2011 UNIVERSITY OF VIRGINIA **SUSTAINABILITY ASSESSMENT**

SUSTAINABILITY · UVA

Dear Sir   Paris September 6. 1789.

I sit down to write to you without knowing by what occasion I shall send my letter. I do it because a subject comes into my head which I would wish to develope a little more than is practicable in the hurry of the moment of making up general dispatches.

The question Whether one generation of men has a right to bind another, seems never to have been started either on this or our side of the water. Yet it is a question of such consequences as not only to merit decision, but place also among the fundamental principles of every government. the course of reflection in which we are immersed here on the elementary principles of society has presented this question to my mind; & that no such obligation can be so transmitted I think very capable of proof.   I set out on this ground, which I suppose to be selfevident, 'that the earth belongs in usufruct to the living: that the dead have neither powers nor rights over it. the portion occupied by any individual ceases to be his when himself ceases to be, & reverts to the society. if the society has formed no rules for the appropriation of it's lands in severalty, it will be taken by the first occupants. these will generally be the wife & children of the decedent. if they have formed rules of appropriation, those rules may give it to the wife and children, or to some one of them, or to the legatee of the deceased. so they may give it to his creditor. but the child, the legatee, or creditor takes it, not by any natural right, but by a law of the society of which

Mr. Madison   they

I set out on this ground, which I suppose to be self evident,
‘that the earth belongs in usufruct to the living’

Thomas Jefferson to James Madison, September 6, 1789

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usufruct, n.
The right of temporary possession, use, or enjoyment of the advantages of property belonging to another, so far as may be had without causing damage or prejudice to this.

Oxford English Dictionary

Garrett Hall (c. 1908) is undergoing restoration to house the Batten School of Leadership and Public Policy. Restorations mitigate growth impacts by improving space functionality while preserving energy embodied in existing building materials.

As Chair of the Presidential Committee on Sustainability, it is my pleasure to present the 2011 University of Virginia Sustainability Assessment on behalf of the Committee. Five years ago the University completed the 2006 Sustainability Assessment, the first comprehensive document to appraise the state of the University's policies, practices, and operations as related to principles and actions that support sustainability. The 2011 UVA Sustainability Assessment documents significant accomplishments of the past five years and recommends actions to continue the advancement of sustainability at the University of Virginia. This report expands upon, not replaces, the original report. Readers are urged to review the 2006 Sustainability Assessment for a more complete account of UVA's history of leadership in conservation and sustainability.

The 2006 Sustainability Assessment recommended a "Strategy for Sustainability" of key steps to advance sustainability in subsequent years. In broad terms, this strategy proposed reinforcing the foundation of diversified sustainability efforts already extant at UVA through widely distributed responsibility with a central coordination point. The strategy also suggested incorporating sustainability measures into existing reporting structures and the creation of an advisory panel to coordinate institutional progress towards sustainability.

Major components of this strategy have been implemented. The University has created new sustainability-focused positions within units across Grounds. The Sustainability Advisory Panel was convened in April 2007 and became the Presidential Committee on Sustainability in August 2008. Many units have introduced sustainability objectives into their annual reporting metrics.

This 2011 UVA Sustainability Assessment utilizes a similar structure to the 2006 report. The "Strategy for Sustainability" contains high-level actions to further advance sustainable practices at the University of Virginia. Following the Strategy for Sustainability are in-depth reviews of accomplishments and opportunities in three subject areas: Governance and Culture, Academics and Learning, and Management Centers. The Management Centers are further categorized into seven focus areas: Land Use, Built Environment, Transportation, Food, Energy and Carbon, Water, and Waste and Recycling.

There are also notable enhancements to this report. The scope of the 2011 Sustainability Assessment has expanded to include activities in the University of Virginia Health System. The sections for Governance and Culture and Academics and Learning now identify specific opportunities, mirroring the format of the management centers.

As the variety and number of activities are ever expanding, the 2011 Sustainability Assessment does not represent a complete inventory of programs and activities in matters of sustainability. Even so, the extent of the programs described in this report clearly illustrates that sustainability is a serious, and growing, University enterprise.

David J. Neuman FAIA LEED-AP
Architect for the University
Chair, Presidential Committee on Sustainability

Although not immediately apparent from the outside, restoration of Pavilion IX is preparing the structure for future faculty residents. Once the restoration is complete, Pavilion IX will become the first Jeffersonian building to be LEED Certified.

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The Learning Barge was designed and built by UVA students and faculty and is now run by the non-profit Elizabeth River Project as a floating classroom featuring interactive lessons on how to improve the heavily polluted Elizabeth River.

The 2011 University of Virginia Sustainability Assessment, prepared by the Office of the Architect and endorsed by the Presidential Committee on Sustainability, documents the significant accomplishments of the past five years and recommends actions to continue the advancement of sustainability at the University.

Strategy for Sustainability

The University of Virginia's evolving sustainability movement has taken advantage of early opportunities, dating back to the 1980's, and is now exploring the system-wide challenges and opportunities that will enable further advancement. As the scale of the University's efforts have grown, it is increasingly necessary to identify priorities, evaluate progress, and set targets in areas of education, behavior change, and operations in order to foster collaboration on sustainability.

This assessment process has identified four key actions to achieve these goals:

- Approve a comprehensive set of objective, measurable goals for sustainability designed to focus priorities and drive change.
- Adopt a concise, motivating sustainability vision: The University of Virginia considers sustainability an institutional and an individual value. We are committed to actions that mutually promote the health of our institution, community, and environment. To achieve this vision, the University supports system-wide collaboration, shared priorities, and frequent assessment of progress.
- Create an interdisciplinary center for sustainability to establish an internal and external focal point for sustainability and to foster collaboration among faculty, students, staff, and administrators.
- Standardize an approach to utilize the Grounds as a teaching tool through collaboration between academic and operational units on areas of shared interest.

Governance and Culture

Both this assessment and the 2006 Sustainability Assessment show that individual units have made substantial progress towards sustainability. Moving forward, better alignment of goals and strengthened metrics will support continued advancement.

As University departments have expanded sustainability initiatives, several established new positions to focus on these initiatives and a larger number of existing positions have expanded to include substantial responsibility for sustainability.

Progress made includes the convening of a Sustainability Advisory Panel in 2007, and the subsequent 2008 creation of the Presidential Committee on Sustainability. The Committee is charged with advising "the President and EVP/COO…on all matters related to the overall qual-

○ Fully Completed
◓ Partially Completed
○ Not Completed

Land Use
Built Environment
Transportation
Food
Energy and Carbon
Water
Waste and Recycling

84% of the 2006 Sustainability Assessment's recommendations have been partially or fully implemented

ity, diligence, and progress of the University's commitment to sustainability in the broad sense of environmental, economic, and social impacts."

