

2010-2011

NORTH CAROLINA STATE UNIVERSITY

**ANNUAL
SUSTAINABILITY
REPORT**

TABLE OF CONTENTS

4

Letters

6

Introduction

9

*Academics
& Research*

12

*Community
& Culture*

16

Energy & Water

20

*Green
Development*

23

*Purchasing &
Waste Reduction*

25

Transportation

26

Events & Awards

28

Looking Forward

30

Acknowledgements

*"Man's mind, once stretched by a new idea,
never regains its original dimensions."
Oliver Wendell Holmes*

A NOTE FROM THE SUSTAINABILITY OFFICE



I come to work and when it's time to head home, I take a piece of inspiration with me, knowing the world is in good hands. I feel this way because, as a person who has been on NC State's campus for over 15 years as a student, employee, or affiliate, I see sustainability rapidly becoming part of our university's culture. Not a day goes by without learning of a new champion making real sustainable change on our campus.

NC State's sustainability program has several goals including resource efficiency, smart business practices, and metric driven decisions but the one that trumps them all is to incorporate sustainability into the university's culture. This culture change insures that sustainability is second nature to anyone who touches our campus. If sustainability is part of our culture and our daily lives, then each action

taken is viewed through a sustainability lens. For example, each new purchase made, patent secured, policy created, technology designed, trip taken, or learning experience contributes to sustainability. As a collective these sustainable steps become business as usual and are carried forward into our communities, lives, and careers. Sustainability becomes part of who we are as a community and eventually sustainability is the culture.

When my children are grown, I want them to look back and question something called a "sustainability movement." I want them look puzzled and say sustainability is a part of the thought process and that is the standard. Hopefully, my children will question what I and my colleagues did all those years because sustainability will be the culture. In working with campus champions, I see the vision of a sustainability culture change within reach; the tipping point is on the horizon.

A handwritten signature in black ink, appearing to read "Tracy Dixon", with a long horizontal line extending to the right.

TRACY DIXON

Director, University Sustainability Office

A LETTER FROM THE CAMPUS ENVIRONMENTAL SUSTAINABILITY TEAM



This year's Annual Sustainability Report recognizes the substantial advances that we are taking as a campus community to make sustainability an integral part of our educational and research mission, our campus culture, and our business decisions. CEST is proud to display these accomplishments in this annual report and to begin to use the report as a means to communicate annual progress towards our long term strategies.

We are pleased to share the news that the Sustainability Strategic Plan (SSP), *Foundation for Advancing Sustainability: A Strategic Plan for NC State University*, is complete. The SSP is the product of the NC State University community, including students, faculty members, and staff members. Members of the Board of Trustees discussed and endorsed the plan that Chancellor Randy Woodson formally accepted in June 2011.

The SSP provides critical support for two key, additional planning processes. On April 22, 2011, the Board of Trustees approved a new strategic plan for the University, *Pathway to the Future*. In addition, developing plans for strategic realignments is forming in response to budget adjustments. The SSP provides important approaches for both campus-wide strategic initiatives and supports the long-term development of the University.

The SSP provides a foundation as NC State University advances sustainability goals to guide the more effective use of energy, water, and other resources. The SSP addresses the immediate need to take actions to envision growing the intellectual and scholastic scope of the university while using fewer resources. The SSP also calls for enhancing the campus culture that invites students, faculty members, staff members, and university to work together to advance sustainability.

The hard work to form strategic sustainability goals now leads to further work to plan tactics and actions. Over the coming year, there will be opportunities to participate with the Campus Environmental Sustainability Team (CEST) as we further refine metrics, benchmarks, monitoring efforts, and investments to advance sustainability. We will also be moving to increase the sustainability content of the academic programs by engaging students in research projects that help guide decisions about use of energy and resources.

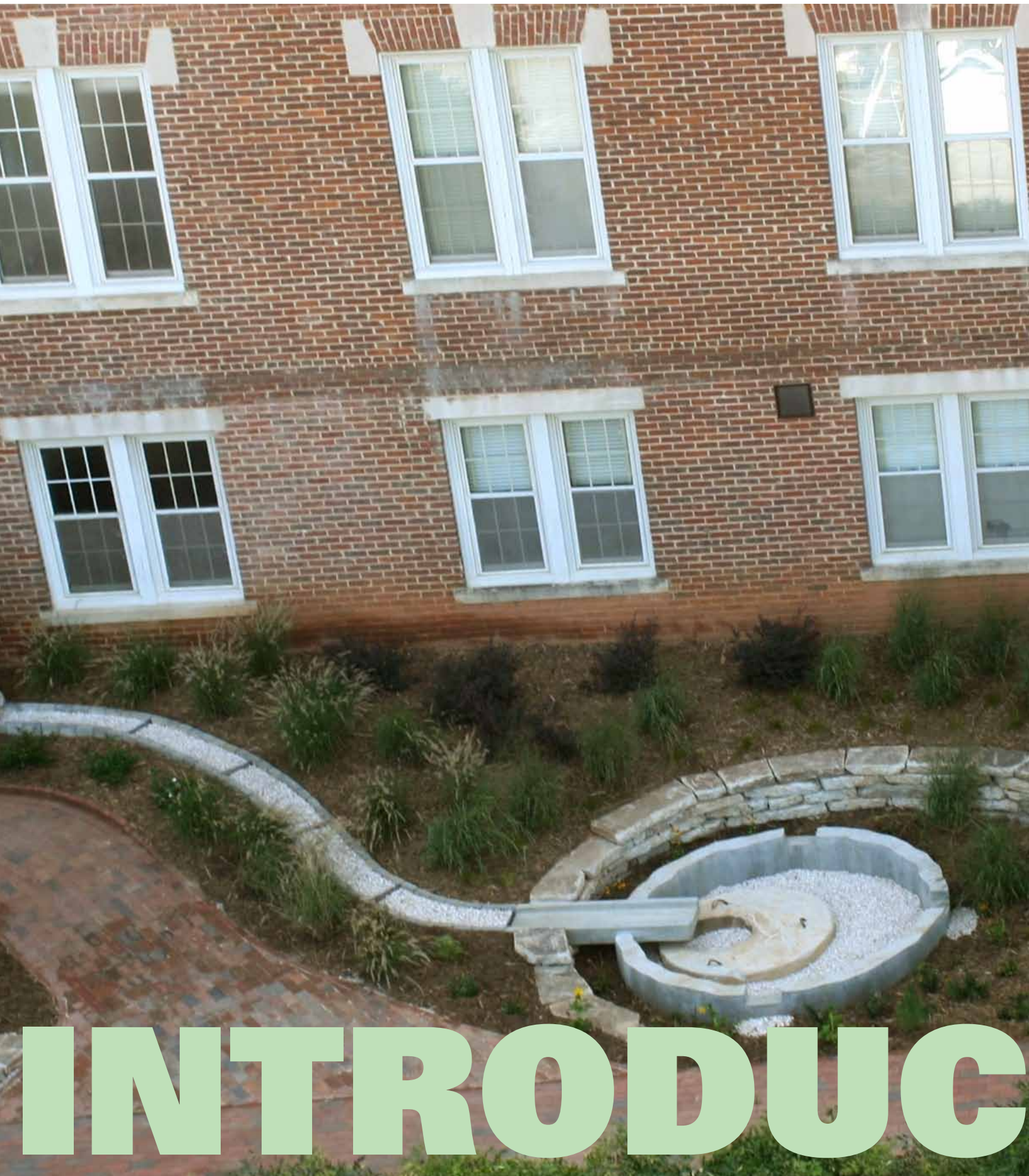
The SSP, and the work to develop tactics needed to advance sustainability, are just beginning. We hope you will join us, and others in the NC State University, who are engaged in the sustainability effort. The CEST is your most effective way to participate, and we invite your contributions and help us as we work to create a more efficient and sustainable NC State.

CEST asks for your participation in the celebration of our accomplishments by distributing this annual report and helping to engage the campus by encouraging support for advancing sustainability at NC State.



JACK K. COLBY,
Assistant Vice Chancellor for Facilities Operations
Co-Chair, Campus Environmental Sustainability Team

WILLIAM E. WINNER,
Professor, Department of Forestry and Environmental Resources
Director, Environmental Sciences Academic Program
Chair, University Energy Council
Co-Chair, Campus Environmental Sustainability Team



INTRODUC



Where is sustainability happening at NC State? The answer is everywhere. A concept once thought of as existing within a small community and having a finite scope is indeed growing and expanding each and every day. From operational efforts to increase efficiencies by staff to the growth and diversity of sustainability related academic programs to student initiatives to educate and involve others; sustainability is all around us.

