found in the representative waste streams were as follows: 32.53% of the academic building waste stream, 40.63% of the administrative building waste stream, and 8.1% of the mixed-use building waste stream. If all recyclable paper products were included in the calculations, the percentages in the representative waste streams were as follows: 55.5% of the academic building waste stream, 59% in the administrative building waste stream, and 25.8% of the mixed-use building waste stream. With an alpha of .05, the responses to the survey question regarding respondents' current newsprint recycling behaviors at home versus their educational level produced a chi-square probability of 0.021, indicating that as educational level increased, so did the reported behavior of recycling. Significant attitudinal responses observed for recycling at home included: aluminum ($p < .001$), plastic and glass containers ($p = .006$). Attitudinal responses for recycling on campus included: paper ($p < .001$), newsprint ($p < .001$), and plastic and glass containers ($p < .001$). As level of education increased, so did the reported pro-recycling attitudes.

Advisor's Approval _____ Dr. Lowell Caneday