The Outreach Subcommittee has implemented four strategies to improve sustainability outreach and education, as follows: 1) a sustainability-awareness campaign, 2) the creation of sustainability communications opportunities, 3) the development and implementation of reminder signage around Grounds, and 4) the creation of events to promote sustainability awareness. More specifically, efforts included the launch of a sustainability website (www.virginia.edu/sustainability) in 2008, UVA Sustainability Pledge in 2010, and Sustainability Partners in 2011.

In addition to the Student Council's Environmental Sustainability Committee, created in 2007, there are currently more than 50 student involved organizations focused on aspects of sustainability. Student initiatives include an effort to create a sustainability-themed residence hall, "Greek Recycling," and the SustainaUnity coalition.

Opportunities: Governance and Culture
• Establish annual funding for the Presidential Committee on Sustainability (Immediate)
• Adopt a high-level, motivating sustainability vision for the University (Immediate)
• Launch the Green Initiatives Funding Tomorrow (GIFT) Program (Immediate)
• Approve a comprehensive set of objective, measurable goals for sustainability (1-2 Years)
• Establish a Sustainability Marketing Position (1-2 Years)
• Implement reminder and interpretive signage around Grounds (1-2 Years)
• Complete the Sustainability House (2-4 Years)

Academics and Learning

Among all of the opportunities for the University to make a positive contribution to sustainability, none are greater than the thousands of young minds that walk the Lawn every spring. Success-

fully conveying the importance of sustainability to University graduates equips them with critical tools to positively impact their environment.

There are over 75 sustainability-related courses offered, many of which may be used to earn the new, interdisciplinary Global Sustainability minor. In addition, the School of Engineering's Technology and the Environment minor takes a technical approach to sustainability and the Darden School of Business has launched an Innovation for Sustainability concentration for MBA students.

Recent sustainability-related research activities includes the UVA Bay Game; a National Science Foundation grant to develop "smart building" energy systems; and Darden's Alliance for Research on Corporate Sustainability. Support for sustainability research is available from seed grants and research awards.

Opportunities: Academics and Learning
• Inventory sustainability research initiatives (Immediate)
• Launch a sustainability speakers series (Immediate)
• Extend course-initiated sustainability projects into multi-year efforts (1-2 Years)
• Design and fund an interdisciplinary center for sustainability (1-2 Years)

Bay Game, watershed sustainability simulation

- Formalize use of the Grounds as a teaching tool (1-2 Years)
- Introduce an undergraduate student area requirement for sustainability (2-4 Years)
- Provide faculty incentives for interdisciplinary collaboration on sustainability (2-4 Years)

Management Centers

The following seven management centers were identified in 2006 and again in 2010 to assess the progress of the physical management of the University towards sustainability.

Land Use

Accomplishments include completion of the Grounds Plan and related documents that guide UVA growth through sustainability principles, the establishment of the Grounds Improvement Fund (GIF), an updated Bicycle Master Plan, the first Biodiversity Analysis, and the continued activity of the Tree Replacement Program.

Opportunities: Land Use
- Recommend best practices for sustaining local natural systems (Immediate)
- Provide planning input on sustainability in the Project Initiation Form (Immediate)
- Establish a sustainability tour of Grounds (1-2 Years)
- Improve use of existing space to minimize need for new facilities (1-2 Years)
- Develop a growth management model to plan for associated impacts (1-2 Years)
- Reconfigure McCormick Road to a pedestrian/transit-focused travelway (2-4 Years)
- Identify sustainability priorities to implement along with building/utility capital projects (2-4 Years)

Built Environment

Buildings generate 85% of the University's greenhouse gas emissions. The University committed in 2007 to Leadership in Energy and Environmental

The LEED Gold-certified South Lawn Complex

Design (LEED) certification for all new construction and major renovation projects and has since certified 7 buildings. Benefits of these efforts include substantial savings in energy and improved occupant comfort and health.

Opportunities: Built Environment
- Mandate specific LEED credits and energy performance for all capital projects (Immediate)
- Expand efforts to inform building occupants about sustainable building features (Immediate)
- Certify two existing University buildings under LEED EB or equivalency (1-2 Years)
- Include occupant productivity and health in building performance measures (1-2 Years)
- Document the lifecycle impacts of construction activities and materials (1-2 Years)
- Develop incentive approach to space utilization (2-4 Years)
- Prototype a dual plumbing system (2-4 Years)

Transportation

The University's Transportation Demand Management program aims to reduce single occupancy vehicle use, minimize parking demand, promote

CAVPOOL, one of the many UVA TDM programs

pedestrian/bicycle systems, and improve the overall quality of life on Grounds. In addition, the Department of Parking and Transportation has implemented a strict Environmental Management System (EMS).

Opportunities: Transportation
- Implement 3+ sheltered bicycle parking, bi-cycle rooms, or corrals per year (Immediate)
- Host educational sessions to promote TDM programs (Immediate)
- Invest in Charlottesville Area Transit to in-crease commuter mode shifts (1-2 Years)
- Increase employee carpool mode split by 1% per year (1-2 Years)
- Introduce bicycle sharing to the Central Grounds and develop plan for larger system (1-2 Years)
- Achieve a bronze-level, or higher, Bicycle Friendly University certification (1-2 Years)
- Document employee telecommuting and ex-pand existing initiatives (1-2 Years)
- Calculate greenhouse gas of UVA-sponsored travel (1-2 Years)
- Move towards pay-per-use parking (2-4 Years)

Food

Dining operations are well positioned to promote healthy and sustainable practices directly to the UVA community. Recent successes include multiple partnerships with the Charlottesville-based Local Food Hub, frequent sustainably-themed events, formation of the Green Dining Committee, and the creation of a student-run community garden.

Opportunities: Food
- Utilize recyclable materials and provide products in bulk at all catered events (Imme-diate)
- Implement sustainable dining programs con-sistently across Grounds (1-2 years)
- Provide recycling at all events, and offer local food and zero-waste catering options (1-2 years)
- Provide 10 or more additional filtered water bottle filling stations (1-2 years)
- Initiate a large-scale garden on underuti-lized University properties (2-4 years)
- Implement food waste composting at 80% or more of University dining locations (2-4 years)

Energy and Carbon

The University's increasing energy consumption brings negative economic and environmental con-sequences, but proper planning and investment can reduce these consequences while offering re-search and education opportunities that support the University's mission.

On June 10, 2011, the Board of Visitors ap-proved a sustainability commitment developed by the Committee on Sustainability, and endorsed by the Faculty Senate, Student Council, General Faculty Council, and all four Employee Councils, that sets a specific greenhouse gas reduction tar-get and reaffirms the University's broader com-mitment to sustainability in operations, outreach, research, and education. In 2008, the Darden School of Business committed to become a zero waste, carbon neutral enterprise by 2020.