The culture shift that will help create a sustainable community at NC State is underway. Each year, we see students coming to the university with not only an understanding of sustainability but experience in making it happen. We have staff on campus, taking it upon themselves to develop programs and projects to educate their peers about the importance of sustainability. Lastly, we see faculty members working hard to expose their students to sustainability initiatives and their impacts taking place right here on NC State's campus.

Chancellor Woodson's acceptance of the Sustainability Strategic Plan (SSP) is proof that we have the administrative support necessary to make the goals set forth in the plan a reality. Consistently, we are challenged by the university's leaders to develop innovative ways to be sustainable and use resources efficiently on our campus. The SSP sets the priorities for sustainability progress on campus while offering flexibility about how we reach those targets.

Each year it becomes more difficult to showcase sustainability progress through a report such as this that simply highlights projects and initiatives. The amount of activity is so great, that it is impossible to cover everything and do justice to the tremendous impact these efforts have on the campus. Thus, as successes grow, we too need to shift the method of tracking and reporting on the advancement of sustainability at NC State.

As the Campus Environmental Sustainability Team (CEST) works to establish the tactical steps needed to advance sustainability, it is more important than ever to accurately track and measure progress. Establishing a baseline of quantitative metrics will allow CEST to easily understand the impact of the tactics and where efforts need to occur moving forward. In future years, the format of this report will be modified to serve as the reporting mechanism for the previously mentioned metrics and activities.

Regardless of how success is measured, the advancement of sustainability at NC State is indeed being accomplished. Though there are many challenges ahead, with each achievement, knowledge is gained so that we can continue to make informed and impactful decisions. The community of people who contribute towards making a difference are not only shaping the university today but laying important foundations for future NC State communities to build upon.

ACADEMICS & RESEARCH

Exponential growth of the Environmental Science Academic Program

NSF GRANT FUNDS NC STATE RESEARCH ON PREDICTING EFFECTS OF CLIMATE CHANGE

North Carolina State University researchers are part of a major new research initiative from the National Science Foundation (NSF) aiming to improve climate scientists' ability to predict potential consequences of climate change. The research will focus on improving the ability to predict hurricanes and precipitation patterns.

A five-year, \$10 million NSF Expedition grant, "Understanding Climate Change: A Data Driven Approach," aims to advance climate science by taking advantage of the wealth of climate data collected by satellites, ground-based sensors and physics-based climate simulations. The grant, which is being led by Professor Vipin Kumar from the University of Minnesota, includes \$1.8 million in funding for work that will be performed at NC State by Drs. Fred Semazzi and Nagiza Samatova.

Dr. Semazzi's goal is to develop a new, more sophisticated, approach to Atlantic hurricane prediction. The new approach "will be based on a combination of the application of highly efficient high-performance computer algorithms, data-mining methods, data fusion and signal detection processing techniques to isolate the triggers for the development of Atlantic hurricanes," Semazzi explains.

Dr. Samatova, an associate professor of computer science at NC State and joint faculty appointee at Oak Ridge National Laboratory, will be developing high performance data analytics algorithms and tools that ideally will be able to improve the accuracy and detail of climate forecasts. Specifically, Dr. Samatova will be developing software that can be used to model the climate system as a complex and dynamic network.

"We also hope to tap into high-performance computing technologies to improve the response time for these climate models," Samatova says. "This should allow climate researchers to analyze data, and explore more hypotheses, much more quickly."

**Modified from an article written by Matt Shipman with NC State News Services*

LEARNING + SERVING = SUCCESS

When you mix meaningful service in the community with experiences related to course curriculum, a powerful learning tool is created. Service learning offers students a variety of opportunities to grow in their community involvement while examining their experiences, related to specific learning outcomes. Several faculty members in the NC State Department of Forestry and Environmental Resources have led their students through service learning experiences with significant positive outcomes. Examples of student work include:

- + Removing invasive species and planting native species
- + Assembling and evaluating information available about Lake Raleigh Woods, surveying faculty members about actual and potential use of the preserve, and investigating several questions and critical issues
- + Developing a natural resource inventory of property along Swift Creek in collaboration with Wake County Parks, Recreation, and Open Space
- + Working with elementary and middle school students to teach them about forestry measurements and environmental education
- + Collecting trash, recyclables, tires and other materials washed downstream from the Richlands Creek watershed

PARTNERS IN PRESERVATION: STUDENTS & FACULTY JOIN WAKE COUNTY FOR LEARNING AND STEWARDSHIP

In fall 2010, a handful of College of Natural Resources students and faculty traveled to eastern Wake County to learn about Piedmont prairies and help remove invasive, exotic plant species as part of a prairie restoration project. Staff from Wake County's Division of Parks, Recreation, and Open Space joined them at the county-owned area of 220 acres that is slated to become the first WakeNature Preserve later this year.

The WakeNature Preserves Partnership is co-chaired by College of Natural Resources faculty members George Hess and Toddi Steelman. The partnership brings together NC State faculty and students, and natural resource and park system professionals from various state, county, municipal, and non-profit agencies. Their goal is to identify and steward the finest natural areas in Wake County for everyone to enjoy.

CMAST SHARES \$4.6 MILLION IN GREEN BUSINESS FUND AWARDS FOR RENEWABLES & ENERGY EFFICIENCY PROJECTS

North Carolina Commerce Secretary Keith Crisco announced this spring that NC State's Center for Marine Science and Technologies (CMAST) would be one of 16 small businesses and organizations across the state that will receive awards from the North Carolina Green Business Fund, totaling \$4,580,686.45. These projects will result in a total of approximately 35 jobs being created or retained.



Students learn about invasive and exotic species at WakeNature Preserve

The CMAST project will receive \$228,519 in funding to install and demonstrate a small hybrid photovoltaic-wind system to power pumps and heat water for application to the state's growing aquaculture industry. Projected energy generation is 21,500 kilowatt hours annually, which will be used to offset energy usage at the Marine Aquaculture Research Center facility in Carteret County.

"Encouraging investments in the green economy is a centerpiece of our job creation strategy," Secretary Crisco said in an April announcement. "This fast growing industry holds vast potential for the future and we must continue to support its development in North Carolina."

**Excerpts from a media release by the College of Physical and Mathematical Sciences*

STUDENTS DESIGN & INSTALL A RAIN GARDEN AT SYME RESIDENCE HALL



The rain garden at Syme utilizes a cistern to store the collected rain water.

construction.

The project was honored with several awards including a 2011 Environmental Award for Institutional Innovation from the City of Raleigh and a 2011 Tri-State American Society of Landscape Architects Award of Merit while Mr. Fox was honored with the 2011 Earthwise Award for a faculty member.

ENVIRONMENTAL SCIENCE ACADEMIC PROGRAM ENROLLMENT INCREASES

NC State rolled out a revised Environmental Sciences (ES) Academic Program in the fall of 2010. The revised program includes new curricula for an ES major and minor, and seven new courses.

The program experienced tremendous growth during the past academic year, reflecting an intense interest from students and faculty members. The interest is consistent with the commitment of advancing sustainability across all missions of the university. There are 75 students enrolled in the revised ES degree, with new students continuously asking about the program. In fall 2011, the first students will graduate with the revised ES degree. About 40 students are in the revised ES minor.

ES ACADEMIC PROGRAM ENROLLMENT

	ES 100	ES 200	ES 300
Fall 2010	70	53	19
Spring 2011	95	84	31
Fall 2011	347	447	78

Students enroll in the ES Academic Program to prepare for a future that includes social and economic growth while using less energy and fewer natural resources. As students enroll in courses, and graduate, they will be prepared for roles as leaders and citizens who understand the need to advance sustainability.

NC STATE RECEIVES \$3.67 MILLION GRANT TO EXAMINE EFFECT OF CLIMATE CHANGE ON SOUTHERN LOBLOLLY PINES

NC State is part of a team of 12 institutions across the southeastern US selected by the Department of Agriculture’s National Institute of Food and Agriculture to establish a regional network to monitor the effects of climate change on southern pine trees. The goal is to use the information to develop new management methods and varieties of pines to help southeastern pine forests adapt to changes in climate.

Researchers will study climate change mitigation and adaptation as it relates to southern pines, particularly loblolly pine, which comprises 80 percent of the planted forestland in the southeast. NC State researchers, led by Dr. Ross Whetten, associate professor of forestry, will participate in establishing the monitoring network to collect information on response to climate change, examining the genetics of pine to learn how the trees grow and respond to temperature and rainfall, and measuring the nutrients the trees take in from and release into the atmosphere and soil.

Dr. Ryan Boyles, assistant professor of marine, earth and atmospheric sciences and state climatologist, will also play a key role in coordinating state climatologists with forestry extension personnel to engage land managers across the region.

