

NC State University

Campus Environmental Sustainability Assessment

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John Guenther
Leslie Hester
Sarah Ketchem
Lindsay Killian
Tavey McDaniel
Jenny Paige

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Industrial Extension Service
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NC Energy Office
NC Sea Grant
NC Solar Center
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NC State Construction Management
NC State Materials Management
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NC State Surplus Property
NC State Transportation
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Office of the University Architect
Office of Undergraduate Research
Office of Waste Reduction and Recycling
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This is primarily a web based document and can be found at the following web address:

www.ncsu.edu/environmental_sustainability/assessment

This document was compiled with data from Fiscal Year 2003/2004. 100 hard copies were printed in 2006 using 100% post-consumer recycled, chlorine-free paper and environmentally friendly toner.

A Letter from the Chancellor

April, 2006

Dear Colleague:

The past few years have witnessed an unprecedented rise in environmental sustainability at NC State. In addition to enhanced academic and research specialties in sustainability and environmental stewardship, the NC State community has renewed its administrative and operation commitment to these priorities.

These advances have been spearheaded by the Campus Environmental Sustainability Team (CEST), a group of faculty, staff, and students formed in 2003. One of CEST's initial accomplishments was the production of NC State's first-ever Campus Environmental Sustainability Annual Report, covering 2002-2003. In 2004, CEST began recognizing significant campus environmental initiatives on its newly created sustainability website.



I am pleased, therefore, that CEST is helping our campus community take another step forward through the first Campus Environmental Sustainability Assessment. The Assessment is a more comprehensive and more objective analysis of environmental responsibility and accounting than has ever been done for this campus. This assessment represents hundreds of hours of work by a variety of Office and Waste Reduction and Recycling (OWRR) staff members as well as NC State students and interns. It was designed to record quantitative and qualitative data fully describing the NC State environmental picture so that we can continue our successes and improve on our shortcomings.

I know that all of us at NC State are committed to maintaining and upgrading NC State's excellence in environmental sustainability, and I thank you for your part in making our university a better place. Please consider this Campus Environmental Sustainability Assessment as an important step on the journey to make NC State a leader in environmental technology, sustainable stewardship, and environmental leadership.

Sincerely,

A handwritten signature in black ink, which appears to read "James L. Oblinger". The signature is fluid and cursive.

James L. Oblinger
Chancellor, North Carolina State University

A Letter from CEST

April, 2006

To the NC State Community:

As a long-term advocate of sustainability initiatives on campus and the current Chair of the Campus Environmental Sustainability Team (CEST), it brings me great pleasure to present the first NC State University Campus Environmental Sustainability Assessment.

Since the sustainability initiative began here at NC State it has been clear that significant change could not take place or be measured until we had a broad scale bench line analysis of where we currently stand on issues such as water and energy use, resource conservation, purchasing and waste management. When CEST was formed by Provost Nielsen in 2003, he and his appointed representatives immediately set an agenda that contained this study as a top priority. After careful consideration it was determined that the most appropriate and economical way to make such a study happen was to use existing resources on campus. The Office of Waste Reduction and Recycling along with three interns took on this daunting task and has followed it to its fruition.

As the Assistant Vice Chancellor for Facilities Operations, I see the findings of this study to be of utmost importance in relation to the way we do business here at NC State. I am most excited about the indicators found in each subsection which give us quantifiable numbers to benchmark against from year to year. For instance, indicators related to energy and water monitoring will allow us to judge improvement in not only usage but also tracking capabilities, allowing us to cross check our own initiatives. We will be able to determine from year to year if the waste management programs on campus are continuing to improve and grow with campus needs. As we move forward with bond projects throughout campus, the Buildings and Land Use sections will help us to track any potential improvements in the way we conserve and develop land throughout campus. From a cultural and academic standpoint it is clear that environmental programs and curricula do exist. However, there is no single resource or centralized clearinghouse where this information can be easily obtained.

You will see from the Findings and Next Steps that a course has been charted that will continue to move NC State in a sustainable direction. I know that we can continue the momentum that has been achieved with the completion of this document and that it serve not as an ending but as a springboard for future sustainability initiatives on campus.

Sincerely,

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

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As an institute of higher education and a land grant university, NC State has a responsibility to teach the values of environmental sustainability. Through education of tomorrow's leaders, practicing sustainable development of campus land and encouraging staff to consider the impact of their decisions on the surrounding community, NC State strives to incorporate the ideals of a sustainable institution into all aspects of campus life.

NC State has a rich history of commitment to sustainability -

- In 1998, North Carolina Governor Hunt issued [Executive Order 156](#), which "directs state agencies to develop and incorporate policies and practices into their daily operations that preserve natural resources, conserve energy, eliminate waste and emissions, and lessen overall environmental impact."
- In response to this order, the NC State University Council approved the "[Commitment to Environmental Sustainability - Guiding Principles](#)" in 1999. The principles publicly declared a commitment to protecting and enhancing the environment through both education and management of the physical NC State campus.
- Chancellor Mary Anne Fox appointed a campus "Sustainability Officer" to lead the charge for NC State.
- The Sustainability Officer created the "University Environmental Sustainability Task Force" in 2000, which issued a report containing five recommendations for the campus. The document included goals such as *Energy Management, Recycling, Campus Restoration, Sustainability Recognition and Green Purchasing*.
- In 2002, an advocacy group comprised of students, staff and faculty was formed called the NC State Sustainability Coalition (NCSSC). This group has worked to further sustainability on campus in a variety of ways.
- In order to accomplish the goals of the Task Force report, the Campus Environmental Sustainability Team (CEST) was created in 2003. Their mission was to:
 - ⇒ Provide leadership to the NC State community regarding campus and educational programming
 - ⇒ Represent the University on internal and external matters
 - ⇒ Develop and champion University strategic planning regarding sustainability
 - ⇒ Convene representatives to coordinate and communicate activities and plans
 - ⇒ Be a clearinghouse for University information
- In late 2003, CEST determined that NC State should perform an environmental assessment of the campus in order to establish baseline/benchmarks from which progress could be measured.
- In spring 2004, the Office of Waste Reduction and Recycling, with additional funding from Facilities Operations, agreed to hire interns and complete the sustainability assessment "in-house."

Given that NC State had never conducted an environmental sustainability assessment of campus before, the process was essentially charting new territory. A significant amount of planning was involved including decisions regarding the topics to be incorporated, how to do the research, what quantitative indicators to include and the format of the document as well as the expectations of the final product. It was decided that the answers to these questions could not be found by judging NC State against other universities but rather that this opportunity should be used to obtain information and create internal benchmarks for future evaluation of progress.

In the end, nine main topics of focus were chosen as the "Concentration Areas" of the document. These concentration areas are: Buildings, Community and Culture, Curriculum and Research, Energy, Land Use, Materials Management, Transportation, Waste Reduction and Recycling and Water. Within these broad topics lie "Subsections", or specific aspects of each concentration area. Within the body of the document exists:

- ⇒ Indicators - quantifiable measures of performance that can be used to measure progress
- ⇒ Spotlights - highlights of the sustainability efforts of a program or group on campus
- ⇒ Policies - campus policies relating to the subsection
- ⇒ Links of Interest - websites with relevant information
- ⇒ Contacts - people on campus to contact about relevant information

The data for the assessment was collected from Fiscal Year 2003/2004. After conducting the research and compiling the data for each concentration area through interviews with numerous campus stakeholders, it became apparent that NC State has already made great strides towards sustainability. Some of these include:

- All campus development is guided by the University Physical Master Plan which attempts to meet the

- educational mission of the University while exercising a commitment to “efficient use of land, buildings, and utilities for environmental, economic and community reasons.”
- Three undergraduate majors, three undergraduate minors, and two graduate minors are offered in environmental fields.
- NC State has met Executive Order 156’s targeted goal of recycling or composting 40% of the waste stream. In addition, more than 325 tons of construction demolition materials were recycled in FY 2003-2004. In prior years this material would have been sent to the landfill.
- Transportation management at NC State has led to national recognition as one of the “Best Workplaces for Commuters.”
- NC State committed to reduce annual water consumption per square foot by 10% over base year 2001-2002 and the University is currently meeting this goal.

Several areas identified by the assessment where NC State has opportunities for improvement include:

- Developing a centralized resource for students, staff and faculty regarding environmental groups, events and programs on campus. This resource could also serve to coordinate environmentally-minded curriculum and research.
- Securing resources such as additional funding and staff could further reduce utility usage on campus. These resources could be used to implement systems to better monitor energy and water usage and work to integrate conservation and renewable energy projects.
- Designation of an Environmentally Preferable Purchasing contact within Materials Management could increase campus awareness of environmentally preferable alternatives as well as Surplus property initiatives.
- Expanding sustainable development of campus land through monitoring and increased measurement of objectives such as “open space”, “green space”, use of native plants, and storm water Best Management Practices.

This first sustainability assessment has shown that while NC State has become a leader of campus sustainability in North Carolina, there are always ways to improve and move even closer to the goal of a sustainable institution. In order to continue the progress already achieved, the University must further expand efforts towards considering the triple bottom line of sustainability which includes society, environment and economy. The following “Next Steps” could work to truly institutionalize sustainability at NC State and provide the infrastructure to address the specific areas of improvement identified in this assessment.

- Create a Sustainability Coordinator position – a person whose full time position is dedicated to furthering academic and operational sustainability efforts on campus
- Develop a campus Sustainability Center – a resource for the entire campus community that can serve as a clearinghouse for environmental and sustainability information on campus
- Sign the [Talloires Declaration](#) - – to further illustrate the commitment NC State has to campus sustainability. This internationally acclaimed declaration is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities.
- Adopt University specific High Performance Building Standards – Build upon the work by the University’s Architects Office assessing how the current NC State Construction Guidelines compare to regional “green building” standards.
- Increase opportunities for students to learn about campus sustainability – further integrating the Facilities and Academic sides of the University.
- Reduce campus energy consumption - increase resources, including funding and staff that are dedicated to campus utility monitoring and management.
- Commit to a yearly Sustainability Report to the Chancellor – Building upon this assessment, develop an annual report that can measure and evaluate progress towards sustainability

These “Next Steps” towards sustainability will only further enhance the standing of this University as an example of an institute of higher education accomplishing its educational mission while incorporating sustainability into the fabric of campus life.

The following are overall findings and opportunities for improvement based on the research and findings of this assessment.

Buildings

NC State is currently involved in more than 40 construction or renovation projects throughout campus and the impact of these projects on the environment is substantial. Opportunities exist for change not only in the building process but also in the efficiency and longevity of the structures after construction.

- NC State has implemented changes in its Construction Guidelines document, which requires the inclusion of recycling sites in every building.
- More than 325 tons of construction demolition materials were recycled in fiscal year 2003-2004. In prior years this material would have been landfilled.
- An assessment of NC State's current adherence to the Triangle J High Performance Guidelines was completed and determined that NC State currently earns only 14% of possible points. Partial points are significantly higher and total 450 out of a possible 1000.

Next Steps

- NC State Construction guidelines, the campus Master Plan and project bid documents could be further developed to include additional environmental requirements.

Community and Culture

The overall climate of the NC State community helps to shape the ideals and values of the students, faculty and staff. Sustainability is becoming a part of the climate on campus in many ways- though there is much yet to be accomplished.

- There are 13 active organizations on the NC State campus whose mission is environmentally focused.
- Events that promote environmental sustainability occur often on campus including annual events such as Energy Awareness Week and Earth Day as well as periodic events.
- The University Council passed a "Commitment to Sustainability" in 1999 followed by five recommendations that were set by the Campus Sustainability Task Force in 2000.
- There are four committees on campus whose focus areas are related to sustainability issues.

Next Steps

- Sustainability on campus could be improved through developing a centralized resource for students, staff and faculty regarding environmental groups, events and programs on campus. A follow-up to the "Commitment to Sustainability" including additional goals is needed by the University.

Curriculum and Research

NC State is honoring its commitment to sustainability in its educational mission through robust undergraduate curricula and an exceptional range and depth of research and extension programs. Opportunities for environmental education may be overshadowed, however, by limited coordination among the many diverse programs. Undergraduates and graduate students interested in sustainable curricula would benefit greatly from a more unified organizational structure overseeing environmental programming.

- 3 undergraduate majors, 3 undergraduate minors, and 2 graduate minors are offered in environmental fields
- 31 approved NC State research bodies housed under 5 separate colleges and departments address sustainability issues

- 21 NC State extension programs administered by 4 separate colleges and departments address environmental sustainability

Next Steps

- A large-scale coordination of environmentally-minded curriculum and research would quickly connect interested students, researchers, and funding organizations.
- NC State could position itself among the nation's leaders in undergraduate sustainability education by compelling each student to complete at least one class or classroom module relating to environmental issues as part of their General Education Requirements (GER).

Energy

Over the last several years, the cost of NC State's energy consumption has greatly exceeded the amount budgeted. As a result, the university has been forced to utilize funds allotted for campus departments and programs to pay for the utility deficit. Energy conservation has now been placed at the forefront of the university in order to find a way to combat the situation.

- The Utilities Services Department under Facilities Operations created an Office of Energy Management in 2003 to help the university work towards conservation.
- NC State created a Strategic Energy Plan to help guide the university to meet the goals of the State Energy Plan. The plan commits to reducing energy usage per square foot adjusted for weather by a minimum of 4% over 10 years.
- Currently the most significant obstacle to energy reduction on campus is the lack of resources to monitor current energy usage.
- Campus-wide efforts towards energy reduction include conservation projects by the Office of Energy Management such as the use of occupancy sensors and compact fluorescent light bulbs as well as research and projects on alternative energy by the Solar Center.

Next Steps

- Energy usage on campus could be further reduced by securing resources such as funding and staff. These resources could be used to implement systems to better monitor energy usage and work to integrate conservation and renewable energy projects.

Land Use

Over the past several years, NC State has experienced significant development of campus buildings and infrastructure. As research and enrollment grow, these development plans have had to strike a balance between increasing demand for space, protection of natural systems and maintaining the campus character.

- All campus development is guided by the University Physical Mater Plan which attempts to meet the educational mission of the University while exercising a commitment to "efficient use of land, buildings, and utilities for environmental, economic and community reasons."
- Projects such as the restoration of Rocky Branch and the protection of valuable Campus Greens such as the Court of North Carolina, demonstrate NC State's understanding of the value of these areas to the campus community.
- The Grounds Management Department manages the campus landscape with a stewardship ethic that includes development of an Integrated Pest Management program to reduce reliance on chemical controls and advanced irrigation systems that allow greater management and conservation of water use on campus.

- After recent approval of a Municipal Separate Storm Sewer System permit, Environmental Health and Safety is working to further develop the campus stormwater program.

Next Steps

- NC State could continue to expand sustainable development of campus land through monitoring and increased measurement of objectives such as “open space”, “green space”, use of native plants, and stormwater BMPs.

Materials Management

Materials Management encompasses several entities on campus including: purchasing, surplus property and printing and copying services. Each of these departments has a substantial impact on the University's procurement of goods and services.

- Due to the decentralization of purchasing throughout campus the university has little control over the way that individual departments spend smaller amounts of money (under \$5000). This has made it more difficult to require the procurement of certain goods, such as recycled content paper, even when the items are available on state contract.
- The NC State Surplus Property office handled approximately 22,500 items in FY 03-04 with a recycling rate of 80-90%.
- Since FY 01-02, recycled content paper purchases at NC State have dropped by close to \$500,000.

Next Steps

- Designation of an Environmentally Preferable Purchasing contact within Materials Management could increase campus awareness of environmentally preferable alternatives as well as Surplus property initiatives.

Transportation

All students, faculty and staff, regardless of where they live or work, utilize some aspect of the campus transportation system. Automobiles, buses, bikes and walking paths are the most commonly used.

- NC State encourages alternatives to single occupancy vehicles and is committed to a pedestrian-centered campus where vehicular access is limited and does not dominate pedestrian travel. However, approximately 15,676 (about 50% of campus population) commute to campus on an average day, making vehicular circulation and parking significant campus concerns.
- Transportation management at NC State has led to national recognition as one of the “Best Workplaces for Commuters.”
- While there is a system of bike paths running throughout campus, including some night paths in development, there are portions of campus where bikers must share the road with drivers and contend with hazardous conditions.

Next Steps

- NC State could benefit from further movement towards the concept of a pedestrian-centered campus as outlined in the campus master plan and increased options for alternative transportation.

Waste Reduction and Recycling

For years NC State has had a successful waste reduction and recycling program. From education to re-use to consolidation of recycling streams, campus programs have been consistently moving forward with the times.

- NC State has met Executive Order 156's targeted goal of recycling or composting 40% of the waste stream.
- The solid waste collection system was converted to a more efficient and cost effective method. Currently, the Office of Waste Reduction and Recycling operates the entire solid waste collection for the campus "in-house."
- Environmental education on campus includes monthly newsletters to the residence halls, presentations, information tables and special events such as the annual Earth Day celebration on the brickyard.
- During Move-Out 2004, NC State diverted nearly 33 tons of material from the landfill with much of that material being donated for re-use.

Next Steps

- Through collaboration of various campus departments, recycling services could be expanded inside buildings by converting to an automated curbside collection of materials. In addition, resources are needed to implement a bio-hazardous waste disposal program on campus.

Water

As the state of NC has faced several years of significant drought conditions, NC State has been compelled to focus efforts on tracking and reducing water usage across campus.

- NC State committed to reduce annual water consumption per square foot by 10% over base year 2001-2002 and the university is currently meeting this goal.
- In FY 2003-2004, the university used 430 million gallons of water. The cost for this water use was \$1.3 million.
- Campus-wide efforts to reduce consumption include forming a Conservation Awareness Team to develop a strategic water plan, developing a new utility billing system to better track usage and purchasing water saving devices such as faucet aerators and low flow showerheads for campus facilities.

Next Steps

- NC State water usage could be further reduced by continuing and expanding efforts to better monitor and evaluate usage as well as increasing conservation projects across campus.

Concentration Area
Main areas of focus designated by a color

Definition
Brief description of the concentration area or subsection designated by red

Links of Interest
Websites with relevant information

Subsections
Specific aspects of concentration areas

Contacts
People to contact about relevant information

Waste Reduction and Recycling

Breakdown of the campus waste stream...seeing waste as a resource.

In 1998, North Carolina Governor Hunt issued [Executive Order 155](#), State Government Environmental Sustainability, Reduction of Solid Waste, and Procurement of Environmentally Preferable Products.

"The revised Executive Order recognizes that the daily activities and routine operations of the State have a significant impact on environmental quality and use of natural resources. While maintaining a focus on waste reduction and recycling, the Executive Order directs state agencies to develop and incorporate policies and practices into their daily operations that preserve natural resources, conserve energy, eliminate waste and emissions, and lessen overall environmental impact."

Included in the order are specific goals towards making state agencies a model for others by setting the standard on sustainability. From purchasing to operations to education, it is our responsibility as part of the North Carolina government to uphold these standards. NCSU is striving to make sustainability a priority in all of our campus operations.

With the population and diverse infrastructure of a mid-size city, The daily operations of NCSU have a major impact on the surrounding environment. In fiscal year 2003-2004 NCSU disposed of more than 3500 tons of materials in the Wake County Landfill costing the university just over \$105,000 in landfill fees alone. At the same time, the Office of Waste Reduction and Recycling, with the help of the campus community, worked to keep useful, recyclable materials out of the landfill and get them into the hands of local reuse and recycling markets. These endeavors not only decreased the amount of material disposed of in local landfills, they also saved the university landfill disposal costs (just under \$50,000) and supported the local economy by supplying them with useful commodities.

Source: "Characterization of Municipal Solid Waste Management 1997 Update" U.S. EPA

Sub-sections

- Recycling Rates** - Percentage of the campus waste stream diverted
- Reuse Opportunities** - Programs directed at keeping useful materials out of the landfill
- Composting** - Programs focused on the diversion of organics from the waste stream
- Environmental Education** - Initiatives dedicated to fostering environmental stewardship
- Solid Waste** - Where, how and how much waste is disposed of on campus
- Hazardous Waste** - NCSU policies and procedures for disposal of hazardous material

Materials which comprise Municipal Solid Waste generated in the United States (total weight = 209.1 million tons) Paper and paper products as well as yard waste make up the largest percentage of the waste stream. Both are being actively diverted from the waste stream at NCSU.

Links of Interest

- [NCSU Office of Waste Reduction and Recycling](#)
- [Wake County Recycling and Solid Waste](#)
- [City of Raleigh Solid Waste Services](#)
- [NCDENR Division of Pollution Prevention and Environmental Assistance](#)
- [NCSU Solid Waste and Recycling Totals 2003/2004](#)

For more information related to waste reduction and recycling opportunities on campus contact:

Office of Waste Reduction and Recycling
Tavey McDaniel, Environmental Programs Manager
Nessa Stone, Operations Manager
Lindsay Nillan, Recycling Coordinator
616-9421, recycling@ncsu.edu

Indicators
Quantifiable measures of performance

Spotlights
Highlights the sustainability efforts of a program or group on campus

Policies
Policies relating to the subsection

Body
Main information about the subsection

Waste Reduction and Recycling

Solid Waste

Where, how and how much waste is disposed of on campus

Indicators

- Waste landfilled in 2003/2004 - 225 lbs./person
- Landfill fees in 2003/2004 - \$105,922
- Number of trash dumpsters on campus - 164
- Number of cardboard dumpsters on campus - 76
- Man-hours spent handling trash on campus in 2003/2004 - 9400

Solid Waste Collection Conversion

In 2003, an independent study was conducted to determine the most efficient and cost effective method of solid waste collection at NCSU. The study resulted in a decision to move the entire solid waste service to an "in-house" operation. This meant converting from an antiquated hoist system to the industry standard front end loader service method.

In late 2003, the purchase of new trucks and dumpsters began. Early 2004 started the phasing out of old equipment and dumpsters which continued into 2005. Currently, 100% of cardboard collections have been converted to front end loader. 80% of trash collections have been converted and will be complete as of the end of Spring Semester 2005.

In house service allows OWRP to provide a higher level of customer service as well as a more cost effective service for the campus.

Program Policies and Goals

- Reduce the amount of waste generated by NCSU through education and re-use.
- Accept all non-hazardous solid waste generated by the campus community
- Meet or exceed campus service requirements
- Provide lowest cost program
- Create flexibility to meet the needs of customers
- Adapt to campus growth by offering scalable services

A Day in the Life of Campus Trash:

Solid non-hazardous waste generated at NCSU most commonly comes from an individual. Collectively, this adds up to about 14 tons of trash collected and land-filled per day. This represents about 60% of all wastes generated by NCSU.