Also in 2008, the Energy and Utilities Department launched the "Delta Force" to retrocommission buildings with a focus on energy conservation. Through May 2011, these efforts resulted in cumulative energy cost savings of over $2 million. Other recent activities include the annual Dorm Energy Challenge and Observatory Hill Dining Hall's participation in the U.S. Environmental Protection Agency's "Battle of the Buildings."

Opportunities: Energy and Carbon
- Make real-time building energy consumption publicly-available (1-2 Years)
- Implement the high-priority recommendations of the Renewable and Innovative Energy Technologies Study (Varied)
- Create in-house capability for LEED building energy modeling (1-2 Years)
- Expand Delta Force retrocommissioning efforts (1-2 Years)
- Continue to evaluate shared energy savings program (1-2 Years)
- Initiate capital projects to renovate 2 or more energy-intensive buildings (2-4 Years)

Water

Long-standing University water conservation efforts have included a variety of building upgrades and retrofits. Recent efforts have focused on outreach campaigns, implementation of trayless dining to eliminate the use of water in washing trays, and installation of hydration stations to refill reusable water bottles. In addition, UVA has many initiatives to improve stormwater management, including the development of reconstructed flood plains and green roofs.

Opportunities: Water
- Launch departmental and building water consumption challenges (Immediate)
- Construct and/or improve two or more stormwater management features annually (1-2 Years)
- Quantify reductions in groundwater recharge caused by impervious surfaces (1-2 Years)
- Require rainwater and condensate collection for all new facilities (2-4 Years)

- Capture coil condensate and rainwater for use in all heating and chiller plants (2-4 Years)

Waste and Recycling

The University has collected and diverted recyclables for 21 years. Recent efforts include the promotion of reusable containers in dining facilities, significant reduction of construction and demolition waste, and composting of pre- and post-consumer food waste at two residential dining halls.

Other initiatives across the University include the MERCI Program that diverts unused medical supplies from UVA Health System's waste stream to humanitarian organizations and an expanded recycling program at the John Paul Jones Arena.

Opportunities: Waste and Recycling
- Establish a campaign to reduce use of bottled drinks (Immediate)
- Introduce a zero waste philosophy to University processes (Immediate)
- Create a handbook for sustainable purchasing (Immediate)
- Send non-recycling solid waste stream to a sorting facility (1-2 Years)
- Build upon success of the "Game Day Challenge" football recycling program (1-2 Years)
- Ensure complete co-location of recycling and waste containers (1-2 Years)
- Expand post-consumer composting collection beyond dining facilities (2-4 Years)
- Implement zero-waste commitments for all major events (2-4 Years)

Working with Environmental Health & Safety, students and faculty from Engineering and Environmental Sciences install water monitoring devices to measure the performance and benefits of the Dell stormwater management project.

Sustainability programs develop through several stages of maturity; early stages are first characterized by awareness, followed by measurement and then reduction of negative environmental effects. As "low-hanging fruit" opportunities are exhausted, a second stage emerges in which programs realize the system-wide nature of their challenges, resulting in the formulation of complex solutions. This awareness leads to a third stage where partnerships, lifecycle assessment, and structural changes are explored and implemented. Finally, programs discover the regenerative, sustainable paradigm that emerges from successful system-wide changes.

Taken as a whole, the University's sustainability movement finds itself in this second stage, having taken advantage of prime opportunities, and is now actively exploring the system-wide challenges and opportunities that will enable further advancement. As the scale and sophistication of the University's efforts have grown, it is increasingly necessary to identify priorities, evaluate progress, and set targets in areas of education, behavior change, and operations in order to foster collaboration and support for sustainability.

This assessment process has identified four key actions to achieve these goals.

ACTION 1 Approve a comprehensive set of objective, measurable goals for sustainability designed to focus priorities and drive change.

The adoption of comprehensive metrics and goals has already begun. In 2007, the University committed to Leadership in Energy and Environmental Design (LEED) certification for all new buildings. As a result, the LEED scorecard became the common tool that set priorities for all capital projects and held them accountable for results. In 2010, the University became a charter member in the Sustainability Tracking, Assessment and Rating System (STARS) developed by the Association for the Advancement of Sustainability in Higher Education (AASHE). In creating STARS, AASHE has recognized a common need to evaluate progress towards sustainability and has created a comprehensive system to measure an institution's performance that addresses all three E's (Equity, Environment, and Economy). The University will earn its first STARS rating in summer 2011. By using this rating as a baseline, the University will be able to set a short-term target (0-3 years) and prioritize actions necessary to achieve this target.

The Environmental Footprint Reduction Plan (EFRP) assesses the University's environmental performance in phases addressing four areas: greenhouse gases, materials, water, and nitrogen. Each phase of the Plan summarizes the University's impact in one of these areas, assesses current trends, establishes a target for future reductions, and proposes key strategies to meet this target. Upon completion of each phase of the EFRP, the University should commit to the proposed target (commitment complete for EFRP Phase 1 - Greenhouse Gases) and move to develop and imple-
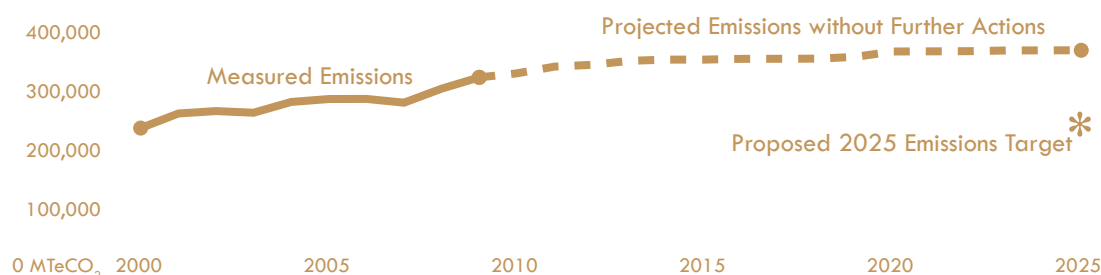
The proposed greenhouse gas emissions target has focused attention on actions that reduce emissions

ment the recommendations contained in the plan. This action will place the University in a leading position with regard to a composite goal incorporating waste, water, and nitrogen as well as carbon emissions.

ACTION 2 Adopt a concise, motivating sustainability vision:

The University of Virginia considers sustainability an institutional and an individual value. We are committed to actions that mutually promote the health of our institution, community, and environment. To achieve this vision, the University supports system-wide collaboration, shared priorities, and frequent assessment of progress.

Since signing the Talloires Declaration in 1991, the University has implemented policies, issued statements, and published documents regarding the environment and sustainability. Taken together these texts convey an institutional commitment to the environment and, in some cases, the sustainability concept. They also reflect the growing maturity of the University's efforts. Yet, this collection of policies and statements lacks a clear hierarchy and provides ambiguous or limited guidance on a number of recent sustainability issues, including collaboration between operations and academics, extent of social equity efforts, and sustain-

ability literacy. The adoption of a single vision for the University will clearly identify institutional priorities.