By the study’s conclusion, researchers hope to develop a computer model that incorporates climate variables – like temperature, rainfall and other factors – to predict forest productivity under different climate conditions. They also want to identify new varieties of loblolly pine, and new management techniques for existing pine plantations, that will allow plantations to better tolerate predicted climate change.

The overall grant, a \$20 million, five-year project, will be led by Dr. Tim Martin at the University of Florida. NC State will receive \$3.67 million to perform its research, education and outreach activities.

MAKING STRIDES TOWARDS A SMARTER GRID

The Future Renewable Electric Energy Delivery Management (FREEDM) Systems Center is a National Science Foundation Engineering Research Center located on Centennial Campus that includes the Advanced Transportation Energy Center (ATEC), an electric drive transportation research organization. The center made many strides in its research on the Smart Grid and the devices required to transform our current grid into an “energy internet.”

The center received strong support from its industry partners, some of whom provided significant infrastructure upgrades during FY 2010-2011. A 40 kW solar photovoltaic array was installed on the roof of the center, and a 20 kilowatt hour energy storage device was also installed to increase the use of the solar array. Researchers developed the prototype solid state transformer; this device will enable the standard utility transformer that we all recognize as a green box in the yard, or a grey canister on a utility pole, to act as a router for energy and enable the use and control of distributed renewable energy, energy storage, and energy saving smart devices.

The parking deck at the center has 10 charging station ports, and two electric vehicle charging stations were donated by industry partners and installed at the center. Researchers at ATEC also completed restoration of a Chevy S-10 Electric Truck with 55 miles of range.



Students lodged at a remote rain forest field station while assisting researchers and studying local ecology.

COMMUNITY & CULTURE

Imbedding sustainability in the NC State experience

SUSTAINABILITY AND SERVICE IN COSTA RICA

The University Sustainability Office partnered with the Center for Student Leadership, Ethics, and Public Service (CSLEPS) to establish a new, sustainability-focused Alternative Service Break (ASB) trip to Costa Rica. The trip's main focus was on the sustainability and conservation of protected lands in Central America.

During the experience, students had the opportunity to learn about environmental education, ecotourism, conservation of natural resources, and the sustainability of the rainforest. Students also participated in service projects, such as working with students to paint a mural at a local school. Additionally, the group helped build a biodigester for a family in the nearby community. The biodigester, which was made entirely of recycled materials, captures methane from animal waste to be used for cooking. Partner organizations included the Tirimbina Rainforest Center, located in Sarapiquí and EARTH University, located in Guácimo.

The trip is now part of the annual Alternative Service Break program and a new group of students will travel to Costa Rica in March 2012.

COLLABORATIVE ENERGY FELLOWSHIPS ON CAMPUS

In the fall of 2010, NC State Energy Management was awarded a grant to fund 10 new positions. The funding was secured through the US Department of Energy, and the American Recovery and Reinvestment Act (ARRA) and supports the project until April 2012.

The 10 fellows are split into pairs, each team working with one of five campus-related sponsor organizations: Energy Management, University Sustainability Office, NC Solar Center, FREEDM Systems Center, and Advanced Energy. Two of the fellows are working with Energy Management analyzing data, identifying opportunities for energy conservation measures (ECMs), and providing outreach efforts for the unit. The University Sustainability Office team is developing a strategy for renewable energy at NC State, creating case studies for current and past ECMs, and making connections throughout the campus community to affect real behavior change at NC State. The NC Solar Center team is focusing on clean transportation (electric vehicles, biofuels, etc.), Science, Technology, Engineering,

and Mathematics (STEM) Education, and Green Research for Incorporating Data in the Classroom (GRIDc). The FREEDM Systems Center team is working on projects focused on clean transportation, renewable energy integration, and smart grid systems. The team at Advanced Energy is performing building energy audits, energy-related regional planning, and technical assistance for energy programs across the North Carolina.

Together, the fellows are working on three large-scale group projects to be completed by April 2012. The projects were chosen through discussion among the five partner groups and all will have a significant impact on NC State's campus energy consumption, research, and outreach long after the projects are completed. The projects include a plan for Centennial Campus Smart Grid, Effective Sustainability Outreach Materials and a Statewide Alternative Fuels and Advanced Vehicle Technology tracking system.

NC STATE ATHLETICS: TRAINING FOR A SUSTAINABLE FUTURE

NC State Athletics is ready to lead the pack in making sports sustainable. In order to plan strategically for how to implement sustainability within athletics, a group of representatives from the Athletics department, Waste Reduction and Recycling, Parks Recreation and Tourism Management and the University Sustainability Office meet regularly to discuss initiatives. To date the group has coordinated getting sustainability information onto gopack.com as well as assisted with greening the Big Event and a spring 2011 baseball game. Future plans include additional greening of sporting events, getting athletes involved and other initiatives to educate and outreach to Wolfpack fans about sustainability.

Sustainability is not a new concept to the Wolfpack. The athletic facilities and grounds are making great strides towards being more sustainable. Examples include upgrades to building envelope and infrastructure, lighting, water conservation, energy efficiency, recycling, HVAC automation, space use and allocation. Plans are also underway to include an orientation curriculum for new athletes and coaches. The WE Recycle program, at Carter-Finley stadium started in 2003 as one of the nation's first, and most successful, football game day recycling programs. WE Recycle collects nearly 20 tons of recyclables at every home game.

GREEN LIVING GUIDE OFFERS A MENU OF SUSTAINABLE TIPS

Together with University Housing, the University Sustainability Office launched a guide in the summer of 2011 that

offers students information, resources and tips on how to live sustainably on campus. The guide includes the following topic areas: Live, Play, Eat, Study, Shop, Get Around and Get Involved. Organized in a menu style, the guide is an interactive online document that allows students to read the basic information or click on links to learn more. Sustainable food options, energy saving tips, alternative transportation, recreation options and ways to get involved with sustainability on campus are only a few of the great topics covered in the guide. In 2009, Janet Hudson's English 332 class worked with the to research and develop the content for the guide. The Green Living Guide will be periodically updated and future plans include a fully interactive website.



Students kayaking at North Carolina's Outer Banks.

WOLFPACK BOUND PROGRAM GETS FRESHMAN OUTDOORS

In the summer of 2010, the Outdoor Adventures Office of University Recreation started a program called Wolfpack Bound. The program is for incoming freshman, and offers an outdoor adventures-themed complement to the traditional NC State new student orientation. The program offers students an opportunity to interact with other incoming freshmen, network with faculty and staff, and learn outdoor

skills in the beautiful mountains of North Carolina and Virginia or the Outer Banks of North Carolina. Throughout the experience, students will be challenged both physically and mentally.

Not only do students have a meaningful, cohort experience, research shows that students who attend wilderness freshmen orientations adjusted better to college life and had higher retention rates and were more involved in extracurricular activities than control groups.

The learning outcomes of the program include:

- + Development of a sense of community within University Recreation and the NC State community.
- + Development of lasting and supportive relationships with other students, faculty and staff.
- + Learning about and development their leadership efficacy.
- + Identification of North Carolina outdoor resources.
- + Development of goal setting skills that are transferable to their academic and daily lives.

CAMPUS SUSTAINABILITY TOUR HIGHLIGHTS GREEN LOCATIONS AT NC STATE

The Campus Sustainability Tour, sponsored by the University Sustainability Office and Transportation, was launched this year to highlight many of the sustainable elements of campus. The tour offers two loops and gives participants walking and biking times for main and Centennial campuses as well as tips for using the Wolfline bus system for the tour. The main campus loop is two miles and takes roughly 40 minutes to walk. Stops include the LED lit Dan Allen Parking Deck, the restored Rocky Branch and the NC Solar House. The Centennial Campus Challenge is close to three miles and takes an hour to complete by foot. Stops include the Lonnie Poole Golf Course, the NC Wildlife Resources Commission building and Lake Raleigh. Download a PDF of the Campus Sustainability Tour on the new sustainability website or stop by the E. Carroll Joyner Visitor Center to pick up a hard copy.

CERTIFIED WOLFPACK GREEN PROGRAM OFFERS SUSTAINABLE EVENT RESOURCES

The goal of Certified Wolfpack Green is to further sustainability at NC State by providing helpful information and encouragement for campus entities to institute sustainable practices. Plans for the program are to have a certification in each of the following categories: events, workplace and labs. A campus entity will earn points for adopting, or completing, sustainable practices which will be applied to one of the following certification levels: Contributor, Steward or Champion.