As an example, the disposal cycle of a typical piece of trash results in the material being handled approximately six times before it reaches the landfill:

- The generator tosses a piece of trash into a wastebasket.
- The housekeeper changes the liner in the wastebasket and deposits the waste into the collection cart.
- The entire building's waste is taken to the dumpster.
- The dumpster contents are emptied into a waste hauling truck. On campus we use front end loader trucks to collect and haul waste from campus.
- The waste is taken to a transfer station where it is dumped into a compaction trailer.
- The trailer is hauled to the North Wake County Landfill. The landfill operator grades and buries the trash.

Due to the lack of moisture and oxygen, trash in a landfill typically does not break down for many decades.

For more information on solid waste disposal on campus, contact:
The Office of Waste Reduction and Recycling
Nessa Stone, Operations Manager
513-8110, nessa_stone@ncsu.edu



Existing and new structures and their impact on campus

According to the US Green Building Council, in the United States buildings account for:

- 36% of energy use/65% of energy consumption
- 30% of greenhouse gas emissions
- 30% of raw material use
- 30% of waste output/136 million tons annually
- 12% of potable water consumption

With buildings having this impact on the environment and NC State currently having over 40 bond projects taking place or scheduled to take place on campus, Green or High Performance Building has begun to get more attention. These projects include the renovation and new construction of buildings and infrastructure on Main and Centennial campuses. This development is not only changing the resources and academic opportunities on campus but also the way the campus looks, feels, and operates. The new buildings and additions have been through a thorough design process in hopes that they will not only be user-friendly but also sustainable and long-lasting. The Office of the University Architect recently finished a benchmarking study of NC State's compliance with the Triangle J Council of Government's High Performance Guidelines. These Guidelines resemble those of LEED but are tailored to the markets and resources of the Triangle region. Throughout this study recommendations are made as to the simple changes NC State can make that would lead to more sustainable building practices on campus.

As Green Building receives more attention both in North Carolina and throughout the country, building occupants are beginning to take more of an interest in how their building can integrate sustainability's principles. As buildings such as Jordan Hall Addition and Leazar renovation have moved through the design process, many sustainable practices have been considered and incorporated. In some cases, however, sustainable design ideas were not included

because their long-term benefits did not support their initial cost. Because the budgets for construction and maintenance are not tied together, it is often difficult for building occupants to justify higher upfront expenses.



Construction/demolition materials being sorted at Materials Reclamation.

The North Carolina State Energy Office is currently running a Performance Contracting pilot project. Performance Contracting is a mechanism to implement resource efficiency improvements with minimal up-front costs. This approach uses savings that result from the efficiency project to pay for the work over time. To date, only three state agencies have developed RFP's under this pilot project.

Building materials, both from deconstruction and new construction, provide an often-overlooked opportunity to accommodate sustainable practices. In the past, the majority of materials from jobsites on NC State's campus were disposed of in Construction Demolition sites throughout the state. Therefore, valuable resources were being buried

without hope for further use. A few years ago, Materials Reclamation opened in Raleigh. This Construction Demolition Materials Recovery Facility accepts mixed loads of debris from building sites and either reuses or recycles the materials. This is an easy outlet for the contractors because the materials can all be placed in one container and taken to the site. The materials are then sorted by hand and machines. The cost to the contractor is the same or less than landfilling. Last year alone, NC State recycled 327 tons of construction demolition material. This was comprised primarily of rock, concrete, drywall and wood from small jobs on campus. The Office of the University Architect is currently working to include bid language in RFPs requiring contractors to recycle at least 50% of construction demolition materials from University projects. Environmental Health and Safety recently hired a part-time Construction Demolition Specialist who will help to make sure these goals are accomplished.

Sub-sections

Guidelines - University required aspects of building design and construction.

Certification - Utilizing established criteria to rate the sustainable attributes of buildings.

Guidelines

University required aspects of building design and construction



Indicators

Number of campus departments and boards involved in the Design Review process - 8 or more

Spotlight on Design Reviews: Recycling/Solid Waste

In the past, dumpster pads and recycling sites were among the furthest things from a designers' mind. Often, this resulted in buildings making it all the way through construction without a place for a trash dumpster, recycling bins, or even adequate access for the trucks servicing these containers. Recently, new specifications were added to the Design Guidelines requiring recycling and dumpster sites for each new building as well as adequate turning radius and access. These guidelines also require that the location of these containers is convenient for Housekeepers and collection staff.

Currently, buildings are designed to meet the Construction Guidelines of NC State. These guidelines lay out the basic requirements for jobs contracted by the University. It is expected that all contractors adhere to the detail in these specifications. The Construction Guidelines are a way for the University to require a certain level of quality or environmental accountability in every job without having to write specific language into individual contracts.

The NC State Construction Guidelines are presented to the design community as an aid to the design and construction of facilities and renovations at NC State. This information represents the efforts of many design, construction, operations, and safety professionals to provide uniform and relevant information to designers on minimum standards required for University work. The current edition of the Guidelines represents a significant upgrade and modification of the prior edition. The Guidelines are intended to be a companion document to the Physical Master Plan - A Campus of Neighborhoods and Paths and to supplement the policies and procedures of the State Construction Office and the latest edition of the State Construction Manual.

A design review process is in place for all plans. Plans are reviewed at the following intervals:
Schematic Design- develops scope of project and alternate solutions.
One solution is chosen for further development.
Design Development-
Comments from Schematic



Building renderings help University staff to understand how a building will fit into the land as well as identifying access issues.

Design incorporated and design developed fully. Construction Document - All comments incorporated and design detailed for construction.

A group of staff from Facilities has the opportunity to review all plans for requirements related to their work in and around the building. This can include everything from Housekeeping's storage concerns to how the slope of the land will affect Ground Maintenance's mowing ability. Comments are made via email, gathered, and then transferred to the designers. Often, on large projects, meetings are held with the design team and those members of Facilities making comments to ensure that comments are understood and integrated whenever possible. Currently, both the Master Plan and Construction Guidelines include language related to Sustainability. The Master Plan dedicates an entire section to Sustainable Design and directs development to include: south facing orientation whenever possible, energy efficiency, incorporation of long-lasting materials, availability of recycling sites, use of indigenous plants, inclusion of materials containing recycled components, and employment of low- impact air quality measures. While this commitment has been made within the Master Plan, the next step to be taken is to ensure inclusion of these aspects from initial design to finished product.

Links of Interest

[University Space Regulation](#)
[University Master Plan](#)
[University Construction Guidelines](#)

Certification

Utilizing established criteria to rate the sustainable attributes of buildings



Indicators

Points currently achieved towards High Performance Certification -140

Points partially achieved - 450

Points needed to achieve -
 Platinum Certification - 750-1000
 Gold: 550-750
 Silver: 450-550
 Bronze: 350-450

Percentage of points currently being achieved -14%

In 2002, the Facilities Division undertook the task of reviewing its current design and building practices in comparison with the Triangle J High Performance Guidelines. Triangle J's High Performance Guidelines were used because these guidelines specifically address the region where the NC State's campus is located.

Five members from each of the Facilities Departments (Office of the University Architect, Facilities Planning and Design, Construction Management, and Facilities Operations) along with representatives from Purchasing and Environmental Health and Public Safety joined together to form five sustainability task forces. Each task force reviewed one of the major sustainability categories - Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, and Indoor Environmental Quality.

These task forces were formed for three reasons:

- to introduce sustainable concepts to the departments of the Facilities Division,

- to review the sustainable efforts of NC State in comparison with the intents of Triangle J's High Performance Guidelines, and
- to develop recommendations to further the sustainable efforts of the University.

The result of the work of the task forces shows that although sustainable efforts have been standard practice of the campus for years, little energy has been spent in documenting this effort. It confirmed that there are areas where the university needs to increase its efforts in several of the major categories. It also showed that none of the university's projects will currently earn even the minimum level of certification. However, with minimal additional effort, it would be possible for all of the university's projects to achieve at least the lowest level of certification with no or low cost.

Currently, buildings are designed to meet NC State's own Construction Guidelines. Compliance to these design and construction guidelines would earn a project 140 out of the possible 1000 points in Triangle J Council of Governments' High Performance Guidelines. Although some projects may be including additional sustainable measures, many of these efforts are not measured or documented. The university's projects are most successful in the area of Sustainable Sites. This is the only category where at least 1/3 of the possible points are achieved, and this category provides over 1/2 of the total points that our projects earn.

The university is not currently documenting any points in the Water Efficiency or Materials & Resources categories. The university could easily achieve points in these categories by concentrating activities to promote and document features in these categories. For the University to consider itself Sustainable, it must meet sustainability intentions in all five of the major categories. Currently the Office of the University Architect is looking for ways to integrate these certification requirements into the Design Guidelines. Two buildings on campus, Jordan Hall Addition and Leazar Hall renovation, are a part of the State's Green Building Pilot project and are attempting to go above the standard requirements by including some high performance initiatives .

For more information on green building on campus contact:

Office of the University Architect
 Michael Harwood, University Architect
 515-6259, michael_harwood@ncsu.edu

Links of Interest

[Triangle J High Performance Guidelines](#)
[US Green Building Council](#)
[NC Green Building Technology Database](#)
[NC Solar Center](#)



When students arrive at NC State for their first year of college, they are stepping into a whole new environment— one that is often very different from their home life. Among others, one of the important values that NC State has a responsibility to teach, as an institute of higher education and as a land grant university, is a sense of environmental accountability. Especially among the on-campus residents, the university has the ability to lead by example and teach residents to live a less consumptive lifestyle. Be it low flow shower heads in the residence halls or local produce in the campus dining facilities— students are exposed to environmentally conscious practices.

From the organizations they join, to the activities they participate in, students are shaped and influenced by the people and events around them. NC State is filled with individuals and organizations, new and old that are dedicated to furthering the cause of sustainability on campus. Land use, energy conservation and green politics are only a few of the issues that are being dealt with by campus organizations. Education of the campus community occurs through special events such as presentations, tables on the brickyard, speakers, movies, off campus outings, conferences and much more. The opportunity is there for the campus to get directly involved with sustainability. The movement simply needs the interest and energy of the people to make it happen.

During a survey conducted at New Student Orientation in the summer of 2004, students were asked if campus environmental sustainability was important to them. Some of the responses included:
“Yes, I think it is vital to every community.” - Electrical Engineering Major
“I think it is very important and would love to help out and participate”- First Year College
“We have a lovely campus and I think it is important to keep it that way. And it is the students’ responsibility to do that.”- Mechanical Engineering Major

The overall tone of the campus community inevitably affects the outlook of the students, staff and faculty. NC State has begun shaping this view by weaving sustainability into the very fabric of the university. This began with a campus commitment to sustainability that was adopted by the University Council in 1999. This was followed by the creation of a Sustainability Task Force that discussed and made recommendations on ways the university could improve environmental sustainability on campus.

Larry Nielsen, former Dean of the College of Natural Resources was appointed the Campus Environmental Sustainability Officer for NC State. He in turn created the Campus Environmental Sustainability Team (CEST), a committee of appointed faculty, staff and students tasked with leading the sustainability effort on campus. CEST continues to be involved in moving sustainability forward on campus and even proposed performing the sustainability assessment as a whole. Then in July of 2005, Dean Nielsen was appointed to the position of Provost and Executive Vice Chancellor for Academic Affairs. NC State is fortunate to have a sustainability advocate in such a prominent and important position at the university.

NC State as a university has not only the ability but the responsibility to the campus community to set an example through a commitment to sustainability. From the administration to staff to students, sustainable goals and practices not only lessen the impact of NC State on the environment but help to create a campus-wide awareness about the importance of this issue.

Sub-sections

Environmental Organizations and Events— People and events promoting sustainable vision and practice

Residence Life- How the lifestyle and perceptions of residents impact campus sustainability

Administrative Leadership— A commitment to sustainability by the executive body



Provost Larry Nielsen presenting an Earthwise Award at the 2005 NC State Earth Day Celebration

Environmental Organizations and Events

People and events promoting sustainable vision and practice



An important part of a student's college experience is the extra-curricular activities they are involved with and exposed to every day. NC State is teeming with environmental sustainability opportunities for students, faculty and staff. From informational tables on the brickyard to weekly meetings— there are numerous ways to get involved with sustainability on campus.

NC State has organizations on campus which deal with a variety of environmental, ecological and sustainable causes. The groups which are most active include:

- CEST (Campus Environmental Sustainability Team)
- NC State Sustainability Coalition
- SOS (The Student Organization for Sustainability)
- SSE (Students for Sustainable Energy)
- SPARC (Students Protecting Animals Responsibly and Compassionately)
- Lake Raleigh Woods
- Campus Greens
- Student Sierra Club
- Leopold Wildlife Club
- Outing Club
- Progressive Coalition
- Natural Resources Grad Students
- The Center for Environmental Farming Systems



The Center for Environmental Farming Systems hosts an organic produce sale every Friday during growing season

Environmental events hosted by various campus organizations are commonplace on the NC State campus. The campus community is

exposed to information on topics ranging from animal rights to energy conservation to organic farming. Large events such as Earth Day happen annually while other small events happen throughout the year. Big or small— every event is able to make an impact on the environment through education and awareness.

Links of Interest

- [NC State Environmental Sustainability](#)
- [NC State Student Organization Resource Center](#)
- [Student Organization for Sustainability](#)
- [Lake Raleigh Woods](#)
- [Students for Sustainable Energy](#)
- [NC State Campus Greens](#)

Indicators

Environmental organizations on campus— 13

Incoming freshman who are interested in joining an environmental organization— 82%*

Incoming freshman who are interested in attending an environmental event— 83%*

(*Data collected from survey at New Student Orientation)

Spotlight on Students for Sustainable Energy

Students for Sustainable Energy (SSE) is an NC State student organization formed in 2004 with the purpose of generating awareness about energy conservation and promoting the use of renewable sources of energy on campus. They have participated and hosted a number of educational events on campus including an Alternative Energy Fair, Energy Awareness Week, Earth Day and a Declaration of Independence from Dirty Energy. In the spring semester, the Student Senate unanimously passed a resolution submitted by SSE requesting student support for renewable energy options on campus. The Students for Sustainable Energy are part of a larger movement among universities across the nation.



Energy Awareness Week

For more information on student organizations or events, contact:

Deborah Felder— Interim Coordinator
Student Organization Resource Center,
919.515.3323, deborah_felder@ncsu.edu

Residence Life

How the lifestyle and perceptions of residents impact campus sustainability



There are numerous ways that the average resident at NC State has a direct impact on campus sustainability. Energy and water use, transportation, recycling, the food they eat - all have consequences that students may or may not be aware of. Some impacts can be controlled or dictated by the University while others depend entirely on the level of understanding and the initiative of the students.

It is important to properly educate students about the effects their everyday actions have on the environment around them. A variety of educational tools are necessary to reach the diverse group of residents at NC State. Information about recycling and energy conservation is provided for new students at a fair in Talley Student Center during their orientation. Presentations about waste reduction and energy use are given to the Resident Assistants each school year. The Office of Waste Reduction and Recycling distributes a monthly newsletter to each residence hall with environmental tips, events, facts and volunteer opportunities. Education not only helps guide the decisions of residents while on campus but also shapes their lifestyle in the future.

Spotlight on the All Carolinas' Meal

In April of 2004, University Dining and the Local FOODS group hosted the first annual "All Carolinas' Meal" at NC State dining halls. This event features foods produced, grown and/or processed in the Carolinas and works to educate students about supporting local farmers and businesses. Representatives from the food vendors featured are present with information and give-a-ways for the diners. All three of NC State dining halls (Fountain, Clark and Case) participated with positive feedback from the attendees at each.

"We're excited to offer our diners the opportunity to experience an event like this," said University Dining's Director of Board Operations, Steve Edwards. "We are always mindful of supporting the local economy and we try to stay abreast of what is available at various times of the year from local producers. However this event takes it a step further and gives our vendors and sponsors an opportunity to connect with and educate our patrons about their products and help them really understand what it means to support local business."

A second successful "All Carolinas' Meal" was held in the fall of 2004 with the plan to continue the event each year in the fall when the most local products are available.



During Earth Week 2004, First Year College and OWRR hosted a "Trash Out" at Tucker Beach. This event engages the students through sorting a residence hall dumpster to demonstrate the amount of reusable/recyclable material that is sent to the landfill.

University Housing has taken the initiative of installing a variety of "sustainable" products into the residence hall in recent years. Reused products include: bathroom marble, bricks and office doors. Energy and water saving products include: halogen light bulbs, 2400 low flow shower heads, 487 front loading washers and automatic flush valves. The wood from removed trees at the Wolf Village site were used to make wooden magnets for the opening of the new housing complex. Each of these projects helps to make NC State a more sustainable living environment.

Links of Interest

[NC State University Housing](#)
[NC State Inter-Residence Council](#)
[NC State University Dining](#)
[Center for Environmental Farming Systems](#)

For more information on sustainability efforts among residents, please contact:

Steve Edwards, Director of Board Operations
 University Dining- 513-7614
steve_edwards@ncsu.edu

Susan Grant, Director
 University Housing- 515-3088
susan_grant@ncsu.edu

Administrative Leadership



A commitment to sustainability by the executive body

Indicators

Number of Student, Staff, or Faculty committees related to sustainability– 4

Number of sustainability resolutions passed by a committee in 04/05– 2

NC State Commitment to Sustainability

On May 10th, 1999 the University Council approved the “Commitment to Environmental Sustainability– Guiding Principles,” which committed NC State to:

- Strengthening undergraduate and graduate programs that have a concentrated focus on environmental issues
- Providing new ideas, technologies, and best-practices to help society - including business, industry, and agriculture
- Protecting and improving campus environment
- Developing short, mid and long-term action plans monitored by specified indicators of progress
- Setting principles as guideposts for future actions

In April of 2000, the University Environmental Sustainability Task Force issued a report of recommendations which included goals for:

- *Energy Management*: reduce energy use by 20%
- *Recycling*: 40% reduction in waste to landfills
- *Campus restoration*: Rocky Branch restored by 2010
- *Sustainability recognition*: establish program
- *Green Purchasing*

Campus Environmental Sustainability Team (CEST)

Responsibilities of the Campus Environmental Sustainability Officer (CESO) and, by extension, the Campus Environmental Sustainability Team:

- Provide leadership to the NC State community regarding campus and educational programming
- Represent the university on internal and external matters
- Develop and champion university strategic planning regarding sustainability
- Convene representatives to coordinate and communicate activities and plans
- Be a clearinghouse for university information

One of the most important ways that the NC State administration demonstrates their support for sustainability is through the establishment of working committees. The following are committees designated to specifically address sustainability related issues on campus.

The Physical Environment Committee (PEC) is an advisory body to the Vice Chancellor for Finance and Business. Two of the committees’ principal responsibilities are:

- “To provide direction and critically review the basic concepts and assumptions underlying University recycling & solid waste programs, energy management, conservation and sustainability initiatives”
- “To provide direction and critically review the basic concepts and assumptions underlying green building practices and the environmental impact as a result of the development of the University.” Currently the chair of this committee is Arthur Anthony.

The Faculty Senate– Resources and Environment Committee is an advisory body to the Chair of the Faculty and to the General Faculty who “is responsible for reviewing and making recommendations regarding policies related to the allocation and management of University resources, and maintenance of and improvements to the University environment.” Currently the chair of this committee is Richard Bernhard.

The Staff Senate– Resources and Environment Committee is an advisory body to the Chancellor. Currently the chair of this committee is Sandee Zechman.

Links of Interest

- [NC State Standing Committees](#)
- [NC State Physical Environment Committee](#)
- [NC State Resources and Environment Committee](#)
- [NC State Faculty Senate](#)
- [NC State Campus Environmental Sustainability Team](#)

For more information on the administrative role in sustainability at NC State, please contact:

Larry Nielsen– Office of the Provost, 515-2195
 Arthur Anthony– Urban Affairs, 515-1323
 Richard Bernhardt– Industrial Engineering, 515-6423
 Sandee Zechman– Transportation, 515-2210



The educational priority of environmental sustainability at NC State

Above all other purposes, NC State is an institution of higher learning whose mission is “to serve its students and the people of North Carolina as a doctoral/research-extensive, land grant university” ([North Carolina State University Mission Statement](#)). In 1999, the NC State University Council refined this mission to include an explicit commitment to environmental sustainability:

“NC State publicly declares its commitment to protecting and enhancing the environment for future generations through its educational mission. First, we will encourage and provide a high level of support for strengthening undergraduate and graduate programs that have a concentrated focus on environmental issues...Second, we will, in collaboration with our sister educational institutions, provide the new ideas, technologies, and best practices that will help society—including business, industry, and agriculture—meet this enormous challenge.” - [Guiding Principles](#), May 10, 1999

How well is NC State fulfilling its commitment to sustainability through its educational mission? How does the University examine the strength of sustainability initiatives in academics, research and extension? While peer universities often provide a useful benchmark for educational comparison, the interdisciplinary nature of sustainability in education makes such evaluation difficult. What can be done is learn from and aspire to the exceptional programs among our [peer universities](#). Some such programs include:

- Carnegie Mellon’s [Environment Across the Curriculum \(EAC\) Initiative](#)—attempt to integrate environmental sustainability into the early undergraduate curricula of each student
- The University of Georgia’s [Semester Environmental Literacy Requirement](#)—provides that each student must take one of many [interdisciplinary courses](#) that enhance a student’s understanding of natural systems and their relationship to human activity
- UNC-CH’s [signing](#) of the [Talloires Declaration](#)—an action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities.

NC State has numerous programs within the realm of academics, research and extension that provide the campus community and NC citizens the opportunity to learn about sustainability and understand the importance of teaching this concept to all students that pass through this institution.