ACTION 3 Create an interdisciplinary center for sustainability, of form to be determined, to establish an internal and external focal point for sustainability and to foster collaboration among faculty, students, staff, and administrators.

Research and discovery of sustainable solutions are inherently interdisciplinary efforts, requiring broad involvement and collaboration across traditional disciplinary and organizational boundaries. Over the past 20 years, a number of initiatives have successfully navigated institutional barriers to interdisciplinary collaboration, but less progress has been made removing these barriers and creating solutions that can foster, rather than inhibit, collaboration.

Comprehensive sustainability actions must embrace our primary role as an institution of learning: to create and disperse knowledge. The sustainability vision recognizes that system-wide collaboration is necessary to realizing this future. Yet, the University's discipline-driven organization constrains growing interdisciplinary sustainability efforts, impeding potential research and teaching efforts. The creation of an academic center, of a form not yet defined, to foster interdisciplinary collaboration on sustainability will enable signifi-

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TIMELINE OF KEY EVENTS   2007   2008

2006 UVA Sustainability Assessment released

See the 2006 UVA Sustainability Assessment for details on key events at UVA prior to 2007

Board of Visitors requires all new buildings to be LEED Certified

Student Council creates Environmental Sustainability Committee

Sustainability Advisory Panel is created

Parking and Transportation launches free transit program

UVA fills its first two sustainability positions

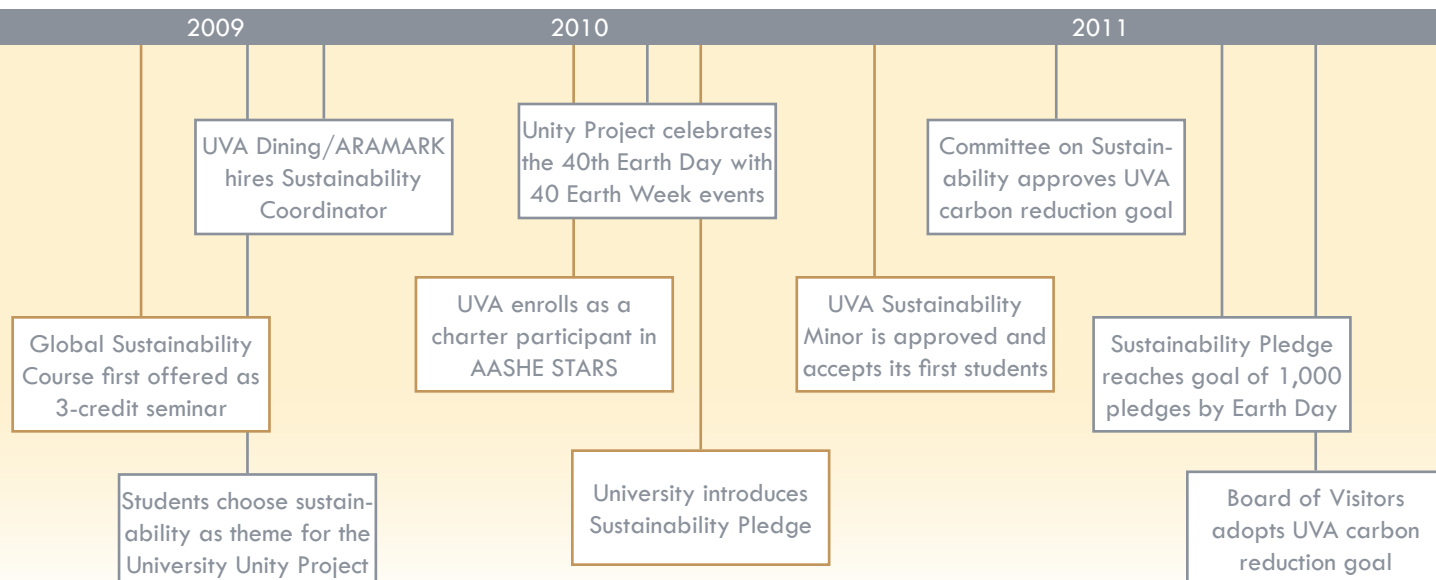Presidential Committee on Sustainability is convened

Delta Force completes first retrocommissioning effort at MR-4

cant progress towards removing these barriers.

ACTION 4 Standardize an approach to utilize the Grounds as a teaching tool through collaboration between operational and academic units on areas of shared interest.

In recent years, ad hoc collaborations between academic and operational units have developed and implemented programs to enhance the sustainability of the University's operations. Students have researched water quality in the Dell, planned bicycle improvements on Grounds, studied energy controls in the Observatory Hill Dining Hall, converted UVA vehicles to run on solar-generated electricity, and more.

Through these efforts, departments have caught glimpses of the collaborative potential between operational and academic spheres. To make the most of these collaborations, operations units need to clearly identify priorities and make data and staff readily available to faculty and students. In return, students and faculty must identify achievable goals and identify a mechanism to successfully maintain multi-year efforts. Formalizing and strengthening this collaboration, possibly through an interdisciplinary center, will be to the mutual benefit of all University parties.

2009	2010	2011

UVA Dining/ARAMARK hires Sustainability Coordinator

Unity Project celebrates the 40th Earth Day with 40 Earth Week events

Committee on Sustainability approves UVA carbon reduction goal

UVA enrolls as a charter participant in AASHE STARS

UVA Sustainability Minor is approved and accepts its first students

Global Sustainability Course first offered as 3-credit seminar

Sustainability Pledge reaches goal of 1,000 pledges by Earth Day

Students choose sustainability as theme for the University Unity Project

University introduces Sustainability Pledge

Board of Visitors adopts UVA carbon reduction goal

I Pledge To:
Use reusable
ToGo Containers 🙂

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I Pledge To:
Use a reusable
water bottle everyday

SUSTAINABILITY · UVA

I Pledge To:
unplug my electronics
when not in use.

SUSTAINABILITY · UVA

I Pledge To:
Buy Goods & Services
Locally When
Possible

SUSTAINABILITY · UVA

I Pledge To:
Reuse office Supplies
R.O.S.E.

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I Pledge To:
Recycle at my
Sorority

I Pledge To:

In October 2010, UVA launched the Sustainability Pledge with a goal to reach 1,000 participants by Earth Day 2011. To promote awareness of the pledge, members of the UVA community were photographed with an action of their choice.