Many campus organizations have been taking strides to green their events. It was in part through their inspiration and encouragement that the University Sustainability Office decided to create a more formal process for recognition of these efforts. A green events certification offers campus events the opportunity to be more sustainable and provides a way for both the host group as well as the program to promote the accomplishments of campus. The certification levels allow for recognition across many areas and regardless of event type. The Green Events Certification criteria includes the following categories: food, waste, purchasing, education, marketing, transportation, energy and water, service, innovation. The certification process utilizes a simple, online form and provides the event planner with information and resources on how to make their event sustainable. The program launched in the summer of 2011 and measures are being taken to incorporate this certification into many of the campus event planning processes.

STUDENT SUSTAINABILITY WORKSHOPS CREATE SYNERGY

In September, 2010 the Sustainability Commission of Student Government launched quarterly workshops for sustainability focused student groups. More than 20 groups, ranging from Net Impact to the Leopold Wildlife Club, were asked to send one representative to attend sessions that featured a speaker from a campus department presenting on their sustainability efforts.

The impetus of the workshops was to gather the many different student groups working on sustainability issues in the same room to gain a better understanding of the events or actions in which each club was engaged. Calls for volunteers were heard, partnerships were built and a greater knowledge of the true breadth of efforts happening on campus was gleaned.

Due to their success, the workshops will continue to be a function of the Commission in future years. Commission members also developed a private Facebook group so the club representatives can keep in touch between workshops dates.

CHANGE YOUR STATE CAMPAIGN TARGETS BEHAVIOR CHANGE

Launched in the 2010-2011 academic year, the intention of the Change Your State (CYS) is to change behavior on campus. The program is designed to be scalable with the ability to change the focus area once the goal of a particular campaign has been achieved.

The university faces a great challenge with energy consumption and thus the first behavior is energy conservation. By using community-based social marketing techniques, the program strives to achieve a five percent reduction of electricity. To this end, a web site was launched to provide energy tips, news and information on projects happening on campus. As a part of the campaign, more than 400 fume hoods, a large source of energy waste and greenhouse gas emissions, received 'Shut the Sash' stickers. In a similar effort to call attention to steps individuals can take to save energy, 'Hit the Switch' stickers were placed above light switch plates throughout main campus. Centennial Campus and all residence halls will receive 'Hit the Switch' stickers in the 2011-2012 school year.

Change Your State was proposed by a group of students in Lynn Ennis' Masters of Business Administration Creativity Class. Energy Management and the University Sustainability Office asked groups to develop a scalable energy awareness campaign for NC State. The Community and Culture working group of the Campus Environmental Sustainability Team then incorporated the best ideas into the CYS behavior change campaign.

ENERGY & WATER

Five percent reduction in campus energy usage over the last year

METERING IS THE FIRST STEP TO ENERGY CONSERVATION

Utility metering at NC State is going through a major change. Smart grid technology will revolutionize how utility distribution systems are operated resulting in significant energy conservation. A smart meter is a two-way telecommunication enabled electrical meter, but it can also refer to any network connected device measuring and reporting any type of utility consumption.

Energy Management is developing and deploying a long-range plan to install smart meters throughout campus. This will allow Energy Management and the campus community to have real-time access to energy consumption data. Analysis of this data enables us to identify and solve distribution problems faster. The promise of smart metering technology enables real-time pricing of utilities based on peak demand; thereby, greatly reducing energy consumption and cost.

ENERGY DASHBOARD PROVIDES ACCESS TO REAL-TIME ENERGY CONSUMPTION

NC State Energy Management is evaluating options for a campus-wide energy dashboard. An energy dashboard helps building occupants be more aware of how utilities are being consumed by a building. The dashboard will provide the campus

community and energy managers with real-time and historic utility data for the buildings where network access is available. The software can perform standard energy calculations and convert it to greenhouse gas emissions released or avoided. The data can also be customized to show other meaningful information such as how many forest trees are saved or planted, or how many cars are taken off the road. The dashboard will provide instantaneous information about the energy use of the campus buildings and whether, or not, they are operating above, or below, a set of defined parameters. The energy dashboard will also enable benchmarking and automated comparisons between buildings and periods of time. The system will provide visual energy usage feedback and inform building occupants about energy efficiency on an effective personal scale. The dashboard will display the data in a user-friendly format so that the data can be reviewed by Energy Management personnel and presented to the campus community during educational activities.

PEAK SHAVING MANAGES ENERGY CONSUMPTION AND CUTS ENERGY COSTS

Peak shaving is a method to reduce energy costs by lowering consumption during the peak time of the day, when electric rates are the highest. NC State is implementing a Peak Shaving Initiative Program to help reduce peak demand of electrical use

during Progress Energy Carolinas, Inc. (PEC) specified peak hours. The peak shaving initiative is conducted during a specific time frame, usually during the months of October to April from 11:15 a.m. to 1:00 p.m. and from 3:30 p.m. to 6:00 p.m. This is done when the outside air temperature is the highest during a billing cycle. NC State can save as much as \$20-75,000 per month by decreasing the peak demand during the warmest days of the month.

On the day of a peak-shaving event, building operators turn off unnecessary lights in all campus buildings and raise the discharge air temperature set points for the HVAC units, thereby reducing energy consumption. The campus community is also notified to think about reducing its energy consumption, especially the lab users, who are asked to keep all non-essential fume hood sashes closed.

The peak shaving event is a coordinated effort between the building mechanical systems and the Central Utility Plants. Once peak shaving is completed, the plants and buildings return to normal operation. During the fiscal year 2010/2011, the university saved more than \$135,000 in electricity costs for the months of October 2010 through April 2011.

SOLAR PHOTOVOLTAIC SYSTEM GENERATES BUZZ ON CENTENNIAL CAMPUS

The 40 kW rooftop solar system at the Keystone Science Building on Centennial Campus took three weeks to install, and is forecasted to generate around 52,000 kWh of energy for the building annually. The entire solar system consists of 186 photovoltaic (PV) modules and four solar inverters. The solar inverters transition the direct current (DC) to alternating current (AC) for immediate use throughout the building and for specific research projects. In addition, the installation incorporates a monitoring system to feed real-time energy generation data to the FREEDM Systems Center engineers within the building.

Future large-scale deployment of solar energy and distributed energy generation within the campus energy grid will reduce the overall cost of operating the university, while making NC State less dependent on fossil fuels, and reducing our carbon footprint.

PARTNERSHIPS TO CUT WASTE IN CAMPUS LABS

As a world-class research campus, NC State has many different types of laboratories across campus. In order to do quality



Students benefit from hands on learning about solar technology.

research, specialized equipment is needed. This equipment often is a high energy user, causing the labs on campus to be “energy hogs.” Ultra-Low Freezers (UTL), freezers that reach temperatures of -86° Celsius, -123° Fahrenheit, are one of the biggest energy users in labs. Each unit uses around 20 kWh of energy per day, or as much energy as an average house uses in a day.

Because UTL freezers use so much energy, it is necessary to track and manage their installation on campus. Energy Management is conducting a survey to determine how many UTLs there are on campus as well as their condition, age, and to ensure they are being utilized properly. When the survey is complete, Energy Management will determine the oldest and worst condition freezers and discuss how they may be replaced with more energy efficient units. A rebate program for labs that replace or eliminate old UTL freezers with energy efficient ones is being considered. Ultimately, the goal of this project is to work hand-in-hand with researchers to ensure they are able to accomplish their goals in tandem with those of the university, and to affect behavior change through energy awareness and education.

ENERGY DETECTIVES UNCOVER CLUES TO BIG ENERGY SAVINGS

In June 2011, a team consisting of one energy manager and two energy analysts were charged with identifying and reporting energy savings opportunities at NC State. The positions are funded through the American Recovery and Reinvestment Act (ARRA) through the University of North Carolina General Administration in Chapel Hill. To date, the team has found savings on Centennial



A solar thermal system was installed on the roof of Carmichael gymnasium.

Campus that add up to more than \$80,000 with a simple payback of less than one year in most cases. The team will continue searching for opportunities across the university armed with temperature sensors, light meters, binoculars, and laptops to calculate all of the savings. The hunt continues through March 2012, when they hope to have completed more than 50 detailed energy audits, outlining savings through temperature set backs, lighting upgrades, operational changes, building automation scheduling, and equipment utilization enhancements that will save the university 10-15 percent in energy consumption on Centennial, main, and Centennial Biomedical campuses.