Sub-sections

[Academics](#) - Curriculum related to environmental sustainability at NC State

[Research](#) - On-going studies advancing environmentally sustainable practices

[Extension](#) – Sustainability outreach to North Carolina citizens

Spotlight on New Student Orientation Survey, Summer 2004

Question:

1. Are you planning on taking any environmentally focused classes? **47% YES**
2. Are you interested in an environmentally focused major or minor? **27% YES**
3. Do you think there should be an environmental literacy course requirement at NC State? **66% YES**

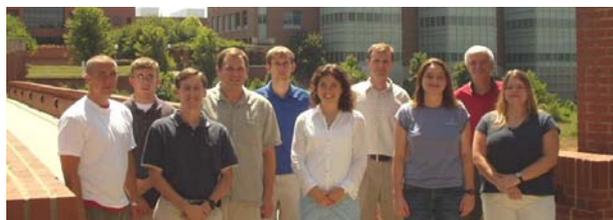
Quotes from incoming students about the role of sustainability in their education:

“It is important to take at least one class because it affects everyone”
- Communications major

“There should be more classes teaching environmental impact and recycling”
- Computer Engineering major

“I know that it’s highly needed and not very available” - English major

“The fact that those classes exist is great, however, this is the first time I’ve really heard about them”
- Chemical Engineering major





Curriculum related to environmental sustainability at NC State

Indicators

Undergraduate Environmental Majors - 3
Undergraduate Environmental Minors - 3
Graduate Environmental Majors - 0
Graduate Environmental Minors - 2
Number of degrees conferred in Environmental Majors - 41
Central coordination of environmental educational programming - None

Spotlight on Environmental Technology Major

Designed for students who want to explore beyond traditional engineering and science specialties in favor of government, industry and non-profits, [Environmental Technology \(ET\)](#) is an emerging field that blends science with environmental law and policy, hazardous material management, and environmental management systems. This new program delivers invaluable hands-on experience in monitoring, analyzing, assessing, and communications about environmental changes in flora, fauna, soil sediment, air, and water. The Environmental Technology major provides graduates with the skills and certifications necessary to become environmental professionals. This innovative program is the only one of its kind in the country.



Environmental academic programming at NC State spans multiple colleges and departments. There are three explicitly environmental [Majors](#) for undergraduates at NC State

- Environmental Science, 7 concentrations:
 - [Air Quality Concentration](#), ESA (CPMS)
 - [Ecology Concentration](#), ESC (CALs)
 - [Economic Policy Concentration](#), ESE (CALs)
 - [Geology Concentration](#), ESG (CPMS)
 - [Soil Sciences Concentration](#), ESS (CALs)
 - [Statistics Concentration](#), EST (CPMS)
 - [Watershed Hydrology Concentration](#), ESH (CNR)
- [Environmental Engineering](#), ENE
- [Environmental Technology](#), ET

The environmental science majors are housed within three colleges, The College of Agriculture and Life Science (CALs), The College of Natural Resources (CNR), and the College of Physical and Mathematical Sciences (CPMS). The Environmental Engineering major is administered by the College of Engineering while the Environmental Technology Major is run within the College of Natural Resources.

[Undergraduate Minors](#) in environmental science include:

- Agroecology (CALs)
- Environmental Science (CHASS)
- Wetland Assessment (CNR, CALs)

There are no graduate programs of study related solely to environmental science or sustainability. However, as in the undergraduate major fields of study, several majors, such as Fisheries and Wildlife Science, Forestry, Entomology, Botany, etc., are directed at studies of the natural world and the human-nature interface. However, there are two [Graduate Minors](#) which relate more directly to environmental sustainability:

- Ecology (interdepartmental, multi-college oversight)
- Water Resources (interdepartmental, multi-college oversight)

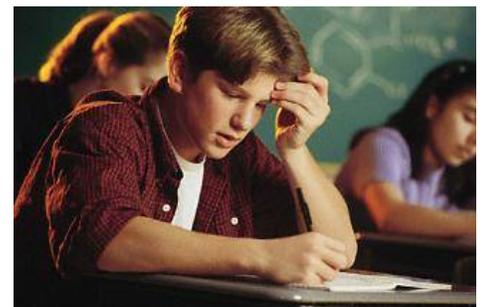
Enrollment in Undergraduate Environmental Programs of Study*:

YEAR	ESA	ESC	ESE	ESG	ESS	EST	ESH	ENE	ET	TOTAL
Fall 04	4	19	4	6	7	2	16	42	53	153
Fall 03	3	21	5	7	10	2	18	46	50	162
Fall 02	4	35	7	7	11	4	18	60	n/a	146

Degrees Conferred in Undergraduate Environmental Programs of Study:

YEAR	ESA	ESC	ES E	ESG	ESS	EST	ESH	ENE	ET	TOTAL
03—04	0	3	0	1	2	1	0	20	14	41
02—03	0	7	2	1	2	0	2	17	7	38
01—02	2	3	3	1	1	0	3	15	n/a	28

*n.b. includes second majors; source: [University Planning and Analysis](#)



Research

On-going studies advancing environmentally sustainable practices



Indicators

Number of approved NC State research bodies addressing sustainability issues - 31

Number of colleges and departments these research bodies are housed under - 5

Research programs at North Carolina State University are generally organized into [Centers, Institutes, and Laboratories \(CILS\)](#). Many of these entities conduct research on environmentally sustainable practices and technology. Included on this page is a list of CILS and other research programs which have some focus on environmental sustainability research, organized by their administrative department.

College of Agriculture and Life Sciences

- [Animal and Poultry Waste Management Center](#)
- [The Center for Applied Aquatic Ecology](#)
- [The Center for Environmental and Resource Economics Policy](#)
- [Center for Integrated Pest Management](#)
- [North Carolina Stream Restoration Institute](#)
- [The Air Pollution Laboratory of the Southeastern Plant Environmental Laboratory](#)
- [Soil and Water Environmental Technology Center](#)
- [Water Quality Program](#)
- [North Carolina Sustainable Agriculture Research and Education Program](#)
- [Center for Environmental Farming Systems](#)
- [NCSU/USDA Forage Program](#)
- [North Carolina Cooperative Fish and Wildlife](#)
- [The Center for Marine Sciences and Technology \(CMAST\)](#) (With the College of Physical and Mathematical Sciences)

College of Engineering

- Solar energy research at the [Applied Energy Research Laboratory](#)
- Energy conservation research at the [Center for Embedded Systems Research](#)
- Nuclear energy and waste research at the [Center for Nuclear Power Plant Structures, Equipment and Piping](#)
- Recycled materials and manufacturing waste reduction research at the [Furniture Manufacturing and Management Center](#)
- [North Carolina Solar Center](#)
- Nuclear energy research at the [Nuclear Reactor Program](#)

College of Natural Resources

- Waste reduction design research at the [Brandon P. Hodges Wood Products Laboratory](#)
- [Center for Earth Observation](#)
- Sustainable forestry research at the [Industry Research Programs in Forestry](#)
- [Southern Center for Sustainable Forests](#)

Office of the Vice Chancellor for Research and Graduate Studies

- [Center for Transportation and the Environment](#)
- [Kenan Center for the Utilization of Carbon Dioxide in Manufacturing](#)
- [Materials Research Center](#)
- [North Carolina Sea Grant College Program](#)

College of Physical and Mathematical Sciences

- Environmental modeling research at the [Center for Research in Scientific Computation](#)
- [The Environmental Statistics Working Group](#) of the Institute of Statistics
- [The State Climate Office of North Carolina](#)



Spotlight on the NC State Solar House

Part of NC State's Solar Center, the [Solar House](#), together with an adjacent research annex, is a living laboratory for solar research. This resource is available to the public as well as students in engineering, architecture, interior design, and other related fields.



Indicators

Number of NC State Extension programs addressing environmental sustainability - 21

Number of colleges and departments these programs are operated by - 4

Industrial Extension Service

- [Environmental Health and Safety](#)
- [NC Solar Center](#)

Office of Extension and Engagement

- [Sustainable Communities Partnership](#)

North Carolina Cooperative Extension Service

College of Agriculture and Life Science and
College of Natural Resources

- [French Broad River Watershed Education Center](#)
- [Natural Resources Leadership Institute](#)
- [Neuse River Education Team](#)
- [NC Stream Restoration Institute](#)
- [Pollution Prevention: Farm*A*Syst, Home*A*Syst, Coast*A*Syst](#)
- [Stormwater and Erosion Control](#)
- [Stormwater Resources](#)
- [Watershed Education for Communities and Local Officials](#)
- [Animal and Poultry Waste Management Center](#)
- [Buffers and Water Quality](#)
- [Environmental Quality and Health](#)
- [Fisheries and Pond Management Extension](#)
- [NC State Pesticide Safety Education Program](#)
- [NC State Water Quality Group](#)
- [Watershed Support System](#)
- [Wetland Soils](#)
- [Wildlife Extension program](#)
- [J. C. Raulston Arboretum](#)
- [Extension Forestry program](#)
- [Forestry Educational Outreach Program](#)
- [Wood Products Extension program](#)

North Carolina State University extension programming is directed by two main extension services: The North Carolina Cooperative Extension Service and the Industrial Extension Service. These Services house several programs related to environmental sustainability. There are more such extension programs within the College of Physical and Mathematical Sciences and the University Office of Extension and Engagement. From air, water and soil quality outreach at the Animal and Poultry Waste Management Center to sustainable community development through the Sustainable Communities Partnership, NC State Extension is working for a more sustainable North Carolina through education and outreach. The following lists detail NC State's varied extension programs related to environmental sustainability, organized by their administrative department.

College of Physical and Mathematical Sciences

- [The Center for Marine Sciences and Technology](#)
- [State Climate Office of North Carolina](#)



Water Quality Group

@ NC STATE



Spotlight on NC State [Water Quality Group](#)

The North Carolina State University Water Quality Group is a team made up of various campus experts that examine and conduct natural resource management programs with an emphasis on nonpoint source (NPS) pollution policy, assessment, and control technologies.

Over the past twenty-six years, the group has been involved in water quality project evaluation, watershed assessment, stream restoration, BMP implementation and education in cooperation with USDA, US EPA, state and local agencies. The NC State Water Quality Group is a component of the North Carolina Cooperative Extension Service and the Biological and Agricultural Engineering Department at North Carolina State University.



Energy consumption, management, and conservation initiatives

The UNC university system spends over 50% of North Carolina's total state government purchases of energy for buildings. In fiscal year 03-04 energy at NC State cost nearly \$20 million dollars which is 11% of the total NC budget for energy. This makes NC State the second largest consumer of energy in buildings in the state, after UNC Chapel Hill.

Significant energy related legislation and directives over the past several years in NC include Governor Hunt's Executive Order 156. This order applies directly to state agencies and universities and requires all to "implement project initiatives or modifications that result in energy efficiency." Several results of the executive order include the State Energy Plan of 2003 calling for a 4% reduction in energy consumption per year and the Utility Savings Initiative, administered by the State Energy Office. This program was set up to help state agencies identify areas for savings and document savings that had been achieved.

In support of the State Energy Plan, NC State has a Strategic Energy Plan to guide the University in conservation to meet state energy reduction goals. The plan commits to reducing energy usage per square foot adjusted for weather by a minimum of 4% over ten years starting in 2004. The Strategic Energy Plan also includes key performance indicators that Facilities Operations uses to track how well the University is doing. These indicators attempt to take into account University growth in terms of gross square feet and weather effects by using degree days. Facilities Operations provided the first annual report on these indicators to the State Energy Office in the fall of 2004.

Energy sources purchased for campus buildings by NC State include electricity, natural gas and fuel oil. Of the money spent on these sources approximately 69% is electricity, 25% is natural gas, and 6% is fuel oil. These sources are then consumed on campus in the form of steam, chilled water, domestic hot water, heating hot water and electricity.

With energy prices on the rise, it is essential that NC State strive to reduce the University's energy consumption in every way possible. The first important stride was made when NC State created the Office of Energy Management (OEM). This office has begun working towards a thorough monitoring of energy use on campus. Obtaining accurate totals of current usage is necessary to be able to manage consumption. OEM is working hard to implement a variety of conservation initiatives at NC State. There are also entities across campus working to research, educate and utilize alternative energy.

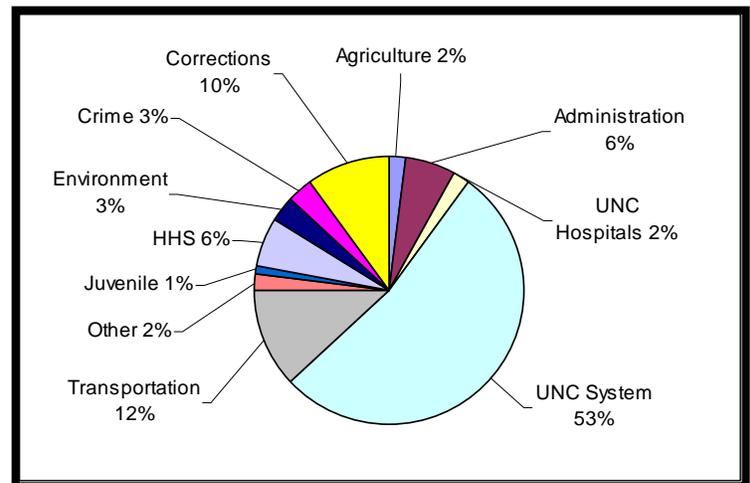
Sub-sections

Usage - Amount of energy consumed at NC State

Monitoring - Measuring and managing energy consumption

Conservation - Efforts to reduce energy consumption and operate more efficiently

Alternative Energy - Research, outreach, education and demonstration projects



FY02 Energy Costs by NC State Agency, Total cost \$179M. Source: "State Energy Plan" Energy Policy Council and State

Links of Interest

- [NC State Office of Energy Management](#)
- [State Energy Office](#)
- [NC Solar Center](#)
- [Energy Policy Act](#)

For more information related to energy use and management on campus contact:

Office of Energy Management
Edward Sekmistrz, Energy Management Engineer
515-2188, Edward_Sekmistrz@ncsu.edu



Amount of energy consumed at NC State

Indicators

- Gross square feet** - 9,986,663
- Total Energy Cost** - \$19,588,501
- Total Energy Cost per square foot** - \$1.96
- Total BTUs** - 1,700,445 million BTUs
- Electricity Consumed** - 234,329,318 kWh
- Electricity Cost** - \$13,512,139

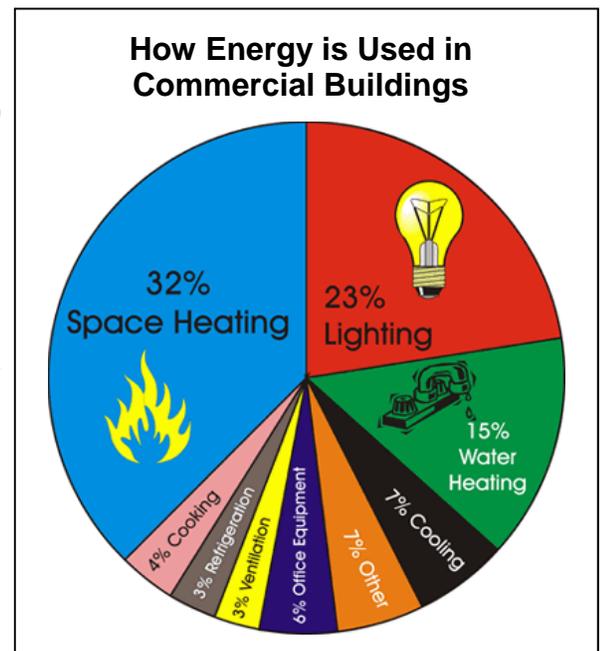
Energy use is one of the largest issues that the University faces from both a financial and an environmental perspective. NC State consumed 1,700,445 million BTUs (British Thermal Unit) of energy, including electricity, natural gas and fuel oil, in fiscal year 03/04. This is equal to 17,673 kilowatt hours of energy per person per year or \$560 per person per year in energy costs on campus.

In North Carolina's climate zone, the majority of energy used in campus buildings is for heating, cooling and lighting. Central steam plants provide heating for North Campus, Centennial Campus and the Centennial Biomedical Campus. Most buildings in these areas are connected to the plants instead of

generating their own steam, which should eventually allow efficiency in the provision of heat and easier maintenance. There are ten buildings at NC State that produce their own steam for heating. Approximately 32% of total energy in a building is utilized for heating (percentage could be less in NC climate zone).

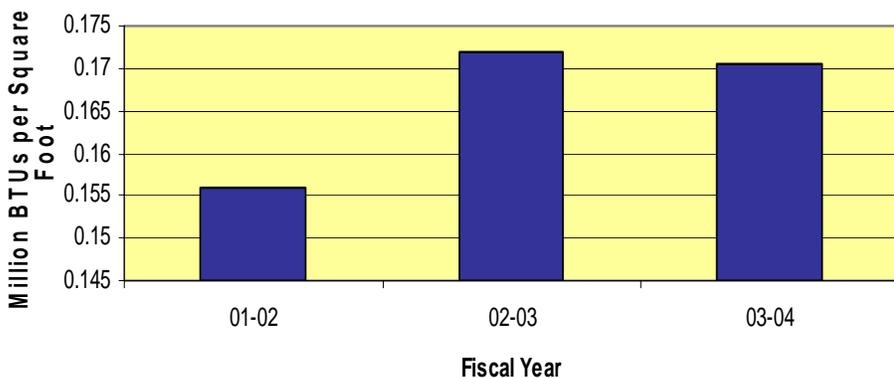
When built, many campus buildings at NC State did not have central air conditioning. Through the years, individual building chillers were added to provide air conditioning to the building. Currently NC State is transitioning to using central chiller plants which can be operated more efficiently as well as better accommodate changes in weather. Approximately 7% of total energy in a building is utilized for cooling (percentage could be more in NC climate zone).

Lighting utilizes a large amount of energy in commercial buildings. However, it is also the usage area that building occupants can conserve the most on. A 60 watt light bulb that is burned 24 hours a day, every day for a year costs the University approximately \$30 a year. If every person on campus were to burn one less light bulb each day, the savings, both financially and environmentally, would be enormous.



Since there are both "Appropriated" and "Receipt" funded buildings at NC State, billing for energy usage is complicated. Many departments are billed by Facilities Operations for the power that they use and thus have opportunities to save money on power bills by operating more efficiently. In other areas, such as Centennial campus, utilities are included in the rent for the building. Therefore, unless the building is an unusually heavy energy user, occupants do not pay more for the amount of power they use, creating little incentive to conserve.

NC State Energy Usage



"If we do nothing else but eliminate the waste we'd be in good shape and ...we could hold down the cost of tuition." - Jack Colby, Director of Facilities Operations

Monitoring

Measuring and managing energy consumption



Indicators

Buildings Metered - unknown

Electric Meters - 171

Avoided costs - \$976,496

Heating Degree Days - 3,182

Cooling Degree Days - 1,734

Monitoring is the first and most important step in being able to manage the amount of energy that is being used at NC State. Professor Herb Eckerlin, said very simply that, "You can't manage what you don't measure." However, management is much easier said than done.

NC State consists of nearly 400 buildings of various sizes and utilizes everything from small sheds to large auditoriums. Many buildings are old, some have been remodeled, some buildings are brand new. The incongruent nature of campus buildings makes it extremely difficult to have a consistent monitoring system for energy.

Currently there are 171 electric meters at NC State. Some buildings have no meters, some have multiple meters, and some meters cover more than one building.

The reading of meters has been done by Housing and Facilities in a system that is labor intensive and does not allow easy access to historical data. New utility accounting software should be in place in 2005 which will allow for greater ease in tracking and analyzing utility usage on campus. It will also allow for bill reconciliation and analysis of historical utility use.

The Utility Services Group will be hiring a dedicated staff member who will be responsible for performing a complete survey of campus meters in 2005 and for reading the meters. The survey will help identify which buildings are well metered and which need additional meters. Since electricity is the largest piece of the utility bill, electric meters are likely to be the first focus for new meters. There will also be a \$300,000 effort to "install, repair, calibrate, replace" meters.

One of the complications with monitoring is that certain areas of campus do not fall under the scope of the Utility Services Group, notably several facilities and fields within the Athletics Department. The Athletics Department is billed directly by Progress Energy for electricity. This makes it more difficult to determine overall campus energy usage.

One of the ways that energy is measured on campus is to use the concept of degree days to help relate energy usage to outside temperature variations. Heating degree days relate to heating a building, and cooling degree days relate to demand for air conditioning. Heating degree days have an average temperature below 65°F, cooling degree days have an average temperature above 65°F. While electricity is influenced more by the number of students on campus, heating days have a big influence on the use of natural gas and oil.



Spotlight on the Office of Energy Management

The Office of Energy Management (OEM), established in 2003, within the Utilities Services Group, consists of one certified energy manager, an energy conservation coordinator, and an electronic technician. This office has developed a strategic energy management plan with the long term goal of reducing campus energy use by 20%.

OEM monitors energy use across campus and encourages students, faculty and staff to conserve energy. OEM ensures that the University is not being overcharged for its utilities and negotiates price breaks on fuel. In addition, they work to identify potential conservation projects and give guidance on selecting efficient equipment.

The Office of Energy Management estimates that they have saved over \$1 million in FY 2004 through electric rate schedule changes, negotiated fuel prices and conservation projects.

Links of Interest

[Progress Energy Fuel Mix](#)
[Green House Gas Inventory Guide](#)
[Degree Day Definition](#)



Efforts to reduce energy consumption and operate more efficiently

Indicators

Number of OEM conservation projects
FY03-04 - 11

Dollars spent - \$60,588

Estimated savings - \$30,193 per year

Average Estimated Payback - 2.01 years

Number of Occupancy Sensors -
Unknown

Number of Infrared Sensors - Unknown

One of the biggest steps towards energy conservation at NC State was the creation of the Office of Energy Management (OEM). There are currently many on-going conservation projects including several initiated by OEM. The projects range from using compact fluorescent bulbs, more efficient light fixtures (T8s vs. T12s) and reducing the number of lamps needed, to adding programmable thermostats and insulating hot water lines.

The Office of Energy Management spent \$60,588 in fiscal year 03-04 on 11 conservation projects. The estimated savings was \$30,193 per year with an average expected payback of just over two years. There is also a \$200,000 effort underway in conjunction with Facilities Planning and Design to perform lighting retrofits.

The Office of Energy Management evaluates the sites of energy conservation projects by considering the benefits, payback time and whether sites are slated to be renovated. Buildings that have plans for

renovation in the next five to ten years are not targeted for conservation efforts due to the fact that the renovations could defeat any conservation related projects. OEM chooses to focus on buildings where they believe conservation will make the largest impact and have an extended period to function, and thus a greater payback.

Conservation Projects

- Research is being performed on improving the usability of window blinds that allow them to be opened or closed using a wall switch. The automatic blinds have the potential to save energy by using sunlight instead of overhead lamps, and save money on cooling by blocking light and heat. The blinds can be put on a timer or central switch to close or open the blinds at certain times of the day. A field test is ongoing in the Talley Student Center.
- Many departments are switching from CRT computer monitors to LCD monitors which use about half the power, generate less heat, take up less space, and have no flicker so they are easier on the eyes. In D. H. Hill Library about one third to one half of all monitors are LCD flat panels and there are 40 compact public use PCs that are more energy efficient than standard CPUs.
- The Information Technology Division is using centrally controlled air conditioning systems that set the temperature at a particular level and which limit the number of people who can adjust the thermostat. They also have a Lights Out campaign to encourage employees to turn off lights when they leave the building.

Projects such as these not only help reduce energy but set a positive example for the campus community.