I Pledge To:
UNPLUG

SUSTAINABILITY · UVA

Implementing sustainability across an organization requires a comprehensive understanding of synergies, lifecycle values, and institutional goals. While individual units can achieve a lot on their own – and both this Assessment and the 2006 Sustainability Assessment show that they do – the continued advancement of sustainability at UVA requires even greater alignment of goals, metrics, and incentives. Since the University is a large and diverse organization with few single points of convergence, support from University leadership is critical to enable the mechanisms needed to advance sustainability.

The issue of energy consumption at the University offers an illustration of the need for collaboration and incentives in advancing an aspect of sustainability. Powering, heating, and cooling the University's 15+ million square feet of buildings generate the vast majority (85%) of UVA's greenhouse gas emissions. The Department of Energy and Utilities generates and distributes energy to University facilities and, over the past decades, has significantly improved energy efficiency at UVA. However, the consumption of energy cannot be fully controlled by Energy and Utilities, but instead is the shared responsibility of the entire University community: students, faculty, staff, and visitors. Yet members of the UVA community do not readily know how much energy they consume nor are they given an incentive to reduce consumption. This lack of knowledge and incentive applies to more than decisions to switch off a light, but ultimately to decisions that have a

significant effect on energy consumption, such as how large a facility to build or what type of lab equipment to purchase. The implementation of a comprehensive structure of awareness, incentives, and responsibility by University leadership will maximize gains in energy efficiency system-wide.

Governance

The 2006 Sustainability Assessment's "Strategy for Sustainability" recommended the creation of "an advisory panel to aid a prescribed administrative unit in communicating and coordinating annual objectives." In April 2007, the Sustainability Advisory Panel was convened to help guide future planning for sustainability through the Office of the Architect. In August 2008, former President John T. Casteen created the Presidential Committee on Sustainability based on the structure of the Advisory Panel. The charge and current membership of the Committee is reproduced in the sidebar on the next page.

As a Presidential Committee, the Committee on Sustainability is the most prominent institutional representative for sustainability at the University. This position has enabled the Committee to successfully become an institutional advocate for sustainability, urging, for instance, consideration of sustainability in the 2009-10 University President search and the 2010-11 Executive Vice President and Chief Operating Officer search. In addition, the broad representation makes the Committee the most appropriate body to implement comprehensive and interdisciplinary programs needed to

5-year trends in UVA grades on Sustainable Endowment Institute's College Sustainability Report Card

PRESIDENTIAL COMMITTEE ON SUSTAINABILITY
Charge and Membership

The Committee on Sustainability advises the President and Executive Vice President and Chief Operating Officer, through the Architect for the University, on all matters related to the overall quality, diligence, and progress of the University's commitment to sustainability in the broad sense of environmental, economic, and social impacts, and their relationship to the future of the University. In carrying out this charge, the Committee shall be engaged in the following:

- Recommend policies, procedures, and priorities that will promote the highest standards of sustainable practice across the University, including but not limited to business operations, energy production and utilization, and design and management of facilities.
- Provide guidance in the development of communication plans with the goal of increasing sustainable behavior among faculty, staff, and students.
- Recommend and encourage the development of new opportunities to educate the University community on sustainable thinking and practice.
- Review and comment on the University's progress toward measurable sustainability objectives.
- Review and comment on the University's responses to major national surveys and/or voluntary compliance with regard to an institutional plan toward the reduction in CO_2 emissions and related environmental impacts.

Membership
Architect for the University, Chair
Associate Vice President for Public Affairs or designee
Associate Vice President for Business Operations or designee
Chief Executive Officer of the University of Virginia Foundation or designee
Chief Facilities Officer
Director of Environmental Health and Safety
Director of Energy and Utilities
Employee Councils Representative
Faculty Senate Representative
Representatives of :
        Vice President and CEO of the Medical Center
        Executive Vice President and Provost
        Vice President and Chief Information Officer
        Vice President and Chief Student Affairs Officer
        Vice President for Research
Four at-large faculty members, including at least one member who will represent the research community
Two at-large student members (one undergraduate student, one graduate student)
Sustainability Planner in the Office of the Architect is an ex-officio member and serves as Secretary

Subcommittees
Environmental Impact
Outreach
Policies
Academic Integration
Student

advance sustainability. For instance, the Committee served as the most natural home of the University-wide Sustainability Awareness Campaign, an effort of the Outreach Subcommittee involving a new UVA Sustainability logo, centralized website, and other initiatives.

The Committee's work is accomplished through five subcommittees: Environmental Impact, Outreach, Policies, Student, and Academic Integration. Each subcommittee works within its subject area to identify initiatives to enhance sustainability and, if approved by the Committee, work with UVA staff to implement these initiatives. Subcommittees include representatives from the Committee along with additional experts from the UVA community.

The Committee has proved to be increasingly effective, but it can be strengthened further. If funded as several other UVA committees are, the Committee's initiatives could be implemented more predictably. Funding would also allow the Committee to maintain and publicize UVA membership in programs and associations of pan-University interest, such as the Association to Advance Sustainability in Higher Education (AASHE).

On March 3, 2011, the Committee on Sustainability approved a sustainability commitment (see sidebar on this page) that sets a specific greenhouse gas reduction target for UVA and reaffirms the University's broader commitment to sustainability in operations, outreach, research, and education. The sustainability commitment was then endorsed by the Faculty Senate, Student Council, General Faculty Council, and all four Employee Councils before being unanimously approved by the Board of Visitors on June 10, 2011.

Organization

The 2006 Sustainability Assessment found that many University departments have created their own sustainability initiatives through the interest of staff and department managers. This "middle-out" development of sustainability initiatives indicated a natural preference for a distributed staffing model.

UVA SUSTAINABILITY COMMITMENT
Approved by Board of Visitors on June 10, 2011

WHEREAS, the University of Virginia has a long tradition of environmental stewardship guided by values that have come to be recognized as sustainability principles,
WHEREAS, the University of Virginia has taken a leadership role to promote sustainability,
RESOLVED:
1. The University of Virginia will undertake to reduce annual greenhouse gas emissions to 250,000 metric tons or less by 2025, 25% below 2009 levels and over a third less than expected 2025 emissions without this commitment.
2. The University will utilize the highest standards of environmental stewardship and resource conservation and will address other areas of concern beyond greenhouse gas emissions, such as waste, water, nitrogen, stream and river protection, noise and light pollution, open space protection, and conservation of the historical and cultural legacy of the community.
3. The University will educate and engage its students, faculty, staff, and the larger community; contribute to knowledge through research; promote health and well being; and foster public service related to these sustainability principles.
4. These initiatives will be supported by comprehensive planning for and communication about sustainability.
5. Initiatives will be evaluated on the basis of benefit, cost, and availability of funding.
6. A report on sustainability will be prepared annually for the President. Progress on sustainability initiatives will be presented to the Board of Visitors every two years.