CNR RECEIVES ARRA GRANT FOR ENERGY INTERNSHIP & FELLOWSHIP PROGRAM

The College of Natural Resources (CNR) at NC State placed 42 students in green energy internships and fellowships using a \$435,481 American Recovery and Reinvestment Act grant

administered through the NC State Energy Office. Students worked in 16 counties in North Carolina for a total of 21 host organizations between the 2011 spring and summer terms. One of the fellows developed a renewable energy database with analysis tools and another created the web interface for the database to help facilitate economic growth within the renewable energy industry sector of North Carolina. Over the summer, ten students worked with the Cooperative Extension Service (CES) in eight different counties—Craven, Davidson, Franklin, Greene, Hertford, Onslow, Warren and Wilson. Interns in these counties assisted CES' efforts to educate the community about ways to increase energy efficiency within homes and businesses and integrate renewable energy there as well. Throughout the summer, interns gave presentations for a variety of groups including children, seniors, farmers, and low-income families on specific ways that each group can be more energy efficient. Companies such as SAS, HandCrafted Homes, Timberline, Jordan Lumber,

and Owens-Illinois used the energy interns to find ways to make their plants and facilities more energy efficient.

VIRTUAL COMPUTING LAB PROVIDES INCREASED ACCESS & DECREASED ENERGY USE

The Office of Information Technology (OIT) is getting greener. OIT is working with others to shape strategies and actions that will make a real difference to NC State's climate impact and sustainability commitments. One of its green initiatives is the Center for Virtual Computing Lab (VCL).

Leading-edge technology, the VCL provides a remote access service that allows users to reserve a computer with a desired set of applications and remotely access it over the Internet from any location. The program currently offers more than 500 24 hour a day, seven days a week virtual lab computers for campus and distance education users. Harnessing the power of cloud computing, the VCL helps the campus environment by reducing power consumption in physical labs and the need for travel, while expanding the availability of NC State's high-end educational resources around the state and world. During fiscal year 2010-11, the VCL service has had more than 12,514 unique users and 192,208

reservations with more than 532,564 hours used.

The VCL, itself, is energy efficient. It is based on high performance computing blade servers, which are designed to be more energy efficient in terms of space, power and cooling than the standard rack servers.

A joint venture of the College of Engineering (COE) and the Office of Information Technology (OIT), the NC State's VCL software is now being shared with other schools as an Apache Software Foundation open source incubator project. With the ongoing support from the COE, OIT, academic and corporate partners, the VCL successfully supports a wide range of users with diverse computing needs.

SOLAR SYSTEM HEATS UP CARMICHAEL GYMNASIUM

A solar thermal system was installed on the roof of Carmichael Gymnasium as a part of the 13-Building Energy Performance Contract project. Southern Energy Management of Morrisville installed the solar thermal project. The system features 112 solar thermal panels, each measuring 10 feet by four feet. The system pre-heats the potable water for showers and locker room use, as well as assists heating water in the competition swimming pools.

Cold water is pumped up to the roof where it cycles through the installed solar panels. Solar energy warms the water and circulates it to the boiler room, where a heat exchanger supplements the boiler, reducing the natural gas consumption required to heat the water in the competition pool.

The system heating the pool works largely in the same way. Pool water is pumped to the roof where it is warmed by the sun. The warm water is delivered to the pool equipment room where it supplements the pools heating system. The solar thermal system heats water to about 100 degrees as it is circulated onto the roof and piped through the solar equipment. In the pools, the water temperature is regulated at about 80 degrees. The system circulates about 70 gallons of water a minute, or 100,800 gallons a day, and takes more than a week to circulate all the water in both pools.

COMBINED HEAT AND POWER SYSTEM ON CAMPUS IN 2012

NC State broke ground on a Combined Heat and Power (CHP) system to be installed in the Cates Utility Plant as part of an energy performance contract. The CHP system, also called cogeneration, is expected to pay for itself over 17 years. The system will be installed as a component of the renovation to the existing Cates Central Utility Plant and is expected to be complete in April 2012.

CHP systems save energy and money through capture and use of the waste heat produced by the gas-fired electric generation turbines. Traditional power plants lose 60 percent of their energy from the fuel it burns to waste heat, a CHP system recovers this waste heat and uses it to generate steam, which is then delivered to campus for heating needs. The renovation to Cates Utility Plant will increase NC State's electrical and steam system efficiency by 35 percent.

In January 2011, NC State University signed a \$60 million energy performance contract with Ameresco Inc. of Framingham, MA, to complete the renovations. Ameresco guaranteed \$4.3 million of savings in the first year alone after the project has been completed. The renovation will install two 5.5 megawatt combustion turbines and 50,000 PPH (pound per hour) heat recovery steam generators.

GREEN DEVELOPMENT

10 Leadership in Energy and Environmental Design (LEED) projects in process

SUSTAINABILITY FROM THE START

Each major building project on campus starts with sustainability in mind. Included in each project's scope is how the building and site will be a model of environmental, social, and economic sustainability and have a positive impact on the campus and surrounding community. Projects state they will practice sustainability principles such as total life cycle costs, integrated design process, including measurement and verification and commissioning, educating and involving residents and visitors, and maximizing and improving existing natural areas of the site. Including the importance of sustainability in the scope sets the expectation that sustainability is among the key criteria for how decisions are made.

TAKING ANOTHER LOOK AT BUILDINGS HELPS SAVE ENERGY

Retro-commissioning (RCx) evaluates and adjusts existing buildings' HVAC systems to make them perform the way they are currently being used, not necessarily how they were originally designed. The process identifies operational and maintenance improvements in buildings and ensures that each mechanical system, alone or collectively, achieves optimal performance. The RCx process is an essential tool for optimizing energy

performance and minimizing operational and maintenance costs. The process evaluates each building system and the building as whole to maximize operation through peak performance algorithms. RCx helps the university reduce energy consumption on campus. As part of RCx, poor performing buildings are identified by NC State Building Maintenance & Operations and Energy Management. Then, outside commissioning consultants are contracted to perform the RCx projects. When the project is completed, energy consumption is tracked, and the improved efficiencies assist the development of a new energy profile based on the behavior of the building. A properly implemented RCx project will yield a payback of less than three years.

GROUNDS MANAGEMENT GREENS OPERATIONS INSIDE AND OUT

The Grounds Management unit is responsible for keeping the campus looking lush and green on the outside but they also work hard to make sure that their operations are sustainable as well. From restoration projects to waste reduction, the following examples show how green is simply business as usual on campus.

- + The Landscape Construction Services group installed a green roof at Engineering Building III on Centennial Campus

- + Encouraging the growth of the Stormwater management Program which prevents sediment pollution
- + Sod pallets are returned to the vendors for reuse and to receive account credit
- + Excavated soils are reused which reduces hauling, saves fuel and is most cost effective
- + Restoration of streams and wetland areas
- + A hydro-seeding process is used to install turf seed. The result is reduced water use to establish new turf. The seeds are applied using a fiber mulch, composed of 70 percent shredded recycled wood and 30 percent recycled paper. This method promotes fast germination which minimizes erosion.
- + Tree replacement is completed inch for inch. For example, when a 10 inch caliper tree dies or is removed it is replaced with either a new 10 inch caliper tree or two 5 inch caliper trees.
- + Hydro-seeding reduces water use and promotes fast germination.
- + A variety of sustainable products are used as well as recycling other products:
 - + Organic fertilizers and compost for amending soils
 - + Bio-diesel for fueling all diesel trucks
 - + Reclaimed railroad timbers for construction of a retaining wall
 - + Recycled aggregates such as crushed concrete, brick, and asphalt
 - + Re-purposed old traffic barricades for construction of storage bins
 - + Biodegradable matting and coir logs for erosion control
 - + Non-potable lake water for irrigation of newly installed landscapes
 - + Re-purposing usable scrap office paper for scratch paper and recycling the rest



Hydro-seeding reduces water use and promotes fast germination.

LEED PROFILE: RANDALL B. TERRY, JR. COMPANION ANIMAL VETERINARY MEDICAL CENTER

The College of Veterinary Medicine (CVM) initiated a multi-year project to design and build the Randall B. Terry, Jr. Companion Animal Veterinary Medical Center. Completed in early 2011, the 115,000 square-foot Terry Center is expected to become a national model for excellence in companion animal medicine. The new building will more than double the size of the previous companion animal hospital and will accommodate more than 20,000 cases referred to the CVM each year.

The sustainable features of the building and site include:

- + Building on a previously developed site
- + Exceeding open space requirements
- + Incorporating best management practices (BMPs) in stormwater management for quantity and quality
- + Reducing the heat island effect with non-roof design features
- + Reducing light pollution
- + Reducing interior water use by 20 percent
- + Landscaping with water-efficient, native plants
- + Achieving energy performance goals
- + Utilizing environmentally preferable refrigerants
- + Storing and collecting recyclable materials



The Eastern 4H Recreation and Conference Facility was the first NC State green building to be completed.