Links of Interest

[Energy Management Projects](#)
[NC Solar House](#)
[Occupancy Sensors, NC State Successes](#)



Spotlight on D. H. Hill Library

D. H. Hill Library is currently renovating the reference desk area of its east wing where dozens of public access computers were previously located. Many of the computers were compact and efficient Dell ultra-small form factor PCs with LCD flat panels. Due to insufficient power to run all of those PCs in the temporary public access area during the renovation, the library worked with their Facilities Manager to develop alternatives. The solution was the installation of 34 Sunray 150 Thin Clients, which are essentially LCD monitors with a keyboard allowing access to the Internet. The Thin Clients allow full Web and Windows application access, but have no CPU and no ports to connect external media such as floppy disks, jump drives, or CDs. They also use about 30-40% of the power of a normal CPU.

Alternative Energy

Research, outreach, education, and demonstration projects



Indicators

Energy Generated by Solar House - 6700 kWh per year

Energy costs saved due to Solar House - \$500 per year

BTUs purchased from renewable energy sources - 0

The use of alternative energy is one of the most important ways that a university can make a difference in energy consumption. Students at some schools in North Carolina have even raised student fees to cover the cost of implementing alternative energy initiatives. NC State is still exploring options for the future on how to incorporate alternative energy into everyday use. However, the Department of Mechanical and Aerospace Engineering does offer classes such as Solar Energy and Energy Conservation and Industry. This department also operates the Industrial Assessment Center who has performed alternative energy projects in conjunction with the Solar Center and the Office of Energy Management.

Spotlight on the North Carolina Solar Center

The NC Solar Center has sixteen years of experience demonstrating the effectiveness of conservation techniques and alternative energy use. The Solar Center has about \$3 million in grants and contracts to perform basic research, education, and extension work around the state. The Solar House uses a combination of efficient home design, photovoltaics, solar hot water, and wind power to meet the utility needs of the NC Solar House and the Alternative Fuels Garage. The Solar House currently saves the University about \$500 per year in energy costs, but is expected to increase this savings level to \$1,200 to \$1,500 per year once wiring upgrades are complete. The Solar Center is conducting research on the potential for wind energy use in coastal areas, energy efficient classrooms, fuel cells, and biofuels such as ethanol and biodiesel.

The North Carolina Solar Center also displaces the use of a small amount of electricity for the NC Solar House with its efficient construction, photovoltaics, wind turbine, and solar water heaters. While NC State does not purchase power from the NC GreenPower program, the North Carolina Solar House, located at the NC State McKimmon Center, plans to be a supplier. The Solar House is also noted for its use of energy conservation in keeping energy bills down. By utilizing alternative energy methods, the Solar House only uses about \$60 of energy per winter for heating.



The Solar House

The educational projects of the Solar Center include outreach to K-12 school groups, the EV Challenge, Junior Solar Sprint, and Students Fueling the Future. Extension activities include the NC HealthyBuilt Homes Program, the Database of State Incentives for Renewable Energy (DSIRE), technical and policy assistance for renewable energy companies, construction design reviews, and coordination of the NC Industries of the Future Program. In addition, the Solar Center provides professional training through workshops, a Renewable Energy Diploma, and is planning a Green Builder Diploma series.

The NC Solar House was visited by 275 students from twelve NC State classes in FY04. It was also visited by seven other colleges and universities. There are 15 NC State students working at the NC Solar Center, most of whom are masters students.

Links of Interest

[NC GreenPower](#)
[NC Coastal Wind Initiative](#)
[NC HealthyBuilt Homes Program](#)
[NC Solar Center](#)

For more information on the NC Solar Center contact:

Steve Kalland, Director
 515-6366, steve_kalland@ncsu.edu
 515-5666, ncsun@ncsu.edu



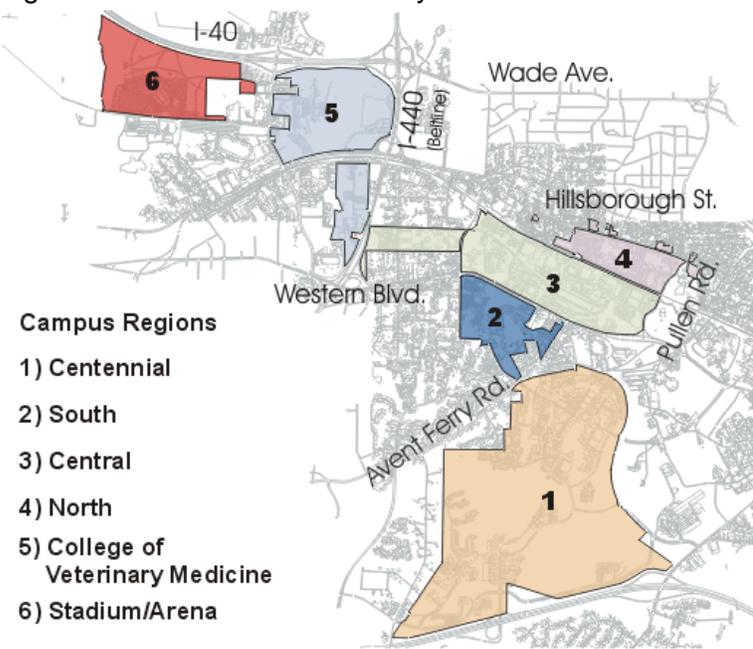
Policies and procedures for use and maintenance of NC State land

Universities, as institutions of higher education, have an important presence within the community and can often act as a primary social and economic component for cities. They are constantly expanding to meet the needs of growing enrollment and a changing society, and development of university land and facilities has an enormous impact on the surrounding environment. Therefore, university decisions are innately tied to community well being.

Land use decisions in particular become important when trying to balance campus needs with those of the surrounding community. Improper lateral expansion, for instance, could threaten established business and residential areas. On the other hand, the community exerts its own pressure upon the university. Over-development of the campus interior would mean loss of green space, which is important to both the university and city.

Issues such as these all impact North Carolina State University, a research extension based land-grant institution located in the heart of Raleigh, NC, a growing southern city. The University's main campus stretches across approximately 2200 acres of prime real estate and anchors one corner of the Research Triangle Park, a hub of high-tech industry. This rapidly developing area consistently ranks as one of the nation's best places to live and do business.

As a land-grant institution, NC State is part of a centuries old tradition of accessible higher education. This system was conceived with the goal of developing, at the college level, "instruction relating to the practical realities of an agricultural and industrial society" that was available to the "common man." NC State takes this mission seriously and controls over 100,000 acres of research farms, forests and facilities across NC to foster mutually beneficial relationships between the campus and the NC community.



Sub-sections

Use of Space - How NC State uses its current space and plans for the future

Restoration - Programs focused on repairing damaged natural areas on campus

Conservation - The protection and wise use of NC State's natural areas

Grounds Management - How NC State maintains its landscaped space

Stormwater - How NC State manages campus run-off

This ethic of incorporating agricultural, social and industrial factors into land use decisions is also displayed on the main and Centennial campuses in Raleigh. Through the master planning process, NC State has examined the institution's impact on the surrounding community and attempted to minimize any detrimental effects. Several of the Guiding Principles of the Physical Master Plan illustrate this commitment including Environmental Sustainability, Pedestrian-Oriented Campus and Efficient, Responsible Development. These guidelines shape the development, use and maintenance of the entire NC State campus.

Links of Interest

[NC State Physical Master Plan](#)
[Centennial Campus](#)

For more information related to land use and development on campus contact:

Office of the University Architect

Michael Harwood, University Architect, 515-6259,
michael_harwood@ncsu.edu

Use of Space

How NC State uses its current space and plans for the future



Indicators

Total acreage of NC State Campus - 2,241

Total acreage of NC State outlying lands - 104,027

% of Open Space on NC State Campus - unknown

Campus Space Deficit - 900,000 ASF

All development and use of space at NC State is guided by the University Physical Master Plan and the two fundamental principles of “Campus Neighborhoods” and “Campus Paths.” “Neighborhoods” are the university’s primary planning unit for physical development. These areas may have diverse characteristics, but all contain a mix of uses, have a sense of self-contained place, and are focused around a shared open space. Neighborhoods are connected by essential networks of “Campus Pathways”. This system ranges from footpaths to transit routes to vehicular thoroughfares. However, the emphasis is on people-powered movement and pedestrian accessibility to campus. Every construction guideline and standard is tied to these concepts and all project proposals are judged by “their contribution to their neighborhood, the network of paths, the campus as a whole, nearby city neighborhoods and the natural environment.”

Campus Space Needs

Increasing enrollment and ever-expanding research goals at NC State exert pressure on the surrounding environment because of the need for new buildings and space to meet demand. The [University Space Committee](#), chaired by the Provost and Executive Vice Chancellor, approves all allocations of space on campus except Holladay Hall. All University buildings and land are subject to assignment and reassignment to meet the institution's overall priorities and needs. This committee attempts to balance space requirements and the educational mission of the university with the Guiding Principles set forth in the Master Plan including “Efficient, Responsible Development - efficient use of land, buildings, and utilities for environmental, economic, and community reasons” and the commitment to Environmental Sustainability.

In 2000, the Master Plan Space Needs Analysis detailed the areas of campus most in need of additional capacity. There was an approximate deficit of 900,000 assignable square feet. This was broken down into:

Classroom Space - 2%
 Class Labs - 8%
 Open Labs - 11%
 Research Labs - 48%
 Study Space - 17%
 Student Services - 14%

The only areas of campus with sufficient room for expansion were office space and athletics. Additional needs included new parking facilities and increased student housing capacity. To meet this demand a Capital Improvement Plan was developed that would add over 2 million assignable square feet to campus by 2005. The implementation of this Plan has already significantly altered the campus landscape and will continue to make land use decisions at NC State extremely important.



Spotlight on [Centennial Campuses](#)

Centennial Campus, a 1,334 acre site adjacent to NC State’s main campus, is hailed as a vision of the future. It is a “technopolis” of multi-disciplinary research and development neighborhoods with university, corporate and government facilities

intertwined within a residential and recreational community. This campus also strives to be a model of environmental stewardship for North Carolina - showcasing how state of the art development can be achieved in harmony with the surrounding natural environment.

[Centennial Biomedical Campus](#) (CBC), including the NC State College of Veterinary Medicine, represents a broadening of the original Centennial Campus model. CBC will focus on the partnerships between NC State, government and industry on biomedical applications, both to humans and animals.

Restoration

Programs focused on repairing damaged natural areas on campus



Indicators

Completed phases of Rocky Branch restoration - phase 1 of 3 complete

Completed phases of North Creek restoration - awaiting clearance of EEP 319 grant. Estimated completion in 2006

Over the past several decades, NC State has become a leader in environmental restoration and a model for other universities. Recognizing the rapid loss of natural systems within the Triangle area, faculty, students and staff have urged the preservation and restoration of significant natural resources on campus lands that have high educational value. Projects such as the Rocky Branch and [North Creek restorations](#) serve as valuable pedagogical tools for students and professionals learning how to preserve and design natural systems in urban areas.

Spotlight on [Rocky Branch Restoration Project](#)



Rocky Branch – Reach III
Before restoration project

Rocky Branch was one of the first urban stream restorations to happen in the southeast, placing NC State at the forefront of a growing effort to restore degraded streams to their natural state. Funding totaling over \$5 million dollars came from several sources including: NC Clean Water Management Trust Fund, EPA, University funds, FEMA, Federal grant from NC DOT, and stream mitigation funding from NC DOT.

Background

Rocky Branch runs 6100 feet through campus from Gorman St. to Pullen Rd. The creek drains into Walnut Creek and has a water shed of approximately one sq. mile. Over the years, surrounding development has severely degraded the stream. Floodplains have been filled in, banks

have been undercut, and sections have been channelized and culverted. Impervious area surrounding the creek has greatly increased, resulting in heavy storm water run off, non-point source pollution and drastic changes to the stream's dimension, pattern and profile. The NC Division of Water Quality classified Rocky Branch as the state's most polluted urban stream in 1978. Concern for the creek among the campus community led to extensive monitoring of the stream, and the development of a restoration plan.

Project details and goals

[NC Sea Grant](#) and NC State's Facilities Division are working together to complete the restoration in three phases. All phases of the restoration aim to:

- Restore a stable/self maintaining stream channel
- Stabilize stream banks with vegetation
- Create/improve habitat for fish and aquatic invertebrates
- Reduce pollution levels of storm water entering the creek with enhanced riparian buffers and storm water controls
- Complete the greenway adjacent to the creek (including informational signage) for recreation and passage through campus



Rocky Branch – Reach III - July 2004

Education is also a critical component of the Rocky Branch project. Due to the fact that the creek was severely down-cut and confined to a narrow corridor through campus, the university community was almost unaware of its existence. The long-term goal is to establish a stable self-maintaining urban stream with a mature riparian buffer that is inhabited by high quality flora and fauna. The stream must first pass through several successional stages and it will take more than 20 years to achieve complete restoration.

For more information on the Rocky Branch Restoration Project contact:
Barbara Doll, Sea Grant Water Quality Specialist, 919-515-5287, barbara_doll@ncsu.edu

Conservation

The protection and wise use of NC State's natural areas



Indicators

Undeveloped land on Main campus, Centennial and Centennial Biomedical campuses - 1,172 acres

Undeveloped land that is able to be developed on Main campus, Centennial and Centennial Biomedical campuses - 424 acres

NC State continues to develop rapidly in response to increasing enrollment and demand. There are approximately 1,172 acres of undeveloped land remaining on campus, most of which resides on Centennial Campus. Use and management of these spaces is a subject of much discussion as the University strives to strike a balance between meeting the needs of a growing campus and preserving its natural areas. Undeveloped areas enrich the quality of life on campus in several ways. Not only are they aesthetically important to campus, they also serve a great purpose in managing storm water run off and functioning as living classrooms and academic resources.

Master Plan

NC State is committed to natural systems protection and acknowledges the value of these areas to the University. The master plan states that "Natural Systems are an important part of the overall campus environment" and that NC State "will develop the campus in a way that sustains the natural environment". Additionally, the Master Plan includes a commitment to "protection of natural systems" and "efficient and responsible development", and mentions "preserving irreplaceable campus buildings and landscapes".

As a reflection of this commitment, the Master Plan states that "Neighborhoods and the Shared Open Space will have access to adjacent landscape features through a system of paths connecting creeks, promontories, the Oval and other Campus Greens, the lake edge, campus forest, and other campus landscape features." In addition, the plan states that "A healthy tree canopy is a part of the state's and the university's natural heritage." Through proper management NC State seeks to maintain the health and vitality of the trees on campus. Maps of the campus "Natural Areas" and "Tree Corridors" are available in the Master Plan.

Campus Greens

According to the Master Plan there are two Campus Greens on the NC State campus. One is the [Court of North Carolina](#), a century old large green space on east campus. This area has been well loved and used by the faculty, staff and students of NC State and is also avidly protected by the campus community. There is an outdoor classroom that is utilized on nice days as well as a plaque that dedicates the space to the use of future generations. The second Campus Green is the proposed "Oval" on Centennial Campus. However, there are a few additional open green spaces on the NC State campus. One such space is Miller Fields, two large open fields on main campus used for intramural sports and special events. Another area is Greek Court, which is home to a large green space that is surrounded by the Fraternity and Sorority houses. This space is mainly used for recreation and special events.

Spotlight on [WALARA](#)



The Woods at Lake Raleigh (WALARA) encompass the water and land area surrounding woodlands and

wetlands on Lake Raleigh, at NC State's Centennial Campus. As NC State continues its master planning process for Centennial Campus, a committee of administrators, faculty, staff and students are considering alternate possibilities for The Woods at Lake Raleigh. In October 2004, a symposium provided a forum for the campus community and community at large to join in this discourse.

Presenters at the symposium included faculty, students and administrators from NC State, a representative from the North Carolina Wildlife Resources Commission, and a keynote presentation by Dr. John Wear, Director of Catawba College's Center for the Environment.

The day included an opportunity for attendee participation at a mid-day charette. During this discussion, participants were able to create and debate various uses of the property surrounding Lake Raleigh. This event culminated with a straw vote count, establishing a "University Teaching and Research Laboratory," and "Biodiversity Preserve" as the most popular options among attendees. Planning for this important university asset continues.

Grounds Management

How NC State maintains its landscaped space



Indicators

Maintained acreage - Intensely manage approximately 950 acres of land including Centennial Campuses

Funds spent annually on environmental controls (pesticides, equipment and other chemical controls) - FY03-04 approximately \$14,000

% of total plant inventory native – no official plant inventory

Most prevalent pesticide – Round Up

Area requiring heaviest chemical maintenance- turf grass areas, Miller Fields and Carter Finley Stadium

Most prevalent plant species being intentionally grown on campus – no plant inventory

Area most heavily watered – Grounds Dept – Miller Fields, Athletics Dept. – Carter Finley

The Grounds Management Department consists of area crews that maintain specific zones of campus and specialty crews including the arborist, masons, turf manager, irrigation manager and the Office of Waste Reduction and Recycling. NC State is broken down into six zones. Carter Finley stadium is maintained by the Athletics department. Grounds intensely manages about 950 acres of land including the Centennial Campuses.

Over the past several years, there has been an increased number of training programs and highly trained individuals working within the Grounds department. Additionally, the Grounds department participates on more committees and collaborates with different entities on campus much more than in the past. There has also been a shift in resource management with an increased focus on conservation.

This focus on conservation has translated into a stewardship perspective for the Grounds Management Department. Whenever possible managers and employees evaluate decisions based on long-term impacts and best management practices. Several examples of this include staff walking sanitation routes to avoid vehicle use, supporting student gardens, maintaining campus stormwater retention ponds and managing the “tree canopy” of campus as one entity rather than individual, disconnected trees. This management strategy not only contributes to the aesthetics of campus, it directly impacts the sustainability of the entire University.



Irrigation

Miller Fields are the highest water consuming area maintained by the grounds department. Turf grass requires high water intake to maintain a certain standard and quality for safety purposes. Carter Finley Stadium is maintained by the Athletics department and also requires large amounts of water for irrigation. In light of recent droughts, NC State has adopted some “xeris-scaping” (low water landscaping) techniques such as using drought tolerant plant materials in designs. Additionally, NC State recently installed an advanced water saving irrigation system, Maxicom, on Miller Field. Maxicom is an irrigation data set system that links to remote satellite stations. A central computer combines data from weather stations, evapotranspiration rates, and rainfall information and produces a suggested watering schedule for the area. The new system is expected to save great amounts of water in an effort to meet the goal of a 10% reduction in water by state agencies set by Executive Order 156.

Input on landscaping design and new construction

Due to the number of new construction and renovation projects on campus and the impact on campus landscaping, a review process was developed to provide opportunity for more input from diverse departments on campus, including the Grounds department. For each project on campus, the contracted landscape architect determines the planting design and submits it to the construction manager. The University Landscape Architect reviews plant species involved in the project with input from the Grounds department. NC State’s exterior Master Plan does provide some guidance on certain species to be planted to maintain consistency with the current landscape. The final review comments are submitted by the NC State Landscape Architect. If plant material does not survive after installation, the Grounds department has decision making power and will choose an appropriate replacement.

Grounds Management Continued

How NC State maintains its landscaped space



Spotlight on Integrated Pest Management

NC State is in the process of developing its Integrated Pest Management (IPM) plan, which will incorporate diverse techniques to minimize reliance on chemical pest controls.

Strategies included in the campus IPM plan (some in development);

- *Establishing a threshold of tolerance* - deciding how much a particular pest can be tolerated in a particular location before taking action
- *Tier application policy* – a three level system to discourage using especially toxic chemicals
- *Correct diagnosis* - sending samples to the plant disease and insect clinic to ensure proper diagnosis and treatment
- *Prescriptions* – when a diagnosis is made, a prescription is written and given to the applicator
- *Mechanically controlling before resorting to spraying*- Weeds over two or three inches tall are not sprayed, they are pulled and hoed out.
- *Reducing overall inventory of chemical controls* – ordering in smaller quantities, eliminating outdated supplies, and mixing only the amount to be used
- *Tighter record keeping* - making sure individuals are using the correct chemicals in the correct manner.

Pesticides

The Environmental Health and Safety department maintains a list of pesticides approved for use on campus and all departments must choose from this list. The Grounds department keeps an official inventory list of chemicals used on Main and Centennial Campuses. The inventory is updated quarterly. CBC keeps a separate inventory and privately operated areas of Centennial Campus are not regulated by NC State's chemical standards.

Selection

Chemicals are not selected based solely on cost and effectiveness. Health and environmental concerns such as chemical persistence and its effect on the campus community are often the deciding factors. Similarly, these factors are considered when deciding the amount and location of chemical applications. With the exception of some pre-emergent applications on turf that are regularly scheduled, pesticides are applied on an as needed basis. While there is no written policy yet, NC State has taken great strides in reducing pesticide use on campus.

Application

Application of pesticides occurs in early morning when winds are calm to prevent drifts. If winds increase, application ceases and is rescheduled for another day. There are no public notices, however there are chemically sensitive students who request notification and they are notified 3 to 5 days prior. Additionally, if level three of the tier system is reached, or anything is used that has a noticeable odor, effect or restricted entry (can not enter area for a certain number of hours after application), then building liaisons are notified and told to shut their windows and alert staff and building occupants about the application.

Education, Training and Safety

There are licensed applicators on staff certified by the Pesticide Safety Board of NC. The Grounds department funds every step of the licensing process for its employees from the pesticide safety classes and the exam to continuing education events like turf and field day, and IPM seminars. Additionally, there are scheduled training events covering safety topics on a weekly basis.

For more information related to grounds maintenance on campus contact:

Grounds Management and Fleet Services

Bill Beardall, Assistant Director
515-9872, bill_beardall@ncsu.edu

Policies

NC State is in the process of strengthening an Integrated Pest Management (IPM) plan and has a Tier policy in place to minimize pesticide application.

There are no written policies in place strictly requiring use of only native and drought tolerant plants. However, these practices are encouraged in the Master Plan. The exterior Master Plan does indicate certain tree types to be planted along specific streets, etc. in order to stay consistent with current landscape designs.

Storm Water

How NC State manages campus run-off



Indicators

Impervious surface on all NC State owned land - 529 acres

Impervious surface on primary campuses (Main, Centennial, Cent. Biomedical) - 427 acres

Number of BMP sites - unknown, to be determined with new storm water management plan

With increased construction on campus, stormwater management has become a concern for NC State. Improper stormwater management can lead to erosion, water pollution and sedimentation build up in streams. Green space or other pervious surfaces are important because they act as a filter for stormwater and the pollutants it carries. In accordance with NC State's current National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit and associated Management Plan, the University requires that stormwater management techniques be applied to all new development and redevelopment projects in the form of structural and non-structural Best Management Practices (BMPs). Stormwater management involves an integrated approach that addresses the issues of pollutant control, capture and treatment affecting both water quality and quantity associated with urban development.