Over the past four years, University departments have continued to expand their sustainability efforts and have, in many cases, established new positions to focus on these initiatives. In 2008, the Office of the Architect established the Sustainability Planner position to coordinate and communicate planning, implementation, and reporting for sustainability. In the same year, the Department of Energy and Utilities (E&U) created the Sustainability Outreach Coordinator to promote

sustainability, particularly conservation initiatives. Also in 2008, the Darden School of Business established a Manager of Sustainability Programs to guide the development of sustainability actions at the School as well as contribute to research in corporate sustainability. In 2009, E&U created the Sustainability Programs Manager, which built upon a position established in 1994 to now manage all of the numerous E&U sustainability programs, including energy and water conservation, sustainability outreach, and recycling. UVA Dining Services/ARAMARK established, also in 2009, its Sustainability Coordinator position to promote and organize dining-related sustainability initiatives. In 2010, the Department of Parking and Transportation created its Transportation Demand Management (TDM) Professional to promote and expand TDM efforts at the University.

In addition to the creation of these new positions, a larger number of existing positions have expanded to include substantial responsibility for sustainability initiatives. Employees in the Health System, Office of Environmental Health and Safety, Public Affairs, Facilities Management, Housing, Procurement, Information Technology, Libraries, and other areas now devote at least some of their time to advancing sustainability. Facilities Management and the Office of the Architect have provided training and incentives to increase the number of staff with Leadership in Energy and Environmental Design Accredited Professional (LEED-AP) credentials.

Outreach

Sustainability education and outreach to the University community are vital components of UVA's efforts to advance sustainability. This communication is necessary to build general support for

The UVA Sustainability Logo

sustainability, increase awareness of existing and new initiatives, and promote behavior consistent with sustainability objectives.

The Outreach Subcommittee of the Committee on Sustainability has worked since January 2009 to develop and implement four strategies to improve sustainability outreach and education:

- Develop a sustainability-awareness campaign that makes it clear what steps the University and individuals are taking to help the environment. Components: developing sustainability icon, implementing sustainability pledge, creating enhanced sustainability website.
- Create sustainability communications opportunities. Components: Establish Sustainability Partners, network of volunteer employees within VP units, schools, and buildings who will distribute and promote sustainability information in their units; Sustainability Speakers; Green Office List.
- Develop and implement reminder and interpretive signage around Grounds. Components: Reminder graphics, interpretive signage describing sustainability efforts, signage linking sustainability to good health.
- Create events to promote sustainability awareness. Components: calendar of green events, such as Earth Week.

From these strategies, specific actions have been implemented that enhance the breadth and sophistication of UVA's outreach efforts.

A key component of the Sustainability Awareness Campaign was the development of a comprehensive web portal to represent the breadth of sustainability efforts at UVA. The sustainability website (www.virginia.edu/sustainability) was initially created in August 2008, and received a complete revamp for Earth Week 2010. The site highlights operational, academic, student, faculty, and community efforts to advance sustainability. The website also serves to direct users to department and organization websites for more information.

The Sustainability Awareness Campaign also focused attention on enhancing representation of sustainability efforts in University communications. The Office of Public Affairs has assigned a writer to cover sustainability initiatives and has established an Environment/Sustainability tag to allow easy identification of news articles. Articles on sustainability now appear regularly in UVA Today, a daily newsletter distributed electronically to faculty and staff.

In October 2010, the Outreach Subcommittee launched the UVA Sustainability Pledge, which reads, "I pledge to consider the social, economic and environmental impacts of my habits and to explore ways to foster a sustainable environment during my time here at UVA and beyond." The pledge is the first step in a continued dialogue to engage the University community in recognizing what personal actions they can take to advance sustainability at UVA.

In February 2011, the Outreach Subcommittee kicked off Sustainability Partners, a network of employees who volunteer a small amount of their time to assist colleagues on improving sustainability in their individual departments and offices.

Numerous events showcasing the University's sustainability efforts are held throughout the year, but Earth Week, a series of events organized annually around Earth Day, is notable for both its scale and its breadth. Days of the week are assigned themes, such as Academics or Energy, with multiple events scheduled for each day. In 2010, UVA's Earth Week festivities got a big boost thanks to the efforts of the student-led University Unity Project (see page 24 for details). The goal for future years is to keep that same momentum while broadening participation from staff, faculty, and the community.

Individual units are actively engaged in promoting sustainability messages to their constituents. These efforts could have broader impact with the creation of a dedicated position responsible for devising and disseminating University-wide sustainability messages, working with individual

To what extent has each of the following played a role in encouraging the University to implement sustainability initiatives?

Source: 2010 Sustainability Assessment Survey
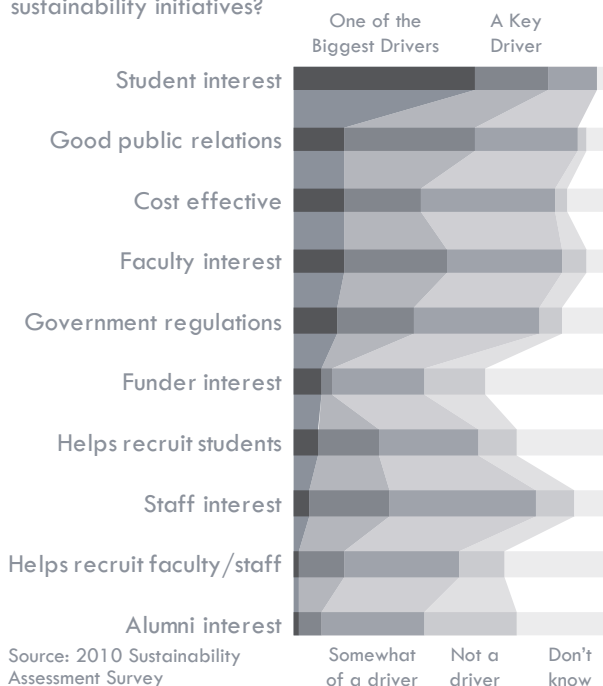
units to develop themes that reflect the breadth of University efforts, and to encourage individual changes of behavior. Because UVA's Public Affairs division works Grounds-wide to promote University efforts, it may an appropriate location for a sustainability marketing position.

One of many Earth Week 2010 Events

SHEFFIELD HALE
Advancing Sustainability through Student Leadership

Sheffield Hale, a fourth-year Environmental Thought and Practice major, began his leadership role in student sustainability as co-chair of the University Unity Project. This Student Council initiative sought to unify the student body around a specific issue, and for that year, students voted to make sustainability the theme. Student leaders came together under the Unity Project to coordinate the largest Earth Week celebration yet, with over 40 events and thousands of students participating. After the Unity Project, Sheffield founded the UVA Green Challenge, engaging over 400 students on how to live sustainably at the University and beyond. He has also spearheaded initiatives under the brand of SustainaUnity, including a web-based hub for student sustainability information (sustainaunity.com), a weekly newsletter, and a listserv connecting over 50 environmental student leaders. "While sustainability student groups have more than doubled since 2008," he said, "students are still looking for more engagement today that will better prepare them for the world tomorrow." Sheffield currently serves as the undergraduate representative on the Committee on Sustainability, where he has helped to create the student subcommittee to document student initiatives and enhance communication between students and the administration.