- + Achieving better indoor air quality
- + Using regional building materials
- + Ensuring that at least 75 percent of construction waste was recycled

LEED PROFILE: EASTERN 4H RECREATION & CONFERENCE FACILITY

Located on the Albemarle Sound, this over 500 acre property was developed as a state of the art, year round conference and environmental education center. The master plan includes a conference facility that can accommodate important 4-H and other group meeting functions and a youth oriented camp emphasizing environmental education with supporting education, recreational and lodging facilities.

Sustainable features of the building and site include:

- + Insulation made from recycled denim
- + Tilt-up concrete exterior panels and bamboo gym flooring occupancy sensors
- + Windows with low-e glass

- + A rain garden that filters storm runoff from the site
- + Efficient geothermal heating and cooling system which helps to reduce energy consumption.

The building opened in February 2011 and will be LEED Silver.

LEED PROFILE: SULLIVAN SHOPS III / FACILITIES OPERATIONS SUPPORT SPACE

Sullivan Shops III is among the first buildings on campus anticipating LEED certification. This new facility provide Facilities Operations Grounds Management and Waste Reduction and Recycling with appropriate office, storage, and equipment repair and maintenance spaces. The building was completed in May of 2011.

There are a variety of elements that comprise the sustainability strategy for the building. In an effort to promote biodiversity, this project provided open space on the site in the amount of more than twice the area of the building footprint. The project also protected existing natural areas and restored damaged areas with native/adapted plants, eliminating the need for watering once landscaping is established. The project employed a number of ways to reduce pollution by encouraging the use of bicycle riding, bus riding, and the use of fuel efficient vehicles. The project favored



Sullivan Shops III has a solar thermal system on the roof.

the use of building materials with recycled content and materials extracted, processed, and manufactured regionally. Another feature is improved indoor air quality, as a result of controlled pollutant entry into the building and cross contamination within the building by capturing dirt and particulates at building entryways, separating areas that contain contaminants and providing high-level filtration systems. The selected roof membrane and standing seam metal roof reflects light and heat, reducing the local heat island effect, therefore minimizing impact on microclimate and human and wildlife habitats. Heat from the eight flat plate solar collectors on the rooftop supplements the boiler in heating the building in the winter time by providing heat to the variable air volume box coils. The project features reduced generation of wastewater and potable water demand through the use of water conserving fixtures and captured rainwater for flushing toilets and equipment washing. Use of a rainwater collection system for building use and campus irrigation purposes also reduces the need for water at the site. At least 75 percent of construction waste from the building's construction was diverted from landfill and recycled. The project is tracking its energy use through measurement and verification for at least one year.

NC STATE RESIDENCE HALLS RECEIVE ENERGY STAR CERTIFICATION

Three North Carolina State University residence halls, Carroll, Sullivan and Tucker, received ENERGY STAR certification, joining a select group of fewer than 80 residence halls nationwide. ENERGY STAR-certified buildings use an average of 35 percent less energy than typical buildings and also release 35 percent less carbon dioxide into the atmosphere.

In Tucker Residence Hall alone, \$10,000 in energy conservation measures were put in place during the 2009-10 fiscal year. These included scheduling HVAC systems for optimum performance, LED lighting upgrades in the common spaces, occupancy sensors in the bathrooms, and energy conservation education for residents. In the first year, the upgrades lowered Tucker's energy consumption enough to power 30 homes for one year. This reduction in consumption helped keep 104 tons of greenhouse gases from entering the atmosphere, according to ENERGY STAR's building portfolio manager.

"For NC State to go from zero to three ENERGY STAR certified buildings is a significant accomplishment," says Dr. Tim Luckadoo, associate vice chancellor for student affairs. "The fact that each certified building is a residence hall demonstrates University Housing's ongoing commitment to address our nation's energy challenge while providing safe and affordable housing for our student body."

Advanced Energy conducted the third-party analysis through a grant from Progress Energy Carolinas. Two NC State units, University Housing and Energy Management, oversee all energy-conservation measures in the residence halls.

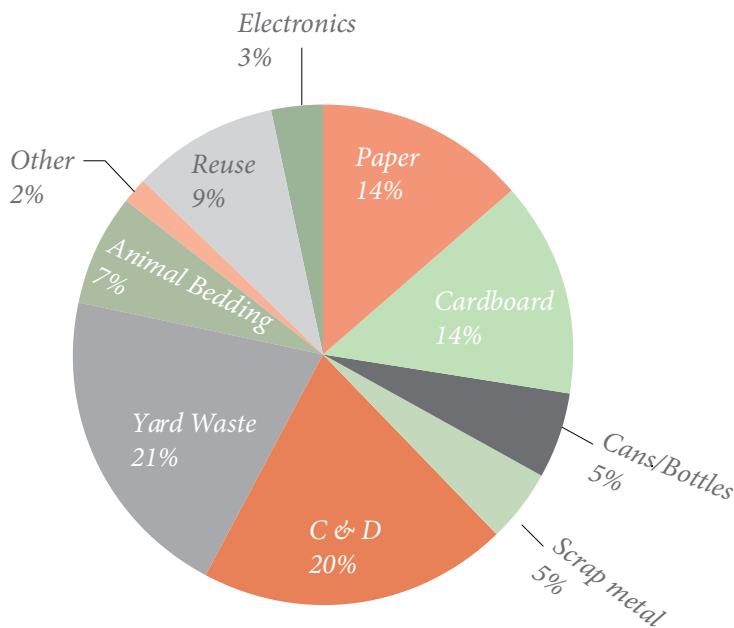
PURCHASING & WASTE REDUCTION

Nearly \$280,000 in avoided landfill costs and recycled material revenue this year

PAPER RECYCLING BECOMES MORE CONVENIENT

Paper recycling on campus is now easier than ever. The WRR collections staff placed new labels on indoor recycling bins that read “Recycle Paper,” to replace the current sorted and mixed paper labels. The combination of the two paper bins frees up recycling bins to reallocate for additional sites. The new “Recycle Paper” stream includes materials such as magazines, catalogs, newspaper, paperboard, file folders, colored paper, white paper, envelopes, sticky notes, and staples. On average, 14 percent of NC State’s recycling stream is paper. By making it easier to recycle with less sorting, the result is an increase in paper recycling tonnage.

MATERIALS DIVERTED FROM LANDFILL



CAMPUS RECYCLERS CAUGHT GREEN HANDED

University Dining, Coca Cola and Waste Reduction and Recycling (WRR) kicked off a five-week promotion to reward NC State students, faculty, staff and visitors for recycling. The promotion, “Caught Green-Handed,” coincided with NC State’s participation in a 10-week nationwide collegiate recycling competition called RecycleMania.

To be caught, winners simply recycled bottles, cans or paper on campus in hopes of being seen by the Caught Green Handed “street team.” Each winner received a Coca-Cola Contour Bottle Light-Up Pen, a Coca-Cola coupon for on-campus C-Stores, and an “I was caught green handed” sticker. All the winners were entered into a drawing for five \$100 Visa cash cards. The goal was to create a buzz about recycling around campus.

WASTE AWARENESS INITIATIVE AT THE COLLEGE OF DESIGN

US Green Building Council for Students at NC State (USGBCS) started a Waste Awareness project for the College of Design at the end of the fall semester 2010. The goal was to collect model waste from studios to emphasize how much reusable or recyclable material is thrown away on a regular basis. PODs Inc, donated a post-consumer recycled plastic POD. The POD was filled to the roof with modeling waste in less than two months, during December and January, 2010-2011.

The USGBCS then hosted an event called, The Great Sort, which educated the design students on the waste material collected from their studios. The students helped sort the waste into one of four categories: paper products, reusable, construction, and trash. The group worked closely with WRR who assisted with weights and statistics as well as determining categories. Overall collections were 80 percent paper product recyclable waste, 10 percent materials that were undamaged and could be reused, five



Chancellor Randy Woodson digs in to local, Howling Cow ice cream.

percent construction waste, and only five percent trash. In total, 1,500 pounds of recyclable paper modeling waste was diverted from the landfill.

USGBCS and WRR set up a permanent recycling plan for the large quantities of paper product waste the studios produce in order to continue diverting recyclable material from the landfill. Another result of the Waste Awareness project was the implementation of a scrap exchange at the design school. The reusable material collected from The Great Sort is the starting point for the exchange. The official opening of the scrap exchange will be at the start of the Spring 2012 semester.

CHANCELLOR'S ICE CREAM DREAM WAS TOPPED WITH SUSTAINABILITY

"The Chancellor's Ice Cream Dream," an event to commemorate Chancellor W. Randolph Woodson's installation, took place October 27 on the Brickyard. The event, sponsored by University Dining, Student Government, and the Chancellor's Installation

Committee unveiled the new chancellor's choice flavor of Howling Cow ice cream.