BMPs used on campus

Bioretention areas (rain gardens), sand filter systems, oil grit separators, grassy swales, constructed wetlands, retention ponds, level spreaders, and grassy filter strips are all used at NC State. Following construction, the Grounds Management department maintains all BMPs.

Stormwater committee

The stormwater committee meets regularly and has several responsibilities including assisting the storm water manager with the continued development of the management program. Departments represented in the committee include: Construction Management, Environmental Health and Safety, Facilities Planning and Design, Facilities Operations, Real Estate, Transportation and the University Architect's Office.

Stormwater fund

All new development projects on campus must meet a 30% nitrogen reduction goal utilizing planning considerations and BMPs. Additionally, all new construction must meet a nitrogen-loading rate of 3.6 pounds per acre per year. Projects have the option of partially offsetting projected nitrogen loads by paying a one time offset fee. The stormwater committee is responsible for setting the fee for each project and the fund is managed by Facilities Planning and Design. As stated in the newly revised Stormwater Guidelines of New Development and Redevelopment Projects, the Offset Payment Fee is currently set at a minimum of \$450.00 per pound per acre. The stormwater committee has the authority to review plans on a project-by-project basis and make adjustments to the offset payment fee.

The funds collected are put in a trust account and then used for storm water management efforts on campus such as retrofits and educational material. A recent project in which offset payment money was used was the North Creek Constructed Wetlands. It is not certain that the storm water fund will be renewed once the account is empty. The university prefers to shift focus to pollution prevention rather than mitigation.

Spotlight on Updating NC State's Stormwater Management

NC State has recently received approval of a Municipal Separate Storm Sewer System (MS4) permit. Following this approval, Environmental Health and Safety staff have been working to update campus stormwater maps and achieve the following goals:

Top Five Priorities upon obtaining the MS4 permit:

- 1) Develop GIS data management system
- 2) Field verification and inventory of outfalls and BMPs
- 3) Develop written procedures for each component of storm water management
- 4) Continued sediment and erosion control inspections & reporting
- 5) Development of a stormwater education and outreach program.

For more information about stormwater management on campus contact:
Environmental Health and Safety
Gwyn Rowland, Stormwater Manager
513-4030, gwyn_rowland@ncsu.edu

Materials Management

p. 36



Managing the flow of materials through the campus system

Preliminary data suggests that the state government of North Carolina purchased approximately \$4.3 billion in goods and services in FY03-04, not including construction; the University of North Carolina system schools spent about \$927 million and NC State purchased about \$150 to \$196 million worth of goods and services in FY03-04.

While there are guidelines for how federal agencies should spend money related to environmentally preferable procurement, such as EPA's Comprehensive Procurement Guidelines and Environmentally Preferable Purchasing Program, they do not apply to state level agencies. Federal Executive Order 13101 describes environmentally preferable as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose."

North Carolina state agencies are governed by Executive Order 156 which encourages the purchase of environmentally preferable products, "including products made wholly or in part from recycled materials." It also states that "agencies shall avoid unnecessary printing or photocopying of printed materials, and shall require two-sided copying on all documents when feasible and practicable. To the extent feasible, all new and re-manufactured photocopy machines and laser printers purchased shall have duplexing capabilities," and all new and re-manufactured photocopy machines and laser printers must be able to use at least 50% recycled content with a minimum of 30% post-consumer content. Agencies are also required to attempt to meet a goal that 100% total dollar value of paper and paper product purchases be toward those with recycled content and should buy the highest percent of post consumer content feasible and practicable.

NC General Statute 143-58.2 specifies that state agencies shall use or require the use of products with recycled content, eliminate procedures and specifications which discriminate against the use of goods with recycled content, revise bid procedures to encourage purchases of recycled goods, and requires agencies to report on such purchases to the Division of Pollution Prevention and Environmental Assistance (DPPEA), which provides a yearly summary of these reports to the General Assembly. NC General Statute 143-58.3 set a goal that by 1997 at least 50% of paper and paper product purchases consist of recycled content material. DPPEA has compiled this data for the past nine years, but they have yet to achieve 100% participation from state agencies. The response rate out of 221 agencies is about 86%.

The buying power of state agencies is enhanced by the state contract system, which is managed by the NC Division of Purchase and Contract. The university can buy from state contract vendors at a reduced rate from the retail price. Purchasers can learn about vendors who provide environmentally preferable goods and services from a number of sources including state e-procurement training, DPPEA's Environmentally Preferable Procurement (EPP) website, links on the NC Division of Purchase and Contract website, and the NC Project Green listserv. Buyers are required to purchase materials from state contract unless they can find the same product for a lesser price or the item they are purchasing is not covered by a state contract.

Links of Interest

[Executive Order 156](#)
[NC General Statute 143-58](#)
[EPA's Comprehensive Procurement Guidelines](#)
[Federal Executive Order 13101](#)

Sub-sections

[Purchasing](#) - Procuring materials and services for campus operations

[Environmentally Preferable Purchasing](#) - Guidelines and resources for buying environmentally preferable products and services

[Surplus](#) - Management and sale of obsolete materials and equipment

For more information related to purchasing and handling of obsolete equipment on campus contact:

Materials Management

Bob Wood, Director of Materials Management
515-6121, bob_wood@ncsu.edu

Purchasing

Procuring materials and services for campus operations



Indicators

Dollars spent by the University on goods and services - \$150 million

Dollars spent on recycled goods - Data unavailable

% of monitors that are LCDs - 34%

Number of central purchasing agents - 7

North Carolina State University purchased about \$150 million worth of goods and services in FY 03-04; of that about \$50 million was spent on items costing less than \$5,000 by individual buyers around the University. The rest of the money came from purchases that were greater than \$5,000 and had to go through the Purchasing department.

Purchasing is decentralized by design across campus, with purchases below \$5,000 in value being handled by individual buyers. The Purchasing department handles all purchases over \$5,000, which are required to be put out for competitive bid. Purchasers have to purchase from the state contract unless they find the same item at a better price somewhere else, then they have to go through a procedure to document the lower price. That information gets fed back to the state so Purchase and Contract can negotiate better deals. The Compliance Group checks small and P-card (purchasing cards) purchases at the end of each month and questions those purchases that did not follow the right procedures, such as buying from state contracts and getting receipts. Leases and lease-to-own agreements follow a different process, to make sure the department can afford the lease and has the funds to pay over time.

Some of the biggest challenges that the purchasing department faces are the need to constantly educate buyers, particularly due to faculty and bookkeeper turnover. Bookkeepers have many demands on them in terms of how to track purchases, following strict procedures, and providing information. Purchasing tries to minimize the number of changes to the computer system to prevent bookkeepers from being overwhelmed by new requirements.

While state policy is to minimize printing and copying, there are no specific incentives to do so other than charging per copy and the desire to cut costs. There has been a decrease in the number of printed newsletters on campus as many are now distributed by email or websites.

The vendors on state contract for office supplies include Corporate Express, Get it Quick.Com, Piedmont Office Suppliers, and Staples. Staples is the University's preferred vendor for office supplies. All purchases through the Staples link will be automatically charged to departmental accounts. NC State uses take-back clauses, making suppliers responsible for disposal of items, but not very frequently. The use of take-back clauses depends on the commodity and may be used for safety reasons or to avoid disposal fees.

Spotlight on Wolfcopy

Wolfcopy maintains 535 copiers on campus, or about 90% of campus copiers as well as 131, or about 20%, of the printers on campus. All of Wolfcopy's printers and copiers are Energy Star products. All of their paper is 30 – 50% recycled content, depending on the application. Wolfcopy is working on a new contract which will require that all copiers can use 30% recycled content paper. Their copiers are leased, but printers are purchased and after usable life of 2-4 years, depending on how heavily they are used, the printers go to Surplus Property for reuse within the University, by other government agencies, or the general public. Wolfcopy recycles their toner cartridges and uses recycled toner cartridges in their machines. Faculty and staff can choose to use Wolfcopy or to purchase paper and equipment from other sources. So while Wolfcopy's procedures are in compliance with state and Federal environmental requirements, campus users are not required to use their services.

Links of Interest

[NC State Materials Management](#)
[NC State Purchasing Guidelines](#)

[NC E-Procurement](#)
[NC Division of Purchase and Contract](#)

Environmentally Preferable Purchasing

Guidelines and resources for buying environmentally preferable products and services



Indicators

30% recycled content paper purchased - 30 million sheets

% of paper purchased that has 30% or higher recycled content - unknown

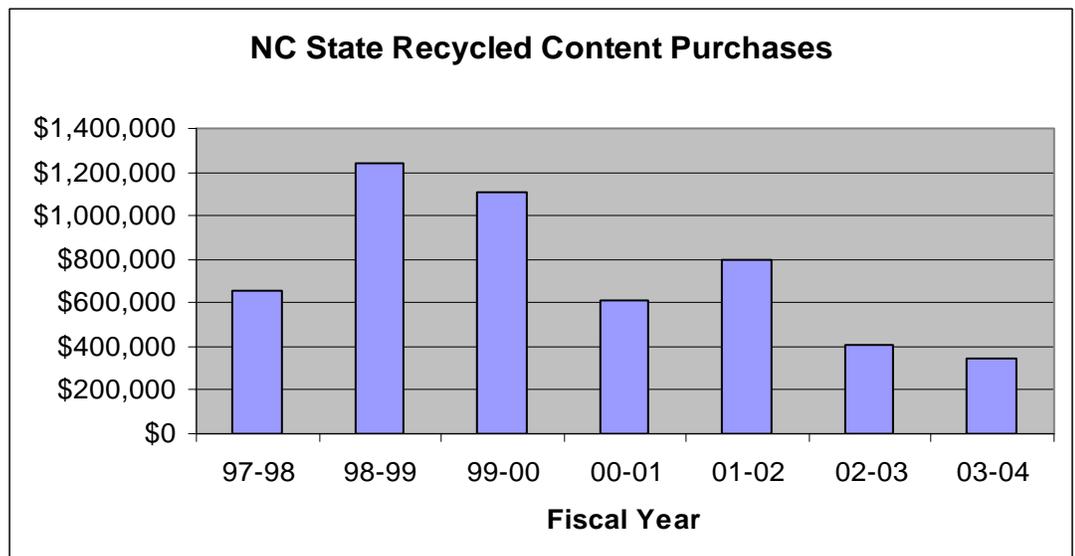
Amount of other recycled content goods purchased - unknown

Energy Star Purchases (% of total purchases) - unknown

Purchasing of all recycled goods by NC State peaked in FY98-99 with \$1.2 million in purchases, with a decline each year to \$344,358 in FY03-04, which is 5.57% of all UNC system recycled purchases. In 1998 the small purchase delegation, what departments can spend without going through NC State Purchasing Department, was increased from \$2500 to \$5000. This change gave more control to individual departments and makes it harder for NC State Purchasing to encourage or track recycled content purchases. Purchasing suspects these numbers are underestimates as departments may not know to report on these items or may not know which items are made of recycled material. It can be difficult to track such items as the computer system can only track by vendor name and item number. Many vendors sell multiple items and there is no way to easily earmark what is considered "green" and what is not.

The Purchasing Department instructs buyers on what processes they need to take and provides oversight on following procedures, but does not tell buyers what they should purchase. Life cycle costs may be taken into account by individual buyers, but is not required.

According to State Term Contract No. 645A in FY03-04, the cost of recycled paper for a carton of 10 reams of 8 ½ x 11 was \$22.90, but virgin paper was still less expensive at \$20.60 for the same amount and size paper. The cost for 50% post consumer content/ Non-Chlorine Bleached paper was \$31.40 per carton, 100% was \$32.58 per carton. This State Contract at one time only included recycled paper, but virgin paper is now an option once more. Overall paper purchases at NC State have declined since FY98-99 from \$1.6 million to \$490,945 in FY03-04. Recycled paper has fluctuated from between 48% and 85% of all paper purchases, with FY03-04 at 55%.



Wolfcopy now has a single copier unit which can print, scan, copy, and fax and has a digital connection to the network. Future units may have four color printing capability and may eventually be the same price as regular copiers. Spending on consumables and maintenance could be reduced if the units replace the other machines. Wolfcopy spent \$25,200 last year on consumables and estimate they could save 20-25% with the proposed unit. Consumables include toner, drums, and rollers. The current cost of color copies is between \$1-\$1.75 per copy. Color

Links of Interest

[Model EPP and Sustainability Policies](#)
[NC State contracts of recycled goods](#)
[DPPEA's Environmentally Preferable Procurement Recycling Product Guide](#)

copies from the new unit would be about \$0.25 each, with quality that is as good as current color copiers. There are no university wide requirements to consider energy efficiency in computers and printers; energy conservation is more of an issue with servers as they draw more power and generate more heat than desktop machines.

Surplus

Management and sale of obsolete materials and equipment



Indicators

Number of items sold through Surplus
21,600 – 22,200

Percent of Surplused items reused -
90-93%

CRT monitors stored in Surplus - 1,200

**Number of non-NCSU customers in
FY04** - 1,040



Spotlight on CRTs

NC State campus departments have been buying increasing numbers of flat screen LCD monitors, which has led to a large number of Cathode Ray Tube (CRT) monitors being sent to Surplus. Due to the gases contained in the equipment as well as hazardous components in the CRTs, this material cannot be sent to the landfill. While the state of NC has negotiated a contract to recycle or dispose of electronic equipment, the cost would be \$2 to \$5 per monitor. With 1,200 monitors currently in Surplus, the cost to use the contract could be up to \$6,000. While some of the newer, name brand monitors have been sold by putting them on a pallet and charging \$20 for the lot, this does not seem to be as effective for older or generic brands. Surplus is exploring options for ongoing recycling of electronic items that are not sold.

University organizations which have obsolete or unneeded equipment, furniture, or supplies can call Surplus Property and have those items picked up at no charge. The items are brought back to the Materials Support facility, labeled, and priced for sale. Departments within the University can view items in Surplus at any time and have items transferred to them at no charge other than a delivery fee if Surplus does the delivery. In FY03-04, the Surplus Property office handled about 22,000-23,000 items. The office receives about 2,000 items a month and sells about 1,800-1,850 items a month for an 80-90% recycling rate. About 200 items per month go to the landfill unless they can be recycled.

Almost anything in the University can go through Surplus with the exception of radioactive or hazardous materials. There are restrictions on some items as to who can buy them; lasers for instance, must have a use related to another university. Some items require the assistance of Environmental Health and Safety to remove hazardous components such as mercury or desiccants.

Items of greater than \$100 in value, including cars and trucks, or items the office is not comfortable selling, go to State Surplus. Items of \$100 or less in value are tagged with a price and put up for sale. If the items are not bought they are sometimes marked lower and are eventually marked down to \$1.00. After that they may send the items to the landfill or put them in batches for bulk sale.

Surplus Property's goals include making items available on campus for no charge and selling left over items to the public. The intent is to reuse material the University has already acquired for the further benefit of the University and tax payers. The purpose of Surplus Property is to help recycle and redistribute equipment. Customers include: computer professionals, lab equipment buyers, the general public, University staff or faculty, and students.

State agencies and non-profits can view and purchase Surplus items any time Monday through Friday. Non-profit buyers must have proof of 501(c)3 status and a letter on organizational letter head stating the items to be purchased, who is allowed to make the purchase, and Federal I.D. number. Public schools and other UNC system universities would be treated as non-profits. The general public is allowed to view items for sale on Thursdays and purchase items on Friday from 8AM to 11AM.

Links of Interest

[NC State Surplus Property](#)

[NC State Surplus Property Agency](#)

[State Surplus Property Recycling Contracts](#)

[State Contract: Electronic Equipment Recycling Services](#)



Managing travel to, from, and around campus

Bureau of Transportation Statistics report that 60.8% of U.S. households own *at least* two cars and 88.1% of individual miles traveled take place in a personal vehicle. With driving clearly the primary mode of travel for Americans, the impacts of these transportation habits are far reaching both socially and environmentally. The Environmental Protection Agency has designated all or portions of eight counties in the Triangle as a "non-attainment" zone for failing to meet the 1997 National Ambient Air Quality Standard for ground level ozone. Wake county is included in this finding. Therefore it is not only necessary, but also imperative that NC State take an active role in finding and creating solutions to these issues.

As an urban based university, the majority of NC State's students, staff and faculty drive to campus. Automobiles are considered a necessity by most, which has resulted in programs and options being developed to deal with the increased need. The goal is to implement alternative opportunities which will be of equal or greater convenience for the commuter. The NC State transit system is well utilized and is always looking for ways to improve service to the campus population.

NC State Transportation endures pressures similar to those of the surrounding region. In 2003, the department began planning an implementation program for the campus paths portion of the NC State master plan for 2010. Implementation strategies were developed to explore possibilities for short and long term transportation improvements on campus. Some of the ways that NC State Transportation meets these needs are:

- Transit
- Parking
- Non-automobile alternatives
- Planning

NC State Transportation is currently in the process of updating it's website to improve the communication aspect of their services.

Additionally, the NC State Transportation Department partners with the Institute for Transportation Research and Education (ITRE), located on Centennial Campus. ITRE is a non-profit organization that assists with a variety of transportation issues around the state. ITRE encompasses several programs, including the Center for Transportation and the Environment (CTE), which specifically aims to connect state transportation departments with environmental advocacy groups and to mitigate environmental impacts associated with transportation.

Sub-sections

[Driving and Parking](#) - Addressing the needs of campus commuters

[Alternatives](#) - Alternative transportation options for campus commuters

[Campus Vehicles](#) - Impacts of University vehicle use

Share of Selected Air Emissions by Transportation Mode: 2001 (percent)

	CO	NOx	VOC	PM-10
Highway gasoline	92.2	41.7	74.7	27.1
Highway diesel	1.4	37.5	3.6	37.8
Aircraft	5.1	0.8	0.3	0.9
Marine Vessel	0.3	9.7	0.0	13.1
Railroad	0.2	9.6	0.6	7.4
Other	0.1	0.8	20.2	13.7

KEY

CO = carbon monoxide
NOx = nitrogen oxides
VOC = volatile organic compounds
PM-10 = particulate matter 10 microns in diameter or smaller.

SOURCE: U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards, "National Emissions Inventory, Air Pollutant Emission Trends", as of December 2002.

Links of Interest

- [NC Department of Transportation](#)
- [Bureau of Transportation Statistics](#)
- [NC State Transportation](#)
- [Triangle Transit Authority](#)
- [Center for Transportation and The Environment](#)

For more information related to transportation opportunities on campus contact:

Transportation Department

Tom Kendig, Director
515-3424, Tom_Kendig@ncsu.edu

Driving and Parking

Addressing the needs of campus commuters



Indicators

Number of parking decks on campus - 6

Number of parking spaces on campus - 18,084

Parking space per person ratio - .6 (3 to 5)

Number of parking permits in use - 15,000-17,000

NC State encourages alternatives to single occupancy vehicles and is committed to a pedestrian-centered campus where vehicular access is limited and does not dominate pedestrian travel. However, approximately 15,676 (about 50% of campus population) commute to campus on an average day, making vehicular circulation and parking significant campus concerns.

Parking

NC State's total parking inventory is based on student enrollment. With enrollment expected to increase to 31,000 by 2010, at least 23,343 spaces are proposed to be on campus

by that time. Parking facilities vary in cost but individual spaces may be valued between \$5,000 and \$25,000 each.

Many commuters are frustrated with parking. NC State recognizes the need for adequate spaces and is committed to a policy of "no net loss of parking" as it continues to develop. However, a parking allocation strategies study conducted in 2004 concluded that campus parking was actually *too* flexible for effective transit operation and equitable parking space management to occur. "Parking Flexibility" or "Cross Parking" refers to zoned parking where one has permission to look for parking in large areas. In order for transit systems to succeed and vehicular traffic to remain under control, there must be some pressure for individuals to choose alternative options. NC State applies some parking restrictions to serve this function.

Freshman may purchase permits subject to availability, however it is not likely that passes will be available. Upperclassmen receive priority. If issued a permit, many freshman receive "storage" permits, rather than dorm permits. The university aims to house 25 percent of the student population in hopes of reducing some need for cars on campus. There has been no parking fee increase for the past three years. The department is instituting an annual 2% increase rather than requesting increases only for specific needs. There are currently no restrictions on employee permits and NC State has not realistically considered staff/faculty parking restrictions at this time.

Recent Parking improvements

- Reduction of cross parking
- Minimized the number of specific permit types
- Consolidated/realigned zones
- Eliminated ineffectual appeals

Current and Future Traffic Improvements

Installing, upgrading or modifying traffic signals at: Dan Allen/Thurman, Gorman/Western, Western/Morrill, Dan Allen/Yarbrough, Varsity/Western, Hillsborough/Horne, Cates/Pullen, Avent Ferry/Varsity, Pullen/Western.

Re-stripe Morrill/Western to add a thru lane to southbound movement. **Completed**

Install 3-way stop signs at Sullivan/Dan Allen. **Completed**

Implement a one-way street system around the Coliseum Deck

Completed

For more information on traffic and parking planning contact:

NC State Transportation

Slade McCalip, Assistant Director

515-1605, slade_mccalip@ncsu.edu

Policies

Parking

The NC State Master Plan is committed to a "no net-loss" of parking policy.

Traffic

The master plan states that "with few exceptions, only service and essential emergency vehicles will traverse through campus" and commits to "effective and appropriate vehicular movement."

[Official NC State University Parking and Transportation policies](#)

Alternatives

Alternative transportation options for campus commuters



Indicators

Wolfline Riders - 1,552,305 trips annually

Number of buses running - 20

Number of stops/routes - 102 stops/10 routes

Number of people registered with the carpool data base - 102 (50 carpools)

Number of vanpool riders and drivers -37
(all faculty & staff)

Number of vanpools traveling to NC State - 4

Number of bike racks - 483

Commuters on the road contribute 70% of ozone-forming air pollution. In response, NC State has developed Wolftrails, a comprehensive Transportation Demand Management (TDM) plan to educate the campus community and alleviate congestion, parking and air quality issues on campus. Transportation management at NC State has led to national recognition as one of the “Best Workplaces for Commuters.” NCSU works with several municipal and regional transit operations to provide transportation options. The major components of this TDM plan include:

[Vanpooling](#) - NCSU in conjunction with Triangle Transit Authority offers low cost vanpooling options. Seven people can start a vanpool and save significantly on gas, parking and wear and tear on their personal vehicle.

[Carpooling](#)- The NCSU Carpool program allows two or more faculty and/or staff members to park for only \$7 a month per rider.