Student Governance and Culture

With strong traditions of student self-governance and involvement at the University, UVA students play a significant role in the implementation of sustainability initiatives. In the summer 2010 Sustainability Assessment survey, "student interest" was cited more than any other motivator as "one of the biggest drivers" in encouraging sustainability initiatives at UVA. Additionally, survey participants and others have reported substantial growth in student interest in sustainability over the past five years. The combination of growing student interest and a growing student body has led to the implementation of numerous student-led sustainability initiatives over the past five years. With this trend continuing, future student sustainability initiatives could easily surpass the innovative and dynamic projects of the past.

In April 2007, Student Council voted to create the Environmental Sustainability Committee. The Committee's mission includes "advising the Council regarding environmental issues affecting the University, as well as the sustainability of the University's environmental practices." The Committee's membership forms numerous task forces organized around specific projects of its choice. In its first year, members met with Executive Vice Presidents Sandridge (EVP/COO) and Garson (EVP/Provost) to enhance the role of sustainability in the Commission on the Future of the University's report. By its fourth year, the Student Council Sustainability Committee had been named Student Council's Committee of the Year twice and spearheaded numerous projects.

Beyond the Environmental Sustainability Committee, there are at least 50 other student-led or involved organizations focused on many aspects of sustainability. These groups vary in scope, in age (7 years in the case of the Green Grounds Group to several months in the case of UVA Beyond Coal), and in organization (from the course-related RideForward group to community non-profits such as Community Bikes). While the diversity of these organizations is an inherent benefit, it creates a challenge for effective communication among groups with overlapping interests. Stu-

dents have been building an informal coalition of student leaders under the name of SustainaUnity throughout the 2010-11 school year, which is expected to strengthen with the young incoming leaders.

Starting in summer 2008, students from the Student Council Environmental Sustainability Committee created a task force dedicated to creating a sustainability-themed residence hall. The concept aims to model successful examples at other institutions (e.g., Dartmouth) in a form that would resemble current on-Grounds programs such as Language Housing. In the fall of 2008, 93% of voting students supported a referendum to have a sustainability house as a University-operated housing option. The initiative remains active, and meetings continue with administrators.

Efforts to provide sustainability-related training to student staff in on-Grounds residences have been expanding. In 2008, a "Recycling Handbook" was created specifically for Orientation Leaders, and was distributed electronically. A similar handbook was created for Residence Life, and a brief recycling presentation was included as part of resident staff training. The Housing Division has now incorporated recycling as part of their annual training presentation to resident staff.

Students from Greek Recycling

Greek Recycling was founded in fall 2009 by a combination of interested groups, including the Inter-Fraternity Council, Student Council, Architecture students, and fraternity members. The group began collecting recycling in the Spring of 2010 by passing out green trash bags to Greek organizations and collecting the bags of recycling on a weekly basis. In the first full semester of operations, fall 2010, the group collected over 5,000 pounds of recyclables. This group continues to grow in size and participation, and recently pur-

A Sustainability Advocate shares tips with a fellow student during a "Taste of Dining" event

chased a trailer to help meet the increasing demand of weekly pick-ups.

In spring 2009, students from the Student Council Environmental Sustainability Committee worked with local landlords to increase off-Grounds recycling capabilities. Notable successes include the creation of an email account to advise off-Grounds residents how to pursue recycling options, the addition of recycling to several large off-Grounds housing properties, and the creation of a paid "Conservation Advocate" position at the "Grand Marc" off-Grounds apartment complex.

The Department of Energy and Utilities has coordinated the Conservation Advocates program, now known as Sustainability Advocates, for over 10 years. The network of over 50 student volunteers serve as peer sustainability advisors in on-Grounds residence halls and other UVA facilities.

In February 2009, the student body chose "Environmental Sensitivity and Sustainability" as the theme for the 2009-2010 University Unity Project. The project surveyed sustainability initiatives around the University and focused on planning the largest Earth Week in UVA history with 42 events spanning 8 days drawing nearly 2,000 students. The Unity Project helped to spark groups and initiatives such as Green CIO Consultants, the UVA Green Challenge, and Flash Seminars.

The continued momentum of the 2009-2010 Unity Project has led to the creation of two organizations - the SustainaUnity sustainability coalition and the Student Subcommittee of the Presidential Committee on Sustainability - and the SustainaUnity website and newsletter to encourage greater communication and collaboration among the various student groups and between the students and University administration.

In 2004, 85% of voting students supported a referendum to increase tuition by $7/semester to buy 33 million kWh of renewable energy credits. Although the referendum served to show support for renewable energy at UVA, the fee increase

was never implemented due to multiple concerns. Several years later, students from the Environmental Sustainability Committee revisited the idea of a student-supported sustainability fund. After research of similar funds at other institutions and multiple discussions with University administrators, the task force produced a recommendation for the GIFT program, Green Initiative Funding Tomorrow. The GIFT program would award funds to student-led projects that seek to enhance sustainability at the University, with projects selected by a student GIFT committee. In February 2010, 76% of voting students supported creation of the GIFT program, although without a specific determination of funding. As a result, Student Council created a GIFT Committee to enact the referendum and develop funding mechanisms. In April 2011, the Vice President for Student Affairs allocated $20,000 in unused student programming funds to further develop the program.

In winter 2009, students representing a number of sustainability organizations presented University administration with a proposal to create a student garden. The proposal spelled out the goals for the garden - to serve as a student retreat, an educational tool, and a link to the community - along with a management plan and case studies. A few months later, the soil was turned over and compost was laid down on a high-visibility site at the corner of McCormick Road and Alderman Road to create the UVA Community Garden. The Department of Urban and Environmental Planning serves as the academic sponsor of the Garden, while the Environmental Sustainability Committee serves as the student-group sponsor.