The free event was part of a week-long celebration of the Chancellor's installation. Each installation week event highlighted sustainability efforts in the NC State community through Chancellor Woodson's strategic planning efforts focused around cultivating a campus community that is locally responsive and globally engaged.

The ice cream sundae was created using 75 gallons of NC State's Howling Cow Ice Cream and served about 2,500 people. Each sundae was served with 100 percent compostable bowls and spoons. Many toppings were donated from local vendors.

MATERIALS FIND A NEW HOME WITH HABITAT FOR HUMANITY

A new initiative within NC State Facilities works to donate furniture and equipment from university renovation projects to



Students waiting in line for a local sweet potato topped with cinnamon-yogurt sauce.

Wake County Habitat for Humanity. Since the start of the partnership in 2010, Habitat for Humanity has accepted laboratory cabinets from Thomas Hall, casework from Butler Hall, and casework from the Friday Institute. The partnership applies to materials that are not accepted by Materials Support – Surplus and that cannot be used in another campus project. The initiative was spurred by a team from Facilities Repair and Renovation, Capital Projects Management, Waste Reduction and Recycling, and the University Sustainability Office.

EARTH WEEK AT UNIVERSITY DINING OFFERS SWEET AND SUSTAINABLE TREATS

University Dining participated in the campus wide Earth Day celebration with a week long schedule of events and menu of sustainable items. Linda Watson, NC State alumna and cookbook author kicked off the week with a free cooking demonstration using local and organic ingredients. Other Earth Week initiatives included University Dining sustainability trivia on the Brickyard, a week of menu items featuring local and organic products, and a partnership with the North Carolina Sweet Potato Commission to offer special recipes and activities focused on sweet potatoes.

WALKWAY RECYCLING BINS PROVIDE CONVENIENCE ACROSS CAMPUS



Walkway recycling bins are clearly labeled for convenience.

Walkway recycling bin placement is a goal of the Campus Environmental Sustainability Team's Waste Reduction and Recycling working group. Placement of the bins are crucial to making recycling easier for campus pedestrians walking from one destination to another.

For pedestrian convenience, the recycling bins are commingled allowing cans, bottles, and paper to be recycled in one container. The outdoor recycling bins are identical to the trash containers, with labels identifying waste from recycling. As a result of the bin choice, WRR and Grounds Management were able to reallocate and retrofit numerous trash cans into recycling bins, thus reducing purchasing costs to the university. Currently there are over 100 walkway recycling sites placed across campus.

TRANSPORTATION

15% increase in Wolftrails participation

CLEAN TRANSPORTATION PROGRAM SUPPORTS ELECTRIC VEHICLE INFRASTRUCTURE

The NC Solar Center's Clean Transportation team worked hard this past year on efforts that benefit the students, faculty, and staff at NC State, as well as visitors to campus. A Neighborhood Electric Vehicle (NEV) was purchased with grant funds from the Clean Transportation Education Program to help staff make short trips on and around campus without using a conventional gasoline vehicle. Since March 2010 the NEV has been driven 1,120 miles by staff attending meetings and events on campus and elsewhere in Raleigh. The Clean Transportation Education Program, was also able to fund the installment of an electric vehicle charging station at the Joyner Visitor Center, in preparation for the upcoming roll-out of plug-in electric vehicles in North Carolina. This is the first such station installed on campus and in the City of Raleigh. The station is available for use by students, staff, faculty, and visitors.

TAKING STEPS TOWARDS SUSTAINABLE TRANSPORTATION

The Sustainable Transportation Education Program (STEP) is a collaborative effort with NC State's NC Solar Center in the College of Engineering and the College of Education. STEP is a program educating middle and high school students on sustainable transportation and the current shift towards the electrification of transportation. The purpose of the STEP program is to prepare students to become immersed in learning about the electrification of transportation and careers in the alternative transportation field. The program provides teacher training and curricula on electric vehicles, plug-in hybrid electric vehicles, Smart Grid, alternative fuels, and careers in science, engineering, and technology while providing application to the automotive and supporting infrastructure. The STEP curricula is a science, technology, engineering, and mathematics (STEM) based program that includes problem-solving, critical thinking, and inquiry-based learning with relevance to real world issues. STEP presented as the first ever education component at the 2011 Plug-In Conference in Raleigh, NC. The program has

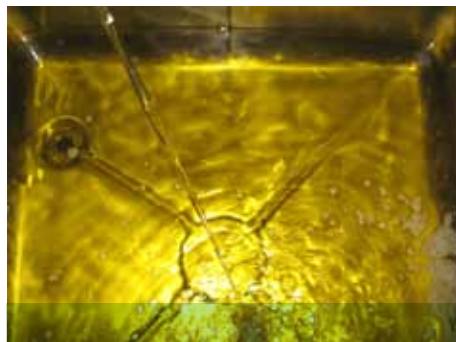


The electric vehicle charging station located at Joyner Visitor Center.

scheduled the Third Annual STEP State Competition for May 2012 and expects to have 10 high schools and twenty middle schools as participants.

BIODIESEL PILOT PLANT FUELS UP

When the North Carolina's Strategic Plan for Biofuels Leadership set the goal of replacing 10 percent of imported petroleum in NC by 2017, students and faculty at the NC Solar Center rose to the challenge and constructed a biodiesel pilot plant off Lake Wheeler Road. With a series of renovations completed in the summer of 2011, the pilot plant facility is fully operational and ready to replace diesel fuel consumed in NC State farm equipment and vehicles. The pilot plant facility will continue to operate through the



Finished BRIC biodiesel being filtered into a final storage tank.

coming 2010-2011 school year with the help from members of the Biofuels Research and Implementation Club (BRIC) at NC State. BRIC is currently made up of approximately 18 engineering students with the goal of teaching interested individuals how to convert low quality feedstocks such as chicken fat, beef tallow, and brown grease into useable biodiesel fuel. Looking ahead, BRIC intends to recycle waste vegetable oil from university sources and convert it into fuel for use in university vehicles and equipment. BRIC is led by seniors Marshall Bowden and Nick Venuti with faculty guidance provided by Dr. Steve Peretti of the Chemical and Biological Engineering Dept and Dr. Alex Hobbs of the NC Solar Center.

FLEET SERVICES WORKS TO REDUCE CAMPUS PETROLEUM DEPENDENCY

Facilities Operations continues to improve their vehicle fleet by replacing their older, less efficient, vehicles with newer, alternative fuel, type models. These new assets are not only capable of running various alternative fuel sources, based on make, model, and engine, but they also emit less harmful emissions out in to the environment. The dedication of staff and the ongoing support of our administration provides us with the opportunity to achieve greater reductions in petroleum dependency and to help become a leading model for other agencies and universities to follow.

CAMPUS'S FIRST ELECTRIC VEHICLE CHARGING STATION INSTALLED AT JOYNER VISITOR CENTER

In a joint project between the Department of Science, Technology, Engineering and Mathematics Education in the College of Education and the E. Carroll Joyner Visitor Center, the university received a grant from the NC Solar Center's Clean Fuels Advanced Technology program to install two Level 2 electric vehicle charging stations (EVSEs). The charging stations are available for guests visiting NC State and are located in the visitor center parking lot. Additionally, a Ford Freestar minivan was converted to run fully on electric power. The converted van is used for educational outreach during campus visits as well as educational programs in local schools. Efforts for educational outreach include a display in the visitor center rotunda, signage in the parking lot and a vehicle wrap clearly indicating the plug-in electric vehicle. The project is a three year commitment and will raise public awareness regarding the benefits of electric vehicles and inspire future students to study in Science, Technology, Engineering and Mathematics (STEM) areas specifically related to clean energy alternatives. An unveiling for the electric vehicles (EVs) and EVSE will be held in fall 2011.



Four Zipcars are available to the campus community for rent.

ALTERNATIVE TRANSPORTATION EFFORTS RESULT IN IMPRESSIVE STATS

The NC State Transportation department continues to find ways to make alternative transportation appealing to students, staff and faculty. From ride matching to bus passes to bike programs, as the options available on campus increase, our campus carbon footprint decreases. Some of the most impressive transportation metrics from the year include:

- + A 30 percent increase in GoPasses from 2009-2010 with more than 400,000 GoPass transit trips taken
- + A 15 percent increase in Wolfrails participants from 2009-2010 totalling 467 participants in 2010-2011
- + A seven percent increase in Wolfline Ridership over fiscal year 2010 totalling 2,383,954 rides
- + Average daily ridership of 15,128 passengers/day
- + Five buses added to Wolfline fleet in fall 2010
- + 400 bike rentals in the first year of the WolfWheels program (through University Recreation)
- + Zimride, a closed circuit ridematching system for NC State was launched in December 2010. Over 750 users have registered to find carpool partners for one-time and regular commute trips.
- + Zipcar launched in January 2011 with four shared vehicles on campus, available for rent by the hour



Students prepare to begin the second annual reusable regatta.