[Bicycling](#)- Bike racks are conveniently located throughout campus and many campus roads offer bike lanes.

[Emergency Ride Home Assistance](#)- Reimburses participants for expenses incurred when emergencies arise and someone has to use alternate transportation in lieu of their carpool or vanpool.

[Rideshare](#) - A statewide rideshare matching service, which allows commuters in North Carolina to quickly and securely find other individuals who share similar commutes and work hours, and are interested in carpooling or vanpooling. In addition, Share the Ride NC allows commuters to find park and ride lots, public transit services, bike routes, and more.

[U-pass service](#) - Allows students, faculty and staff to ride CAT and TTA buses for free by showing a valid University ID when boarding.

[Park and Ride](#) - For those with cars but not parking permits. Park and Ride allows parking for free and bus transportation to campus.

Telecommuting - Working from home when all of the necessary access is available cuts down on driving and the need for parking spaces on campus.

Policies

The [Campus Physical Master Plan](#) serves as a written commitment to a pedestrian centered campus with varied alternative transportation options. Two of the 13 guiding principles for NC State address alternative transportation. Principle #10 asserts that NC State will be a pedestrian centered campus and principle #11 commits to encouraging alternatives to single occupancy vehicles. However, this guiding principle also recognizes a commitment to no net loss of parking and does not mention a limit on parking gain.

The [Campus Paths Implementation Program](#) serves to meet both short and long term transportation needs and implement plans laid out in the Master Plan. Public meetings were held in fall 2004 to present an overview of the five year transit plan. The plan addressed alternative approaches to meeting the transit needs.

Alternatives Continued

Alternative transportation options for campus commuters



Bicycles and Pedestrians

The Campus Paths portion of the master plan outlines a pedestrian only "All Campus Path", which connects many major areas of campus. The path accommodates bikes, walkers, wheelchairs, rollerblades, and strollers. Vehicular access is strictly limited to service vehicles. The path will be recognizable and defined by signage, lighting and emergency blue light telephones. The transportation office has also added "strutting wolf" pedestrian crossing signs at some intersections.

While there is a system of bike paths running throughout campus, including some night paths in development, there are certainly portions of campus where bikers must share the road with drivers and contend with some hazardous conditions. A new bike map is being developed that indicates proficiency levels for bike zones on campus. The map will define areas of high traffic volume, low traffic volume and areas where separate biking facilities are available. Particularly congested zones will be designated as "dismount zones". New share the road signs, "sharrows", will help direct bikers through busy streets. At the present time there is no bike share program on campus and bikes are not allowed on Wolfline buses.



Wolfline

"[Wolfline](#)", the campus bus system, began in 1980 and has consistently gained ridership since inception. It is widely agreed that Wolfline contributes to the quality of life on campus by decreasing traffic congestion and air pollution. Ridership records date back to 1989 at which time annual costs were \$348,810 and 512,181 trips were given on 3 routes with nine vehicles running. During the 2003/2004 academic year, costs totaled \$2,673,051 with 1,552,305 trips, ten routes, and twenty buses running. In contrast, *each* parking space at NC State is valued between \$10,000 and \$25,000. The expectation is that Wolfline will continue to grow in importance at NC State as enrollment increases and campus space becomes a greater concern.

Wolfline is funded 80% by student fees and 20% by parking permit revenues. Challenges for the bus system include rising fuel prices, rapidly increasing ridership, and changing class schedules.

NC State Transportation holds public meetings for the discussion of transportation issues which affect the campus population. These include: Wolfline, traffic, bicycle and pedestrian improvements. Campus Paths public meetings on the transit component of campus transportation were held on October 5th and 6th 2004. A brief overview of the five-year transit plan, which included alternative approaches to meeting the transit needs of the community, was presented. Participants broke into small groups to review maps, transit, pedestrian, bicycle, traffic and parking proposals, and to offer comments and suggestions.

For more information related to Alternative Transportation contact:

NC State Transportation

Slade McCalip, Assistant Director
515-1605, slade_mccalip@ncsu.edu

Adena Messinger, Transportation Planning
515-1609, adena_messinger@ncsu.edu

Pat Mitchell, TDM Wolftrails, Transit Manager
513-7400, pat_mitchell@ncsu.edu

Projects

- Internet Map of Actual Bus Locations (AVL)
- Increase Wolfline Fleet (add 9 new buses)
- Increase Centennial Connections to Wolf & King Villages and North Campus
- Provide Reverse (counter clockwise) Routes
- Provide North Campus and Centennial internal circulator services
- Continue U-Pass program
- Continue biodiesel fueling

Campus Vehicles

Impacts of university vehicle use



Indicators

Gallons of diesel fuel used - 0

Gallons of biodiesel fuel used - 35,193

Gallons of gasoline used - 287,587

Number of leased Motor Fleet Management vehicles - 293

Number of flex fuel vehicles in Motor Fleet Management - 156

Miles traveled by Motor Fleet Management vehicles - 515,405

Across NC State, daily University vehicle use has far-reaching impacts on the campus and the surrounding community. Not only do most faculty and staff drive to campus for work, they also utilize departmental or motor fleet vehicles on a routine basis. The types of vehicles, fuel and miles traveled all contribute to the impact of campus transportation.

In fiscal year 2003-2004, the University leased 293 vehicles from NC Motor Fleet Management. 156 of these were flex fuel vehicles. The new fleet management software that NC State Fleet Services started using in late 2004 allows for tracking of vehicle maintenance and the type of fuel used, as well as determining miles per gallon for each vehicle and the fleet overall. This will allow for performance comparisons between flexible fuel vehicles, alternative fuel vehicles, and conventional vehicles. Every year the University is expanding efforts to comply with the Energy Policy Act of 1992, a federal law requiring that 75% of North Carolina's new light-duty vehicle purchases be alternative fuel vehicles.

NC State has some experience using alternative fuels on a large scale, operational basis. Fleet Services has been using B-20 biodiesel since July 2003, and in the fall of 2004 Wolfline began a pilot program of using biodiesel to see how B-20 affects the buses. The University no longer even purchases regular diesel for use in campus vehicles. The cost of the B-20 is typically higher per gallon in cost than conventional low sulfur diesel on state contract. However, B-20 biodiesel on the whole produces fewer pollutants than conventional diesel, with estimated reductions of 12% in Carbon Monoxide, 20% in Hydrocarbons, 12% in Particulates, and 20% in Sulfates; B-20 is estimated to increase Nitrogen Oxide emissions by 2%.

Other attempts at NC State to reduce the impact of vehicle usage include many departments beginning to utilize small electric vehicles for travel throughout campus. The Office of Waste Reduction and Recycling uses small "Club Car" utility vehicles for their student recycling collection program. This allows the students to travel throughout campus collecting

Spotlight on Biodiesel



In 2003, NC State was awarded \$7,250 to operate 123 vehicles and pieces of equipment on

biodiesel (B20). This fleet includes trash trucks, semi-trucks, buses, street sweepers, backhoes, and recycling trucks. In addition, the funds will help purchase B20 to run the Wolfline bus service, contracted through Veolia. The Biofuels Program grant was awarded to the NC State Biodiesel Committee, a partnership of three University departments, a student, and Veolia. The Committee proposed a five-phase program over two and a half years to get all University diesel vehicles and buses operating on B20. The current award will cover Phase I and II.

recyclables without creating emissions or using gasoline. The library uses an electric vehicle to transfer books from main campus to the warehouse and Transportation utilizes a small electric vehicle for easy access throughout campus even in times of high traffic such as move-in and move-out. Many of Facilities' shops are also experimenting with electric vehicles in place of traditional gas powered "E-Z Goes". The fumes from those vehicles are often hard to tolerate because of the open cab.

Use of lower emission fuels such as biodiesel, purchasing flex fuel vehicles, and utilizing electric vehicles are all ways that NC State is attempting to improve regional air quality and reduce the impact of campus vehicle use.



OWRR's electric vehicle

Waste Reduction and Recycling ^{p. 45}



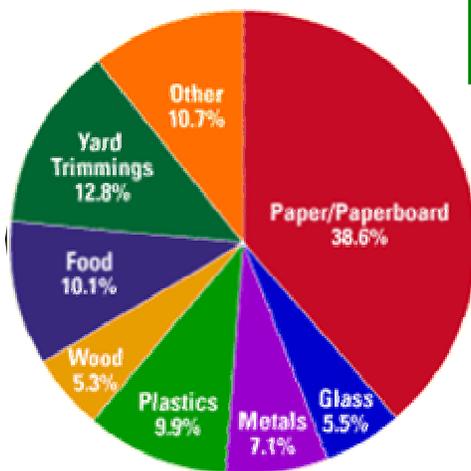
Breakdown of the campus waste stream ...seeing waste as a resource.

In 1998, North Carolina Governor Hunt issued [Executive Order 156](#), *State Government Environmental Sustainability, Reduction of Solid Waste, and Procurement of Environmentally Preferable Products*.

“The revised Executive Order recognizes that the daily activities and routine operations of the State have a significant impact on environmental quality and use of natural resources. While maintaining a focus on waste reduction and recycling, the Executive Order directs state agencies to develop and incorporate policies and practices into their daily operations that preserve natural resources, conserve energy, eliminate waste and emissions, and lessen overall environmental impact.”

Included in the order are specific goals towards making state agencies a model for others by setting the standard on sustainability. From purchasing to operations to education, it is our responsibility as part of the North Carolina government to uphold these standards. NC State is striving to make sustainability a priority in all of our campus operations.

With the population and diverse infrastructure of a mid-size city, the daily operations of NC State have a major impact on the surrounding environment. In fiscal year 2003-2004 NC State disposed of more than 3500 tons of materials in the Wake County Landfill costing the university just over \$105,000 in landfill fees alone. At the same time, the Office of Waste Reduction and Recycling, with the help of the campus community, worked to keep useful, recyclable materials out of the landfill and get them into the hands of local reuse and recycling markets. These endeavors not only decreased the amount of material disposed of in local landfills, they also saved the university landfill disposal costs (just under \$50,000) and supported the local economy by supplying them with useful commodities.



Sub-sections

[Recycling Rates](#) - Percentage of the campus waste stream diverted

[Reuse Opportunities](#) - Programs directed at keeping useful materials out of the landfill

[Composting](#) - Programs focused on the diversion of organics from the waste stream

[Environmental Education](#) - Initiatives dedicated to fostering environmental stewardship

[Solid Waste](#) - Where, how and how much waste is disposed of on campus

[Hazardous Waste](#) - NC State policies and procedures for disposal of hazardous material

Materials which constitute Municipal Solid Waste generated in the United States (total weight = 209.1 million tons)

Paper and paper products as well as yard waste make up the largest percentage of the waste stream. Both are being actively diverted from the waste stream at NC State.

Source: “Characterization of Municipal Solid Waste Management 1997 Update” U.S. EPA

Links of Interest

[NC State Office of Waste Reduction and Recycling](#)
[Wake County Recycling and Solid Waste](#)
[City of Raleigh Solid Waste Services](#)
[NC DENR Division of Pollution Prevention and Environmental Assistance](#)
[NC State Solid Waste and Recycling Totals 2003/2004](#)

For more information related to waste reduction and recycling opportunities on campus contact:

Office of Waste Reduction and Recycling
Lindsay Killian, Environmental Programs Manager
Nessa Stone, Operations Manager
515-9421, recycling@ncsu.edu
www.ncsu.edu/facilities/recycling

Recycling Rates



Percentage of the campus waste stream diverted

Indicators

Overall Diversion rates in 2003/2004 - 40%

Number of recycling bins on campus - 1,453

Different types of materials recycled - 25

Financial savings from recycling in 2003/2004 - \$48,776

In a typical week, a recyclable from campus passes through a number of hands before reaching its final destination. The process begins with a person depositing the material into the nearest recycling bin. One might find a convenience bin in the hallway or utilize the central recycling site at a building, usually located at or near the loading dock. A central site is composed of roll carts which are labeled for the following materials: office fiber, newspaper, magazines, beverage containers (glass, plastic and aluminum) and at the residence halls, chipboard. A campus generator can also deposit white paper into small desk side bins that are collected by University Housekeeping.

Spotlight on Student Based Recycling Program

In the fall of 2003, OWRR began a new program to help provide more convenient locations for recycling bins inside the academic buildings on campus.

More than 200 bins have been placed in hallways on campus to collect office fiber, newspaper and beverage containers. All of these bins are emptied weekly by student employees.

Our overall collection totals increased dramatically with the addition of these convenience bins, from 1045.44 tons in 2002/2003 to 1149.15 tons in 2003/2004.



The material from the desk side and convenience bins are emptied into the roll carts at the central sites. It is then manually collected and emptied into barrels on the back of a pick-up truck. The material is then transported back to a warehouse on campus where paper products are stored in large cardboard boxes called "gaylords" and beverage containers in 8

cubic yard dumpsters. The paper products are then loaded by forklift onto a tractor trailer for transport to market. Each individual 8-yard dumpster full of beverage containers is transported directly to market.

"Markets" or the businesses which accept and process the materials for recycling, are relatively close to campus. Paper is delivered to Paper Stock Dealers less than a mile from campus and beverage containers are taken to Container Recycling Alliance on Capital Blvd. Because these markets are so close by a transportation savings is realized as well as a decrease in landfill fees. All office materials are delivered to market free of charge and revenue is received for paper and cardboard.

Materials currently diverted from the waste stream include:

Paper products	Non-perishable Food
Corrugated cardboard	Scrap Metal
Glass, Plastic, Aluminum and Steel	Wood
Hardback Books	Bricks
Packing Materials	Concrete
CD's, Diskettes	Yard Debris
Ink/ Toner Cartridges	Tires
Phone Books	Car and Truck Batteries
Clothing	White Goods
Household goods	Oil/ Anti-freeze

For more information about recycling opportunities on campus contact:

Office of Waste Reduction and Recycling
Lindsay Killian, Environmental Programs Mgr.
Nessa Stone, Operations Manager

515-9421, recycling@ncsu.edu

Re-Use Opportunities

Programs directed at keeping useful materials out of the landfill



Indicators

Move Out 2004 Totals

- **Food** - 992 lbs
- **Clothes** - 3750 lbs
- **Furniture** - 1500 lbs.
- **Miscellaneous charitable donations** - 400 lbs.
- **Wood and concrete blocks** - 9000 lbs
- **Paper products** - 42,700 lbs
- **Beverage Containers** - 7700 lbs

Total - 66,042 lbs or 33,021 tons

Each year the Office of Waste Reduction and Recycling along with Campus Housing gathers items during Move Out that would normally be thrown away, and donates them to needy groups in the Raleigh area. In addition, wood, concrete blocks and other recyclables (such as paper, cardboard, phonebooks and beverage containers) are collected and sent to recycling facilities in the area.

In 2004, bins were placed in the residence hall lobbies and central recycling sites to collect food, charitable donations (such as furniture, clothes, books, sheets, kitchen utensils, and other room supplies) wood and concrete from lofts, as well as regular recyclables.

In total, NC State diverted over 33 tons of material from the landfill by donating it for either re-use or recycling. The hope is to increase these amounts with each coming year.



In addition to yearly Move Out collections, OWRR also serves as an avenue for the campus community to find reuse options for any items they no longer need. If possible, an on-campus department or group is contacted for use of the material. Examples of re-use on campus include: plastic lab boxes re-used for Tsunami Relief Fund collection, yard debris from campus is ground and re-used as mulch by Grounds Management, office supplies and paper that are found in the recycling are retrieved and re-used by university staff.

Some materials are donated to local organizations that help support needy families. Old beds, desks and dressers from University Housing were re-used by a local homeless shelter. Additionally, mattresses to be disposed of from the residence halls were utilized by a program for migrant farm workers.

Generators are also directed to use the Waste Trader program through the state's Department of Pollution Prevention and Environmental Assistance. The program provides an online marketplace for discarded items while supplying users with materials they need.

Spotlight on NCSU Surplus

The Office of Waste Reduction and Recycling collaborates with University Surplus to help redirect items that still have a useful life. Together they educate the campus community to consider reuse before disposal. Not only does surplus provide a way to store the "discarded" items but NC State is able to gain revenue from material that it would normally pay disposal costs for.

Spotlight on Sprint Project Connect

In November of 2003, OWRR partnered with Sprint on the Project Connect College Challenge, a used cell phone collection drive. Collection boxes were placed in residence halls, the student center and library as well as local businesses. In total, 63 cell phones were donated for re-use or recycling during the two-week drive. All of the proceeds from Project Connect were donated to Easter Seals and to Governor Easley's Hurricane Isabel Fund.



Links of Interest

- [Waste Trader](#)
- [NC State Surplus](#)
- [City of Raleigh Swap Shop](#)
- [Habitat for Humanity Re-Use Center](#)

Composting



Programs focused on the diversion of organic materials from the waste stream

Indicators

Amount of organic materials diverted from the waste stream in 2003/2004 - 412.7 tons

Amount of mulch used by the campus from the compost site in 2003/2004 - 564 cubic yards

Financial savings in 2003/2004 from using composted material - \$7,896

Recycling and re-use of organic material on campus has been a common practice at NC State for nearly 20 years. Currently, all of the yard waste collected on campus is taken to the Inwood Road Compost Site off of Lake Wheeler Road. Each year the material is ground into mulch and then sits to cure for a year before use. When the mulch is ready, the Grounds Management Department uses it for their planting projects on campus, saving the university nearly \$8,000 in 2003/2004 alone.

Recently, the compost site obtained approval for a Level 4 Permit which allows for pre and post-consumer food waste, yard waste, wood and paper products, manures and non-hazardous animal bedding, and vegetative agricultural waste. Future plans for the site include partnering with the Compost Training Facility to develop a teaching and demonstration area for students as well as other members of the community.

This will also allow for many research and extension opportunities.

A comprehensive composting program helps decrease waste, saves



NC State mulch dresses a bed on campus

money and resources and creates positive educational opportunities. Since food alone typically makes up 10% of the waste stream, a composting program for food waste would significantly decrease the amount of solid waste that NC State sends to the landfill.

Policy

'Agencies that operate or contract for the operation of food service establishments, such as snack bars, cafeterias, dining halls, etc., are encouraged to implement programs to recover and recycle leftover food when practicable and feasible.'

- [North Carolina Governor Hunt's Executive Order 156](#)

Spotlight on Vermicomposting

Rhonda Sherman is the Director of the Compost Training Facility at NC State. She specializes in solid waste management, particularly in composting and vermicomposting. Her work includes publications as well as educational and technical program assistance.

"*Vermicomposting* is the process of turning organic debris into worm castings." It is estimated that North Carolina buries or burns 420,000 tons of food every year. Using worms to decompose food waste offers several advantages including: reducing garbage disposal costs; producing less odor and pests; saving the water and electricity disposals use; and producing a free, high-quality soil amendment (compost). "When worm compost is added to soil, it boosts the nutrients available to plants and enhances soil structure and drainage." Vermicomposting also requires very little space, labor and maintenance. (*Worms Can Recycle Your Garbage*- Sherman, 1996)

For more info visit:

[Vermicomposting Resources](#)

For more information related to composting on campus contact:

Office of Waste Reduction and Recycling
Gerald Sanders, Heavy Equipment Supervisor
515-9882, Gerald_sanders@ncsu.edu

Biological and Agricultural Engineering
Rhonda Sherman, Extension Solid Waste Specialist
515-6770, Sherman@unity.ncsu.edu

Environmental Education

Initiatives dedicated to fostering environmental stewardship on campus



Earth Week

Every year NC State celebrates the world we live in and use every day. On or around April 22nd, Earth Day, students, faculty and staff come together to have a fun, informational, interactive event on the brickyard. The event features food, games, vendors, music, art, giveaways and much more!

In 2004, Earth Day was accompanied by a week full of other events including: the All Carolinas Dinner, Residence Hall Trash Out, and an environmental film at the campus movie theater.

The Earth Day Celebration has been found to be a very effective educational tool. This brickyard event helps to introduce people to environmental issues that they may not otherwise be exposed to. In addition, Earth Day highlights and shows appreciation for the many sustainability efforts on campus.



Earth Day 2004

Education is one of the most important ways to effect change on a college campus, or in any community.

The Office of Waste Reduction and Recycling has a variety of educational initiatives. OWRR gives educational presentations to diverse audiences both on campus and off. Venues include residence halls, Resident Assistant trainings, staff and departmental meetings, building liaison briefings, and various conferences such as The Carolina Recycling Coalition and the National Recycling Coalition. Additionally, OWRR participates in a number of educational tabling events including New Student Orientation, Earth Week, Employee Appreciation Day and other environmentally related events during the year.

OWRR also distributes a monthly newsletter, called *The Installment*, to all campus residence halls. It includes information such as upcoming events, ways to conserve resources and energy, as well as other recycling facts, tips and information.

OWRR collaborates with a variety of organizations and departments on campus including: the Campus Environmental Sustainability Team, Sustainability Coalition, Office of Energy Management, University Dining, University Housing, University Housekeeping, Students for Sustainability, Students for Sustainable Energy, Campus Greens, SPARC, the Caldwell Scholars and many more. These groups come together to educate the campus community on issues such as recycling, waste reduction, reuse, recycled products, energy conservation, alternative energy, water conservation, alternative fuel vehicles, local and organic foods, animal rights, land use issues and much more.

Chuck It Recycling

This football tailgating recycling program educates not only students but all fans to recycle at Carter-Finley Stadium. Each home game, the Chuckwagons circle the parking areas collecting cans and bottles. After only two years, the Chuck It Recycling Program has become a mainstay of Wolfpack tailgating. Each year the program has recycled nearly 10 tons of material.

Links of Interest

[Office of Waste Reduction and Recycling Programs](#)
[NC State Environmental Sustainability](#)
[NC State Chuck It Recycling Program](#)

For more information about environmental education on campus contact:

Office of Waste Reduction and Recycling
 Lindsay Killian, Environmental Programs Manager
 515-9421, recycling@ncsu.edu

Solid Waste

Where, how and how much waste is disposed of on campus



Indicators

Waste land-filled in 2003/2004 - 225 lbs./person

Landfill fees in 2003/2004 - \$105,922

Number of trash dumpsters on campus - 164

Number of cardboard dumpsters on campus - 76

Man-hours spent handling trash on campus in 2003/2004 - 9400

Solid Waste Collection Conversion

In 2003, an independent study was conducted to determine the most efficient and cost effective method of solid waste collection at NC State. The study resulted in a decision to move the entire solid waste service to an "in-house" operation. This meant converting from an antiquated hoist system to the industry standard front end loader service method.

In late 2003, the purchase of new trucks and dumpsters began. Early 2004 started the phasing out of old equipment and dumpsters which continued into 2005. Currently, 100% of cardboard collections have been converted to front end loader. 80% of trash collections have been converted and will be complete as of the end of Spring Semester 2005.

In house service allows OWRR to provide a higher level of customer service as well as a more cost effective service for the campus.

Program Policies and Goals

- Reduce the amount of waste generated by NC State through education and re-use
- Accept all non-hazardous solid waste generated by the campus community
- Meet or exceed campus service requirements
- Provide lowest cost program
- Create flexibility to meet the needs of customers
- Adapt to campus growth by offering scalable services

A Day in the Life of Campus Trash:

Solid non-hazardous waste generated at NC State most commonly comes from an individual. Collectively, this adds up to about 14 tons of trash collected and land-filled per day. This represents about 60% of all wastes generated by NC State.

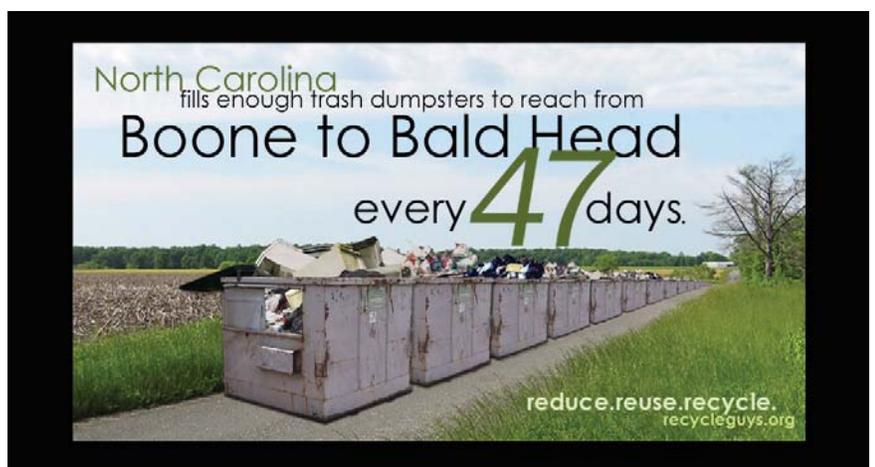
As an example, the disposal cycle of a typical piece of trash results in the material being handled approximately six times before it reaches the landfill:

1. The generator tosses a piece of trash into a wastebasket.
2. The housekeeper changes the liner in the wastebasket and deposits the waste into the collection cart.
3. The entire building's waste is taken to the dumpster.
4. The dumpster contents are emptied into a waste hauling truck. On campus we use front end loader trucks to collect and haul waste from campus.
5. The waste is taken to a transfer station where it is dumped into a compaction trailer.
6. The trailer is hauled to the North Wake County Landfill. The landfill operator grades and buries the trash.

Due to the lack of moisture and oxygen, trash in a landfill typically does not break down for many decades.

For more information on solid waste disposal on campus, contact:

The Office of Waste Reduction and Recycling
Nessa Stone, Operations Manager
513-8110, nessa_stone@ncsu.edu



Hazardous Waste

NC State policies and procedures for disposal of hazardous material



Indicators

Chemical Waste Disposed in fiscal year 2003/2004 - 209,994 pounds

Chemical Disposal Costs in 2003/2004 - \$190,872

Regulated Medical Waste Disposed in fiscal year 2003/2004 - 256,094 lbs.

Medical Waste Disposal Costs in 2003/2004 - \$156,500

The department of Environmental Health and Safety (EH&S) oversees the disposal and recycling of all hazardous waste at NC State. EH&S acts as an advisor and consultant rather than the regulator of campus departments. It is the responsibility of each principal investigator to ensure that all personnel are aware of environmental safety regulations and that they follow all guidelines and procedures provided by EH&S. The US EPA conducts annual campus inspections and can issue notices of violation and fines for noncompliance. All fines are paid by the particular department in violation.

The Hazardous Waste Program Manager is the authorized representative for the University's generator, treatment, and storage facilities. As the generator representative, the

Program Manager is responsible for the management, including off-site treatment and disposal, of chemical wastes submitted for disposal by University generators. Under his guidance, hazardous waste personnel operate a federally permitted hazardous waste treatment and storage facility. The Program Manager provides assistance to generators in determining appropriate waste management. Generators can contract individually with outside vendors for disposal or recycling of hazardous material but all agreements must be reviewed and approved by EH&S.

When a generator wants to dispose of a hazardous material through NC State's program, they first must complete a waste submission form to correctly identify the material and where it was produced. This process was streamlined in 1995 when online submission and registration was developed on the EH&S website. EH&S passes the waste information onto the contracted vendors for disposal and the vendor picks up material at the labs. EH&S tracks the material, provides assistance to campus generators, and reports annual campus hazardous waste disposal to the appropriate regulatory agencies. However, EH&S relies on generators voluntarily reporting waste disposal and therefore cannot verify compliance with all regulations governing disposal of chemical waste.

Waste Minimization and Challenges

EH&S has focused its waste minimization efforts on recycling and reuse, finding potential markets for wastes (alternative fuels) and potentially hazardous recyclable materials (fluorescent tubes, batteries). Other campus waste minimization efforts include educating labs on a case-by-case basis on ways to reduce material used in experiments. Teaching labs on campus have moved to micro-scale experiments primarily due to the financial savings involved. All generators of hazardous waste on campus are responsible for minimizing generation "to the degree they have determined to be practicable" according to the NC State Chemical Waste Management Program Waste Generator Manual. An area for improvement for some labs is the removal of chemicals that are no longer needed, either by redistribution or disposal. This reduces the hazards and risks posed by the labs, and potential for accidental spills.

Other challenges include limited EH&S staff and the attitude of campus generators towards waste disposal. There are 14 employees trained to inspect the over 2,500 labs at NC State every six months. Despite the fact it is the responsibility of the principal investigators to educate personnel and ensure compliance, often their focus is on the research not the proper handling of hazardous materials. Training has increased in the past several years to address this issue. EH&S has developed a chemical waste manual and online lab safety training to increase educational efforts on campus.

Links

[NC State EH&S Hazardous Waste](#)
[NC State EH&S Waste Generator Manual](#)

For more information on hazardous waste disposal on campus contact:

Environmental Health and Safety

Rob Pecarina, Hazard Waste Program Specialist
 515-6863, Robert_pecarina@ncsu.edu



Water consumption, management, and conservation initiatives

Over the past several years, NC has experienced significant drought conditions in many areas of the state. Therefore it is imperative that all state agencies think critically about water usage. In response to the severe drought of 2002, several state level laws and executive orders were enacted dealing with water use in NC including Executive Order 26 for Long-Term Water Efficiency Plans, House Bill 1215, Executive Order 156, and the Utility Savings Initiative.

Executive Order 26 charged state agencies to “develop and begin implementing long term, financially feasible conservation measures.” The General Assembly’s House Bill 1215, more specifically, established “a goal to reduce water consumption by state agencies by at least ten percent.” State agencies that have not submitted a long term water conservation plan are barred from non-essential water use. NC State submitted its Long Term Water Efficiency Plan to the NC Division of Pollution Prevention and Environmental Assistance in July, 2004. The University submits annual updates to this plan.

Executive Order 156 is a broader directive instructing all state agencies to “implement project initiatives or modifications that result in” water conservation “during the construction and operation of agency facilities,” including day to day “operations and management of state-owned and leased facilities.” The Utility Savings Initiative, administered by the State Energy Office, was set up to help agencies identify areas for savings and track savings that have been achieved. This Initiative also encourages state agencies to evaluate their water usage compared to offices or buildings of similar size and use. Utility accounting, tracking the costs and quantities of various utilities consumed, is needed across state agencies in NC, but has been very limited thus far.

During FY03-04, state agencies in North Carolina spent approximately \$28.4 million dollars on water and sewer fees. NC State’s portion of this cost was 4.8% or \$1.3 million. It is difficult to evaluate this data based on usage because information on volumes consumed or discharged by state agency is not available. NC recently began requiring state agencies to examine water usage although most of the data is related to money spent, not volumes of water consumed. This evaluation is further confused by the fact that the cost of water and sewer is not uniform across the state. During this time period, NC State did track usage and found that the University consumed 581,215 ccf (one hundred cubic feet) or 434,748,920 gallons of water. The University’s water is purchased from the City of Raleigh and comes from Falls Lake in northern Wake County.

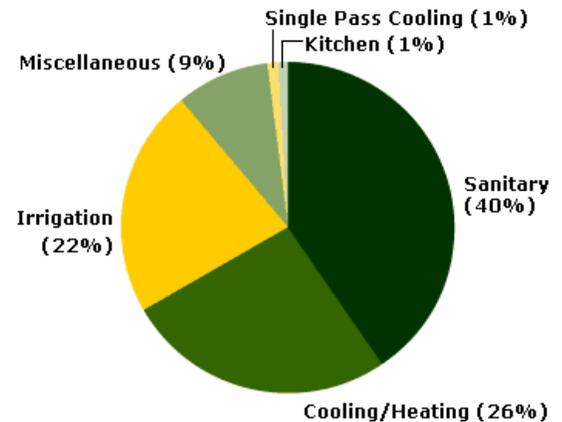
Sub-sections

Usage - Amount of water consumed at NC State

Monitoring - Measuring and managing water consumption

Conservation - Efforts to reduce water consumption and operate more efficiently

How Water is Used in Commercial Buildings



Links of Interest

[Executive Order 26](#)
[Executive Order 156](#)
[NPDES](#)
[Clean Water Act](#)
[Safe Drinking Water Act](#)

For more information related to water use and management on campus contact:

Office of Energy Management
Edward Sekmistrz, Energy Management Engineer
515-2188, Edward_Sekmistrz@ncsu.edu

Usage

Amount of water consumed at NC State



Indicators

Total volume of water used - 581,215 ccf or 434,748,920 gallons

Building gross square feet - 9,986,663

Volume per square foot - 0.058 ccf/gsf

Total cost of water and sewer - \$1,372,287

Cost per volume - \$2.36 per ccf

Volume of irrigation water used - unknown

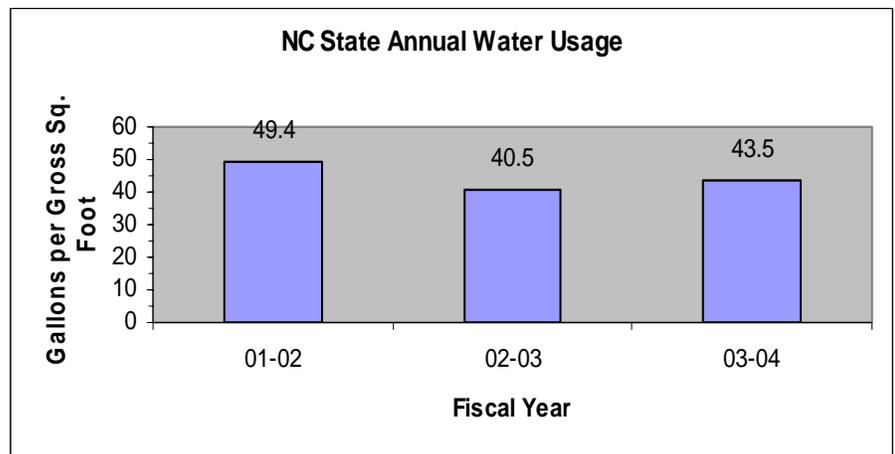
In FY 03-04, NC State used approximately 430 million gallons of water on campus. To put this into perspective, this amount of water would cover the 524 acres of central campus in 2.5 feet of water. Campus water usage has been decreasing over the past several years even as total square footage increases.

The cost of campus water usage in FY 03-04 was approximately \$1.3 million. The City of Raleigh charges a flat rate for water of \$2.36 per ccf and bills are issued on the assumption that the same volume of water going into buildings is discharged as sewage. This is not always a valid assumption, particularly for water used for irrigation. There are a number of irrigation accounts that the University has with the city, where the water used is metered and NC State is only charged for water, at a rate of \$1.70 per ccf. The City of Raleigh also charges a minimum fee per meter regardless of water use during a given billing period.

The Office of Energy Management (OEM) is working to better track usage on campus through a new utility billing system that will eventually allow comparison of water use by building type across the University. This system will allow OEM to identify the buildings or activities on campus that are the most water intensive and target conservation efforts towards these areas. It will also give OEM the ability to educate building occupants about water usage and make individuals more aware of the impact their usage has on the entire campus. These educational efforts are one of the only ways OEM can impact usage in appropriated buildings on campus because building occupants and departments are not charged directly for their utilities.

There is more incentive for self-supporting cost centers such as Housing, Dining, Athletics and Student Affairs to reduce their water consumption because it does impact their bottom line. OEM cannot dictate how to operate these facilities, but does make an effort to bring these departments together to talk about conservation and utility usage. Athletics and Housing have the greatest number of showers under their purview and they purchase their own equipment. Dining and Housing personnel are aware of water conservation options, but short-term budgetary concerns make it hard to justify spending money for upgrades. Laboratories tend to have a much higher demand for water than other buildings on campus; actual demand should be determined soon with the Office of Energy Management's benchmarking effort.

Irrigation is an important use of water on campus but actual usage is hard to determine. Turf, grass, and plants are typically watered between midnight to 6:00 AM to avoid evaporative loss. Rain water is preferable to city water because it has not been processed and still has minerals in it that are needed by the plants. Watering is generally done on an as needed basis. Need is determined by using moisture gauges, observing wilting plants, or by mathematical formulae using weather and historical data. Irrigation of most of campus is the responsibility of the Landscape Irrigation Manager, with occasional temporary help. There are two water trucks which are used when there is spotty rainfall, for the trees and annuals. Rain gauges are checked weekly all over campus. In order to prepare for drought more heat tolerant plants are used, plants are trimmed, watering is cut back as well so that roots will grow deep, and lawns are mowed to a higher height as taller grass requires less water.



Monitoring

Measuring and managing water consumption



Indicators

FY04 Rainfall - 38.9 inches

Gallons of Make up water used -
11,667,900 (Central Steam Plant only)

Cold Water Meters - 117

Steam Meters - 5

Hot Water Meters - 36

Condensate Meters - 48

In order to effectively manage water consumption, NC State must accurately monitor and measure current usage. The Office of Energy Management has found that metering is the primary challenge to managing water use on campus.

NC State purchases water from the City of Raleigh. The City has a master meter on Main campus through which it measures water consumption remotely. NC State sub-meters water usage to measure use of individual buildings, groups of buildings, or parts of buildings. The sub-meters are read manually by campus personnel. Most water used on campus travels through the master meter. However, some buildings have separate individual building meters. In addition, several receipt supported buildings have totally separate accounts and pay the City directly for their water. This system makes it very difficult to determine a grand total of water consumption across the entire campus.

The number and variety of buildings on campus is also a challenge when it comes to managing water use at NC State. Almost every building on campus is unique in terms of its use, water requirements and infrastructure making it difficult to compare one building to another and determine which are more efficient. The Office of Energy Management looks at water use among the buildings in terms of 100 cubic feet and 100 cubic feet per square foot, to try to compare buildings and see which use more than others. There are about 10 meters that cover outdoor facilities. These meters are not currently monitored. Also, some water used for irrigation comes from nearby buildings, and is not metered separately, so irrigation uses would be included in the buildings' overall consumption. The irrigation systems on Main campus and Centennial have the potential to use about 2.85 million gallons of water yearly.

Another challenge of monitoring water usage at NC State is not all 390 buildings on Main, Centennial and Centennial Biomedical campuses are metered, and existing meters may be serving only part of a building or multiple buildings. There are several types of meters on campus, each measuring different utilities in different ways. It is difficult to know when and where the University uses chilled water, steam, and city water and it is even more difficult in areas that have had multiple renovations. A list of meter locations exists, but surveys have found inconsistencies in where they are and what areas they are supposed to measure.

To combat these issues, the Office of Energy Management plans to install more meters and a new utility billing system to better track water use across campus. The Office is also developing a position dedicated to reading and identifying any inaccuracies in campus meters.



Spotlight on Irrigation Monitoring

The installation of a system called Maxicom was the biggest advancement of Grounds Management in saving and monitoring irrigation water in FY03-04. Maxicom is a central irrigation system which waters depending on weather data, and uses flow sensors to detect leaks. If it detects abnormal flow it will shut down automatically. The cost to install the system on Lower Miller Field, which is the largest main campus user of irrigation water that is not managed by Athletics, was \$40,000. There are plans to install additional sites on the largest and hardest to manage sites, which would cost about \$5,000 each depending on the site. Using this system will allow irrigation water use to be cut back easily. The current rain gauges are being replaced by gauges with remote controls.

Conservation

Efforts to reduce water consumption



Indicators

FY03-04 OEM dollars spent on conservation projects - \$3,059

Pay back period of conservation projects - 0.20 years

Low flow shower heads - 2600 (2400 in University housing, 200 Carmichael and Facilities)

Front loading washers - 487

% of faucets with aerators - unknown

NCSU's strategic plan for water was submitted to the State Energy Office based on a 2001-2002 baseline. The water conservation plan was put together by Facilities Operations, Athletics, Housing, Dining, and Student Affairs and specifies actions that each area will take to control and reduce water consumption. In this plan, NCSU committed to reducing water usage by 10% from the baseline year. NCSU will be able to tell if the plan is working by comparing total metered water flow, changes in individual building usage, and changes in use for such areas as Dining or Housing.

To meet the goals set forth in this plan, the Office of Energy Management (OEM) uses Repair and Renovation money to fund water conservation projects throughout campus. As these funds are limited, the Office looks for projects that give the biggest return on investment with a payback period of three years or less. Buildings that are expected to be renovated in the next five to ten years are not considered as targets for conservation efforts as the renovations would likely destroy the conservation improvements. The focus is usually on buildings where the conservation projects will have the greatest impact and have a longer period to function, and thus a greater overall payback. OEM staff emphasize awareness and voluntary participation to reduce overall use.

Spotlight on NC State Water Conservation Plan



NC State has committed to reduce annual water consumption per square foot by a minimum of 10% over base year 2001-02. The University has implemented aggressive water conservation measures in response to the drought of 2002-03. A Conservation Awareness Team was also formed to develop a strategic water plan and continue evaluating current water conservation practices. As a result, NC State is currently meeting the 10% water conservation commitment.

Conservation Projects

There are many water conservation efforts going on around the University.

- The OEM purchased 500 aerators and 200 low flow shower heads for distribution across campus in FY03-04. The aerators were used mainly in old North Campus. The 200 low flow shower heads were mostly for use in Carmichael gym and maintenance facilities that have showers. The OEM is working on having only aerators that are rated at 0.5 gallon per minute (gpm) kept in stock, and the only new faucets bought being ones that come with aerators. Low flow faucets and aerators are being used to replace older fixtures.
- University Housing is using only front loading washers in residence halls across campus. This type of washer uses approximately one third of the water of a top loading model. The front loading washers spin dry more efficiently meaning less dry time and energy used by the driers.
- University Housing is also using 2.0gpm low flow shower heads in all 2400 showers in campus residence halls. When 1.5-1.75 gpm heads were tried, the students objected, so University Housing is staying with 2.0 gpm heads for customer service reasons.
- Housing has upgraded the majority of their faucets to include aerators, only 169 of the 3,000 are lacking this equipment.
- Housing only utilizes low flow, 3.5 gallon per flush (gpf), toilets in the residence halls.

Projects such as these set a positive example for the campus community while reducing University water consumption.