EVENTS & AWARDS

EVENTS

WEDNESDAYS 10AM-3PM
Campus Farmer's Market

OCTOBER 20TH 2010
Campus Sustainability Day
Energy Rushes

NOVEMBER 15TH 2010
E-Waste Recycling Event

NOVEMBER 22ND
Energy Rush

FEBRUARY 21ST
Big "Green" Event

MARCH 5TH-12TH 2011
Alternative Service Break
Trip to Costa Rica

MARCH 19, 2011
North Carolina Arbor Day
Celebration
WESAcat Race

MARCH 22ND 2011
TedxNCSU

MARCH 26TH 2011
Rubbage Ride (part of
Service Raleigh)

APRIL 2011
Envirovision Video Contest

APRIL 6TH 2011
Empower Film Series:
Vanishing of the Bees

APRIL 9TH 2011
Reusable Regatta

APRIL 11TH 2011
Empower Film Series:
Waiting for Superman

APRIL 11-15TH 2011
Earth Feast in Campus
Dining Halls

APRIL 15TH 2011
Earth Day on the Brickyard
Earth Day Concert

APRIL 19TH 2011
Empower Film Series: 11th
Hour

APRIL 20TH 2011
E-Waste Recycling and
Paper Shredding Event

APRIL 29TH 2011
First Green Baseball Game

MAY 2011
Bike to Work Month

JUNE 2011
Obama's Job Council Visits
FREEDM Systems Center

CONFERENCES & WORKSHOPS

SEPTEMBER 9, 2011

6th Annual Green NC Tradeshow
Sponsored by NC State University and the
NC Solar Center

APRIL 27TH AND 28TH 2011

7th Annual Sustainable Energy Conference
Sponsored by the NC State Energy Office

MAY 17TH -21ST 2011

National Solar Conference
Sponsored by the NC Solar Center and the
Jenkins Graduate School of Management

AWARDS

APRIL 2011

The Campus Environmental Sustainability
Team recognized the 2011 Earthwise Award
recipients:

MEGAN CAIN (student)

ANDY FOX (faculty)

ANNE TAZEWELL (staff)

Three North Carolina State University resi-
dence halls, Carroll, Sullivan and Tucker,
received ENERGY STAR certification from
the US Environmental Protection Agency.

The Syme Rain Garden Received awards
which included a 2011 Environmental
Award for Institutional Innovation from
the City of Raleigh and a 2011 Tri-State
American Society of Landscape Architects
Award of Merit.

AUGUST 2011

Renee Strnad, Extension Forestry Specialist
and Coordinator of NC Project Learning
Tree in the College of Natural Resources,
was named Environmental Educator
of the Year and received her Governor
Conservation Achievement Award



Newly labeled trash bins raise awareness about campus waste.

LOOKING FORWARD

In 2012, NC State will be participating in AASHE STARS, a national higher education sustainability reporting system.

Centennial Campus Development is placing 10 electric vehicle charging stations on Centennial Campus through a grant with Triangle J Council of Governments and a partnership with Advanced Energy.

An update of the Physical Master Plan which will integrate and coordinate transportation, land use, utilities, buildings and storm water will begin.

The WolfWheels program will partner with the Crafts Center on campus to offer bike maintenance workshops that certify bikers to use the maintenance equipment in the Crafts Center.

Televisions and computer equipment have been banned from the NC landfills as of July 1st 2011. Waste Reduction and Recycling (WRR) is exploring ways to make electronic and techno recycling easier for the campus community by providing

a roll-cart bin at each academic and residential building for such materials as: batteries, CD's, small electronic devices, toner cartridges and more.

Continue to ensure sufficient supporting alternative transportation infrastructure (shared bike lanes, bike racks, pedestrian paths, signage, carpool parking supply, etc).

The Campus Environmental Sustainability Team will be identifying a mechanism and group to revamp the Earthwise Awards.

WRR is labeling common area trash bins as "Landfill" or "Waste to Landfill". The labels are to raise awareness on where the trash will eventually go. There are many items banned from NC landfills such as aluminum cans, plastic bottles, cardboard and electronics.

The Shut the Sash program will be implemented to encourage energy savings in campus laboratories.



Evaluate the potential size and growth of the electric vehicle market on campus and the necessary charging infrastructure required to support the market.

One Less Cup is an incentive program for campus customers to bring their own cup into Campus C-stores and other campus retail locations and in return they receive 10 cents off their fountain drink or drip coffee purchase. The program is a collaboration between NC State University Dining, Waste Reduction and Recycling and the University Sustainability Office to raise awareness on the amount of cups being sent to the landfill each year.

The Bike and Pedestrian Master Plan will be completed.

Lighting will be upgraded in 24 campus buildings, including converting T12 lamps to energy efficient T8 campus as well as occupancy sensors, by December of 2011.

Self service recycling and waste management will begin in all university buildings.

Coordination with Marketplace vendors to highlight sustainable items on their electronic ordering sites will begin.

Dining will work to determine a baseline for local and organic food purchasing.

Continue the implementation of the Change Your State behavior change and awareness campaign targeting five percent reduction in electricity.

Organize and implement a six building self-performance energy conservation measures contract.

Begin increasing alternative fuel and low-emitting vehicles in the university motor pool and departmental fleets.

ACKNOWLEDGEMENTS

WRITING & EDITING

LINDSAY BATCHELOR,
University Sustainability Office

DAVID DEAN,
University Sustainability Office

TRACY DIXON,
University Sustainability Office

DESIGN & LAYOUT

ALISON CITRON
Graphic Designer
www.alisoncitron.com

CONTRIBUTORS

MARCY BAUER,
NC Solar Center

MARSHALL BOWDEN,
NC Solar Center

LIZ BOWEN,
University Sustainability Office

KELLEY BRACKETT,
Campus Enterprises

MEGAN CAIN,
University Sustainability Office

ALISON CARPENTER,
Transportation

ERIN CHAMPION,
Environmental Sciences Academic Program

BILL DAVIS,
Capital Projects Management

STACY FAIR,
E. Carroll Joyner Visitor Center

ANDY FOX,
Landscape Architecture

ANALIS FULGHUM,
Waste Reduction and Recycling

RHONDA GREENE,
Office of Information Technology

JEFF HIGHTOWER,
Utilities Planning and Infrastructure

KARLA HEINEN,
Forestry and Environmental Resources

LAURA KARPE,
University Recreation

SCOTT JENNINGS,
Fleet Services

SARAH KETCHEM,
*Grounds Management, Fleet Services, Waste
Reduction and Recycling*

KELSEY KUSTERER,
FREEDM Systems Center

TIM PEELER,
Athletics

LISA SCHABENBERGER,
Forestry and Environmental Resources

TIA SIMPSON,
US Green Building Council for Students

MATT SHIPMAN,
News Services

NESSA STONE,
Waste Reduction and Recycling

STEVEN TOWNSEND,
*College of Physical and Mathematical
Sciences*

BILL WINNER,
Environmental Sciences Academic Program

CONTACT INFORMATION

UNIVERSITY SUSTAINABILITY OFFICE

Tracy Dixon, Director
Lindsay Batchelor, Program Coordinator
David Dean, Outreach Coordinator

CAMPUS ENVIRONMENTAL

Jack K. Colby,
Assistant Vice Chancellor for Facilities Operations
Co-Chair, Campus Environmental Sustainability Team

William E. Winner,
Professor, Department of Forestry and Environmental
Resources
Director, Environmental Sciences Academic Program
Chair, University Energy Council
Co-Chair, Campus Environmental Sustainability Team

MAILING ADDRESS

NC State University Sustainability Office
Campus Box 7536
Raleigh, NC 27695-7536

sustainability@ncsu.edu
sustainability.ncsu.edu

PHYSICAL ADDRESS

Administrative Services III
2701 Sullivan Dr.



ELECTRONIC AVAILABILITY

This document is available online at sustainability.ncsu.edu. Minimal copies were printed to reduce resource use. Please think twice before printing it.

PRINT AVAILABILITY

100 copies of this public document were printed for distribution throughout the university. This document was printed on 100% post consumer recycled, chlorine free paper that is Forest Stewardship Council (FSC) certified.

EQUAL OPPORTUNITY STATEMENT

NC State University is dedicated to equality of opportunity. The university does not condone discrimination against students, employees or applicants in any form. NC State commits itself to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age or disability. In addition, NC State welcomes all persons without regard to sexual orientation.