Links of Interest

[Office of Energy Management](#)
[NC Project Green](#)
[Irrigation Association](#)

Buildings

Guidelines	Number of campus departments and boards involved in the Design Review process	8+
	Average project completion time	N/A
Certification	Points currently achieved towards High Performance Certification	140
	Points partially achieved	450
	Points needed to achieve:	
	<i>Platinum Certification</i>	750-1000
	<i>Gold Certification</i>	550-750
	<i>Silver Certification</i>	450-550
	<i>Bronze Certification</i>	350-450
	Percentage of points currently being achieved	14%

Community and Culture

Environmental Organizations and Events	Environmental organizations on campus	13
	Incoming freshman who are interested in joining an	82%*
	Incoming freshman who are interested in attending an environmental event	83%*
Administrative Leadership	Number of Student, Staff, or Faculty committees related to sustainability	4
	Number of sustainability resolutions passed by a committee in 04/05	2

Curriculum and Research

Academics	Undergraduate Environmental Majors	3
	Undergraduate Environmental Minors	3
	Graduate Environmental Majors	0
	Graduate Environmental Minors	2
	Number of Degrees Conferred in Environmental Majors	41
	Central coordination of environmental educational programming	0

Curriculum and Research Continued

Research	Number of NCSU research bodies that address sustainability issues	31
	Number of colleges and departments these research entities are housed under	5
Extension	Number of NCSU Extension programs that address environmental sustainability	21
	Number of colleges and departments these programs are operated under	4

Energy

Usage	Gross Square Feet	9,986,663
	Total Energy Cost	\$19,567,298
	Total Energy Cost per square foot	\$1.96
	Total BTUs	1,726,434 MBTUs
	Electricity Consumed	240,393,904 kWh
	Electricity Cost	\$13,512,139
Monitoring	Buildings Metered	Unknown
	Electric Meters	171
	Account savings	\$976,496
	Heating Degree Days	3,182
	Cooling Degree Days	1,734
Conservation	Number of OEM conservation projects FY03-04	11
	Dollars spent	\$60,588
	Estimated savings	\$30,193 per year
	Average Estimated Payback	2.01 years
	Number of Occupancy Sensors	Unknown
	Number of Infrared Sensors	Unknown
Alternatives	Energy Generated by Solar House	6700 kWh per year
	Energy costs saved due to Solar House	\$500 per year
	BTUs purchased from renewable energy sources	0

Land Use

Use of Space	Total acreage of NCSU Campus	2,241
	Total acreage of NCSU outlying lands	104,027 acres
	Percent of Open Space on NCSU Campus	Unknown
	Campus Space Deficit	900,000 ASF
Restoration	Completed phases of Rocky Branch restoration	phase 1 complete
	Completed phases of North Creek restoration	Est. completion in 2006
Conservation	Undeveloped land on Main campus, Centennial and	1,172 acres
	Undeveloped land that is able to be developed on Main campus, Centennial and Centennial Biomedical Cam-	424 acres
Grounds Management	Maintained acreage	950 acres
	Funds spent annually on environmental controls	FY03-04 ~ \$14,000
	Percent of total plant inventory native	no official plant inventory
	Most prevalent pesticide	Round Up
	Area requiring heaviest chemical maintenance	turf grass areas, Miller Field and
	Most prevalent plant species being intentionally grown	no official plant inventory
	Area most heavily watered	Grounds Dept – Miller Fields Athletics Dept. – Carter Finley
Stormwater	Impervious surface on all NC State owned land	529 acres
	Impervious surface on primary campuses (Main, Cen-	427 acres
	Number of BMP sites	Unknown

Materials Management

Purchasing	Dollars spent by the University on goods and services	\$150 million
	Dollars spent on recycled goods	Data unavailable
	Percent of monitors that are LCDs	34%
	Number of central purchasing agents	7

Materials Management Continued

Environmentally Preferable Purchasing	30% recycled content paper purchased	30 million sheets
	% of paper purchased that has 30% or higher recycled content	Unknown
	Amount of other recycled content goods purchased	Unknown
	Energy Star purchases (% of total purchases)	Unknown
Surplus	Number of items sold through Surplus	21,600 - 22,000
	Percent of Surplused items reused	90-93%
	CRT monitors stored in Surplus	1200
	Number of non-NCSU customers in FY03-04	1,040

Transportation

Driving and Parking	Number of parking decks on campus	6
	Number of parking spaces on campus	18,084
	Parking space per person ratio	.6 (3 to 5)
	Number of parking permits in use	15,000-17,000
Alternative Transportation	Wofline Riders	1,552,305 trips annually
	Number of buses running	20
	Number of stops/routes	102 stops/10 routes
	Number of people registered with the carpool data base	102 (50 carpools)
	Number of vanpool riders and drivers	37 (all faculty & staff)
	Number of vanpools traveling to NCSU	4
	Number of bike racks/spaces	483 racks
Campus Vehicles	Gallons of diesel fuel used	0
	Gallons of biodiesel fuel used	35,193
	Gallons of gasoline used	287,587
	Number of leased Motor Fleet Management vehicles	293
	Number of flex fuel vehicles in Motor Fleet Management	156
	Miles traveled by Motor Fleet Management vehicles	515,405

Waste Reduction and Recycling

Recycling Rates	Overall Diversion rates in 2002/2003	23%
	Number of recycling bins on campus	1,453
	Different types of materials recycled	25
	Financial savings from recycling in 2002/2003	\$75,992
Reuse	Move Out 2004 Totals:	
	<i>Food</i>	992 lbs
	<i>Clothes</i>	3750 lbs
	<i>Furniture</i>	1500 lbs
	<i>Miscellaneous charitable donations</i>	400 lbs
	<i>Wood and concrete blocks</i>	9000 lbs
	<i>Paper products</i>	42,700 lbs
	<i>Beverage Containers</i>	7700 lbs
	<i>Total</i>	66,042 lbs/ 33,021 tons
Composting	Amount of organic materials diverted from the waste stream in 2003/2004	412.7 tons
	Amount of mulch used by the campus from the compost site in 2003/2004	564 cubic yards
	Financial savings in 2003/2004 from using composted material	\$7,896
Solid Waste	Waste land-filled per capita in 2003/2004	225 lbs./person
	Landfill fees in 2003/2004	\$105,922
	Number of trash dumpsters on campus	164
	Number of cardboard dumpsters on campus	76
	Man hours spent dealing with trash on campus in 2003/2004	9400
Hazardous Waste	Chemical Waste Disposed in fiscal year 2003/2004	209,994 lbs
	Chemical Disposal Costs in 2003/2004	\$190,872
	Regulated Medical Waste Disposed of in fiscal year 2003/2004	256,094 lbs.
	Medical Waste Disposal costs in 2003/2004	\$156,500

Indicator List

Water		
Usage	Total Volume of water used	581,215 ccf or 434,748,920 gallons
	Building Gross Square Feet	9,986,663
	Volume of Irrigation water used	Unknown
	Volume per square foot	0.058 ccf/gsf
	Total cost of water and sewer	\$1,372,287.68
	Cost per volume	\$2.36 per ccf
Monitoring	FY04 Rainfall	38.9 inches
	Gallons of Make up water used	11,667,900 (Central Steam Plant only)
	Cold Water Meters	117
	Steam Meters	5
	Hot Water Meters	36
	Condensate Meters	48
Conservation	FY03-04 OEM dollars spent on conservation projects	\$3,059
	Pay back period of conservation projects	0.20 years
	Low Flow Shower Heads:	
	<i>University Housing</i>	2400
	<i>Carmichael and Facilities</i>	200
	<i>Total</i>	2600
	Front Loading Washers	487
Percent of faucets with aerators	Unknown	

Buildings

NCSU Space Regulation- <http://www.ncsu.edu/policies/finance/facilities/pdf/REG07.25.14.doc>

NCSU Master Plan- <http://www.ncsu.edu/facilities/univ-arch/1a-physical.htm>

NCSU Construction Guidelines- <http://www.ncsu.edu/facilities/univ-arch/4-construction.htm>

Triangle J High Performance Guidelines- <http://www.tjcog.dst.nc.us/hpgtrpf.htm>

US Green Building Council- <http://www.usgbc.org/>

NC Green Building Technology Database- <http://www.ncgreenbuilding.org/site/ncg//index.cfm>

NC Solar Center- <http://www.ncsc.ncsu.edu/>

Community and Culture

NCSU Environmental Sustainability- http://www.ncsu.edu/environmental_sustainability/index.html

NCSU Student Organization Resource Center- <http://www.ncsu.edu/sorc/>

Student Organization for Sustainability- http://www.ncsu.edu/stud_orgs/env_science/

Lake Raleigh Woods- <http://www.lakeraleighwoods.org>

Students for Sustainable Energy- <http://www.wolfpackenergy.org>

NCSU Campus Greens- <http://www.nc-campusgreens.org/>

NCSU Housing- <http://www.ncsu.edu/housing/index.php>

NCSU Inter-Residence Council- http://www.ncsu.edu/irc/About_Us.html

NCSU Dining- <http://www.ncsudining.com/>

Center for Environmental Farming Systems- <http://www.cefs.ncsu.edu/>

NCSU Standing Committees- http://www.ncsu.edu/staff_senate/committees/index.php

NCSU Physical Environment Committee-

http://www.ncsu.edu/provost/governance/standing_committees/PEnC/index.html

NCSU Resources and Environment Committee- http://www.ncsu.edu/faculty_senate/resenvi-04-05.htm

NCSU Faculty Senate- http://www.ncsu.edu/faculty_senate/r5-0405.htm

NCSU Campus Environmental Sustainability Team- http://www.ncsu.edu/environmental_sustainability/

Curriculum and Research

NCSU Mission Statement- <http://www2.acs.ncsu.edu/UPA/strategicplan/mission.htm>

NCSU Guiding Principles- http://www.ncsu.edu/environmental_sustainability/guiding_principles.html

NCSU Peer Universities- http://www2.acs.ncsu.edu/UPA/peers/current/ncsu_peers/peerlinks_ncsu.htm

Environment Across the Curriculum (EAC) Initiative- <http://www.cmu.edu/education/greening/>

UGA Semester Environmental Literacy Requirement- http://bulletin.uga.edu/bulletin/prg/ELR_Req.html

UGA Interdisciplinary courses- <http://bulletin.uga.edu/bulletin/prg/ELRcourses.html>

UNC Signing of Talloires Declaration-

http://sustainability.unc.edu/Index.asp?Type=Principles&Doc=talloires_declaration

Talloires Declaration- http://www.ulsf.org/programs_talloires.html

NCSU Majors- <http://www.ncsu.edu/majors-careers/>

NCSU Air Quality Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=39

NCSU Ecology Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=87

NCSU Economic Policy Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=87

NCSU Geology Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=39

Curriculum and Research cont'd

NCSU Statistics Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=39

NCSU Watershed Hydrology Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=30

NCSU Environmental Engineering- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=52

NCSU Environmental Technology- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=14

NCSU Undergraduate Minors- http://www.ncsu.edu/advising_central/minors.html

NCSU Graduate Minors- <http://www.grad.ncsu.edu/catalog/>

NCSU Commitment to Environmental Sustainability Guiding Principles-

http://www.ncsu.edu/environmental_sustainability/guiding_principles.html

Environmental Technology (ET)- <http://www.cnr.ncsu.edu/for/courses/undergrad/envtech/envtech.html>

University Planning and Analysis- <http://www2.acs.ncsu.edu/UPA/>

Centers, Institutes and Laboratories (CILS)- <http://www.ncsu.edu/sparcs/centers/>

Animal and Poultry Waste Management Center- http://www.cals.ncsu.edu/waste_mgt/

The Center for Applied Aquatic Ecology- <http://www.ncsu.edu/wq/>

The Center for Environmental and Resource Economics Policy-

<http://www2.ncsu.edu/unity/lockers/users/v/vksmith/index.html>

Center for Integrated Pest Management- <http://cipm.ncsu.edu/>

North Carolina Stream Restoration Institute- <http://www.bae.ncsu.edu/programs/extension/wqg/sri/>

The Air Pollution Laboratory of the Southeastern Plant Environmental Laboratory-

<http://www.ncsu.edu/phytotron/index.html>

Soil and Water Environmental Technology Center- <http://www.soil.ncsu.edu/swetc/index.html>

Water Quality Program- <http://www.water.ncsu.edu/>

North Carolina Sustainable Agriculture Research and Education Program- <http://www.sustainable-ag.ncsu.edu/>

NCSU Center for Environmental Farming Systems- <http://www.cefs.ncsu.edu/>

NCSU/USDA Forage Program- <http://www.ncsu.edu/forage/>

North Carolina Cooperative Fish and Wildlife Research Unit- <http://www2.ncsu.edu/nccoopunit/>

The Center for Marine Sciences and Technology (CMAST)- <http://www.cmast.ncsu.edu/>

Applied Energy Research Laboratory- <http://www.mae.ncsu.edu/Centers/aerl/>

Center for Embedded Systems Research- <http://www.cesr.ncsu.edu/>

Center for Nuclear Power Plant Structures, Equipment and Piping-

<http://www2.ncsu.edu/ncsu/CIL/cnpps/index.html>

Furniture Manufacturing and Management Center-<http://www.fmmcenter.ncsu.edu/>

North Carolina Solar Center- <http://www.ncsc.ncsu.edu/>

NCSU Nuclear Reactor Program- http://www.ne.ncsu.edu/NRP/reactor_program.html

Brandon P. Hodges Wood Products Laboratory- <http://www2.ncsu.edu/unity/lockers/ftp/rvcgmm/web/>

Center for Earth Observation- <http://www.ceo.ncsu.edu/>

Industry Research Programs in Forestry-

http://www2.ncsu.edu/ncsu/research_outreach_extension/centers/forindustry.html

Southern Center for Sustainable Forests- <http://www.env.duke.edu/scsf/>

Center for Research in Scientific Computation- <http://www.ncsu.edu/crsc/>

NCSU Institute of Statistics- <http://www4.stat.ncsu.edu/~fuentes/env/>

The State Climate Office of North Carolina- <http://www.nc-climate.ncsu.edu/>

Curriculum and Research cont'd

NCSU Soil Sciences Concentration- http://www.ncsu.edu/majors-careers/do_with_major_in/showmajor.php?id=87

Center for Transportation and the Environment- <http://www.itre.ncsu.edu/cte/>

Kenan Center for the Utilization of Carbon Dioxide in Manufacturing- <http://www2.ncsu.edu:8010/champagne/>

Materials Research Center- <http://www.mse.ncsu.edu/>

North Carolina Sea Grant College Program- <http://www.ncseagrant.org/>

Water Resources Research Institute- <http://www2.ncsu.edu:8010/ncsu/CIL/WRRRI/>

Solar House- http://www.ncsc.ncsu.edu/solar_house/NCSU_solar_house.cfm

Commitment to Environmental Sustainability Guiding Principles-
http://www.ncsu.edu/environmental_sustainability/guiding_principles.html

North Carolina Cooperative Extension Service- <http://www.ces.ncsu.edu/Environment/>

College of Agriculture and Life Sciences- <http://www.bae.ncsu.edu/programs/extension/proindex.html>

French Broad River Watershed Education Training Center-
<http://www.bae.ncsu.edu/programs/extension/wqg/frenchbroad/index.html>

Natural Resources Leadership Institute- <http://www.ces.ncsu.edu/depts/agecon/nrli/>

Neuse River Education Team- <http://www.neuse.ncsu.edu/index.html>

NC Stream Restoration Institute- <http://www5.bae.ncsu.edu/bae/programs/extension/wqg/sri/>

Pollution Prevention: Farm*A*Syst, Home*A*Syst, Coast*A*Syst- <http://www.soil.ncsu.edu/assist/>

Stormwater and Erosion Control- <http://www.soil.ncsu.edu/programs/stormwater/>

Stormwater Resources- <http://www.bae.ncsu.edu/stormwater/>

Watershed Education for Communities and Local Officials- <http://www.ces.ncsu.edu/depts/agecon/WECO/>

Animal and Poultry Waste Management Center- http://www.cals.ncsu.edu/waste_mgt/

Buffers and Water Quality- <http://www.soil.ncsu.edu/programs/waterquality/>

Environmental Quality and Health- http://www.tox.ncsu.edu/extension/environmental_toxicology.htm

Fisheries and Pond Management Extension- <http://www.ces.ncsu.edu/nreos/wild/fisheries/index.html>

NCSU Pesticide Safety Education Program- <http://ipm.ncsu.edu/pesticidesafety/>

NCSU Water Quality Group- <http://www.bae.ncsu.edu/programs/extension/wqg/>

Watershed Support System- <http://www.water.ncsu.edu/watershedss/>

Wetland Soils- <http://www.soil.ncsu.edu/programs/wetlands/>

Wildlife Extension Program- <http://www.ces.ncsu.edu/nreos/wild/wildlife/index.html>

J. C. Raulston Arboretum- <http://www.ncsu.edu/jcraulstonarboretum/>

Extension Forestry Program- <http://www.ces.ncsu.edu/nreos/forest/>

Forestry Educational Outreach Program- <http://www.ces.ncsu.edu/nreos/forest/feop/>

Wood Products Extension Program- <http://www.ces.ncsu.edu/nreos/wood/>

Industrial Extension Service- <http://www.ies.ncsu.edu/>

Environmental Health and Safety Extension Program- <http://www.ies.ncsu.edu/environmental/index.cfm>

NC Solar Center- <http://www.ncsc.ncsu.edu/>

College of Physical and Mathematical Sciences- <http://www.pams.ncsu.edu/centers.php>

The Center for Marine Sciences and Technology- <http://www.cmast.ncsu.edu/whatwedo/extension.htm>

State Climate Office of North Carolina- <http://www.nc-climate.ncsu.edu/>

Office of Extension and Engagement- <http://www.ncsu.edu/extension/tenvi.html>

Sustainable Communities Partnership- <http://www.ncsu.edu/extension/cenvi.html>

Energy

NCSU Facilities Office of Energy Management- <http://www.ncsu.edu/facilities/energy>
State Energy Office- <http://www.energync.net>
NC Solar Center- <http://www.ncsc.ncsu.edu>
Energy Policy Act- <http://www.eere.energy.gov/vehiclesandfuels/epact/>
Progress Energy Fuel Mix- <http://www.progress-energy.com/aboutenergy/powerplants>
Greenhouse Gas Inventory Guide- <http://www.lclark.edu/~seed/ghginventoryguide.pdf>
Degree Day Definition- <http://www.cpc.ncep.noaa.gov/products/outreach/glossary.shtml>
NCSU Energy Management Projects- <http://www.ncsu.edu/facilities/energy/morris.htm>
NC Solar House- http://www.ncsc.ncsu.edu/solar_house/NCSU_solar_house.cfm
Occupancy Sensors, NCSU Successes- <http://www.p2pays.org/ref/32/31316.pdf>
NC Green Power- <http://www.ncgreenpower.org>
NC Coastal Wind Initiative- <http://www.ncsc.ncsu.edu/programs/programs.cfm>
NC HealthyBuilt Homes Initiative- <http://www.ncsc.ncsu.edu/programs/programs.cfm>

Land Use

NCSU Physical Master Plan- <http://www.ncsu.edu/facilities/univ-arch/1-physical.htm>
Centennial Campus- <http://centennial.ncsu.edu/>
University Space Committee- http://www.ncsu.edu/provost/governance/admin_committees/spacecom/index.html
Centennial Campuses- <http://centennial.ncsu.edu/>
Centennial Biomedical Campus- <http://centennial.ncsu.edu/cbc/index.html>
North Creek Restoration - <http://www.bae.ncsu.edu/programs/extension/wqg/northcreek.html>
Rocky Branch Restoration Project -
http://www.ncseagrant.org/index.cfm?fuseaction=page&filename=rocky_branch.html
NC Sea Grant - <http://www.ncseagrant.org/index.cfm>
WALARA - http://www.ncsu.edu/environmental_sustainability/symposium.html
Court of North Carolina - <http://www.ncsu.edu/nso/traditions/campus/court%20of%20nc/courtnc.htm>

Materials Management

Executive Order 156- <http://www.p2pays.org/ref/03/02221.pdf>
NC General Statute 143-58- <http://www.p2pays.org/main/statutes.asp#content>
EPA's Comprehensive Procurement Guidelines- <http://www.epa.gov/cpg/>
Federal Executive Order 13101- <http://www.ofee.gov/eo/13101.htm>
NCSU Materials Management- <http://www.fis.ncsu.edu/materialsmgmt/Default.htm>
NCSU Purchasing Guidelines- http://www.fis.ncsu.edu/materialsmgmt/purchasing/Purch_guidelines.htm
NC E-Procurement- http://www.ncgov.com/eprocurement/asp/section/ep_index.asp
NC Division of Purchase and Contract- <http://www.doa.state.nc.us/PandC/pandc.htm>
Model EPP and Sustainability Policies- <http://www.p2pays.org/epp/policies.asp>
NC State contracts of recycled goods- <http://www.doa.state.nc.us/PandC/recycled.htm>
DPPEA's Environmentally Preferable Procurement- <http://www.p2pays.org/epp/>
Recycling Product Guide- <http://www.recyclingmarkets.net/>
NCSU Surplus Property- <http://www.fis.ncsu.edu/materialsmgmt/MaterialsSupport/SurplusWeb.htm>
NC State Surplus Property Agency- <http://www.doa.state.nc.us/daa/ssp/ssp.htm>
State Surplus Property Recycling Contracts- <http://www.doa.state.nc.us/ssp/recycle.htm>

Transportation

- NC Department of Transportation**– <http://www.ncdot.org>
- Bureau of Transportation Statistics**– <http://www.bts.gov>
- NCSU Transportation**– <http://www.ncsu.edu/transportation>
- Triangle Transit Authority**- <http://www.ridetta.org/index.html>
- Center for Transportation and the Environment**- <http://152.14.30.150/cte/>
- Official NC State University Parking and Transportation Policies**-
<http://www.ncsu.edu/policies/finance/transportation/POL07.60.1.php>
- NCSU Vanpooling**- <http://www2.acs.ncsu.edu/trans/alternatives/vanpool.html>
- NCSU Carpooling**- <http://www2.acs.ncsu.edu/trans/alternatives/carpool.html>
- NCSU Bicycling**- <http://www2.acs.ncsu.edu/trans/alternatives/bike.html>
- NCSU Emergency Ride Home Assistance**- <http://www2.acs.ncsu.edu/trans/alternatives/erha.html>
- NCSU Rideshare**- <http://www2.acs.ncsu.edu/trans/alternatives/ridematch.html>
- NCSU U-pass service**- <http://www2.acs.ncsu.edu/trans/transit/upass.html>
- NCSU Park and Ride**- <http://www2.acs.ncsu.edu/trans/transit/Fall-Spring/parkandride.html>
- NCSU Physical Master Plan**- <http://www.ncsu.edu/facilities/univ-arch/1-physical.html>
- NCSU Campus Paths Implementation Program**- <http://www2.acs.ncsu.edu/trans/alternatives/campuspaths.html>
- NCSU Wolfline**- <http://www2.acs.ncsu.edu/trans/transit/index.html>

Waste Reduction and Recycling

- NC Governor Hunt's Executive Order 156**- <http://www.sustainablenc.org/main/orders.htm#156>
- NCSU Office of Waste Reduction and Recycling**- <http://www.ncsu.edu/facilities/recycling>
- Wake County Recycling and Solid Waste**- <http://www.wakegov.com/recycling/default.htm>
- City of Raleigh Solid Waste Services**– <http://www.raleigh-nc.org/sws/recyclinghome.htm>
- NC DENR Division of Pollution Prevention and Environmental Assistance**– <http://www.p2pays.org>
- NCSU Solid Waste and Recycling Totals 2003/2004**-
<http://www.ncsu.edu/facilities/recycling/Recycling%20Info/Image/ProjectedTotals04-05.xls>
- Waste Trader**- <http://www.ncwastetrader.org/home.aspx>
- NCSU Surplus**- <http://www.fis.ncsu.edu/materialsmgmt/MaterialsSupport/SurplusWeb.htm>
- City of Raleigh Swap Shop**-http://www.raleigh-nc.org/portal/server.pt/gateway/PTARGS_0_2_306_202_0_43/http%3B/pt03/DIG_Web_Content/category/Resident/Garbage_and_Recycling/Recycling/Cat-1C-2005610-094034-Swap_Shop.html
- Habitat for Humanity Re-Use Center**- <http://www.habitatwake.org/ReuseCenterpage.htm>
- Vermicomposting Resources**- <http://www.bae.ncsu.edu/people/faculty/sherman/vermiculture/worm-pubs.html>
- North Carolina Governor Hunt's Executive Order 156**- <http://www.sustainablenc.org/main/orders.htm#156>
- NCSU Office of Waste Reduction and Recycling Programs**– <http://www.ncsu.edu/facilities/recycling/programs>
- NCSU Environmental Sustainability**– http://www.ncsu.edu/environmental_sustainability/
- NCSU Chuck It Recycling Program**– http://www.ncsu.edu/facilities/recycling/Chuck_It.html
- NCSU EH&S Hazardous Waste**- <http://www.ncsu.edu/ehs/waste.htm>
- NCSU EH&S Waste Generator Manual**- <http://www.ncsu.edu/ehs/www99/left/cwgm/index.html>

Water

Executive Order 26- <http://www.sustainablenc.org/main/EO%2026.pdf>

Executive Order 156- <http://www.p2pays.org/ref/03/02221.pdf>

NPDES- <http://cfpub.epa.gov/npdes/>

Clean Water Act-<http://www.epa.gov/region5/water/cwa.htm>

Safe Drinking Water Act- <http://www.epa.gov/safewater/sdwa/>

Office of Energy Management-

<http://www.ncsu.edu/facilities/energy/>

NC Project Green- <http://www.sustainablenc.org/water.htm>

Irrigation Association- <http://www.irrigation.org/swat/>