2011 Opportunities: Governance and Culture		
Action	**Timeline**	**Synergies**
Establish annual funding for the Presidential Committee on Sustainability.	Immediate	
Adopt a high-level, motivating sustainability vision for the University.	Immediate	🏛️
Develop funding mechanisms and launch the Green Initiatives Funding Tomorrow (GIFT) Program.	Immediate	
Approve a comprehensive set of objective, measurable goals for sustainability designed to focus priorities and drive change.	1-2 Years	🏛️ 🌓
Establish a Sustainability Marketing Position in the Office of Public Affairs.	1-2 Years	
Develop and implement reminder and interpretive signage around Grounds.	1-2 Years	🍃
Complete the Sustainability House, a sustainability-themed University-operated residence.	2-4 Years	📖

Synergies Legend

🏛️ Strategy for Sustainability   📖 Academics and Learning   🌓 Management Centers

🍃 Built Environment
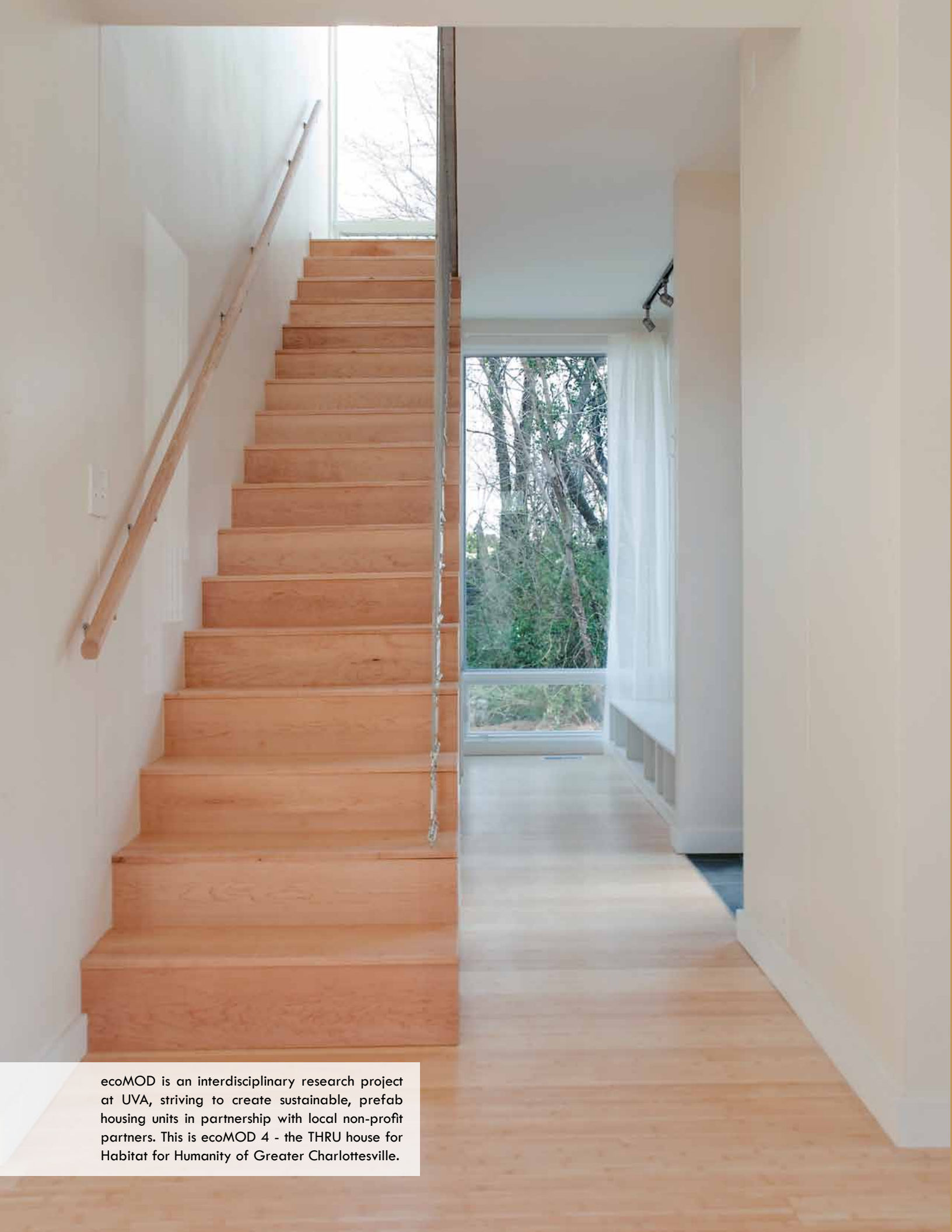
ecoMOD is an interdisciplinary research project at UVA, striving to create sustainable, prefab housing units in partnership with local non-profit partners. This is ecoMOD 4 - the THRU house for Habitat for Humanity of Greater Charlottesville.

Among all of the opportunities for the University to make a positive contribution to sustainability, none are greater than the thousands of young minds that walk the Lawn every spring. Successfully conveying the importance of systems thinking and knowledge of sustainability to University graduates will give them critical tools to positively impact their environment, wherever that might be.

The operations of the University play an important role in this effort, as the Grounds can provide numerous real-world educational opportunities. But the classic tools of learning - coursework, research, and student-faculty interactions - must take full advantage of their potential to prepare students with the ability to advance sustainability in their careers.

Courses

There has been a strong faculty and student interest in sustainability for many years. Faculty members have offered exploratory courses and helped students complete projects related to sustainability. Much of this work has developed in isolation from other efforts, but departments are now collaborating on courses and projects.

For example, the Global Sustainability course, a course developed by faculty in Architecture, Engineering, and Commerce, was designed as a prototype for a widespread sustainability literacy course that could reach a large number of University students. Students are introduced to topics such as environmental economics, sustainable policies, green design, and the history of sustainability. Students also complete a semester-long project that requires them to identify a program from the local community and research how to enhance its sustainability. These projects range from educating K-12 students at nearby schools to implementing recycling programs at local businesses.

The Global Sustainability course is approaching the end of its three-year guaranteed funding from Jefferson Public Citizens, and continued support for the course is not assured. Lacking an interdisciplinary home and source of funding, the course could meet the same fate as Environmental Choices, an environmental and sustainability-focused survey course offered in the early 1990's. There exists a clear need to identify a more assured future for efforts such as these.

Across the University of Virginia, there are over 75 courses offered that have been identified as being associated with sustainability. These courses are housed in many departments, including:

- Anthropology
- Architecture
- Biology
- Business
- Commerce
- Economics
- Engineering
- Environmental Sciences

Enrollment Growth in the Global Sustainability Course (*Enrolled as of May 1, 2011)

- Global Development Studies
- History
- Landscape Architecture
- Law
- Urban and Environmental Planning

In December 2009, a student task force formed to research and advocate for a minor in sustainability. The task force first researched courses that already existed, faculty members interested in the topic, majors that heavily focused on sustainability, minors that related to sustainability, supportive staff members, and sustainability programs at other universities and colleges. After the research was completed, the task force then met with various faculty members across the University to solicit opinions and identify barriers to a minor in sustainability. The task force took this information and compiled a presentation for the School of Architecture, Office of the Provost, and the student body. In February 2011, the Global Sustainability Minor was approved and made available to students beginning in spring 2011.

The Minor is comprised of five courses. The Global Sustainability course is required. Students must also take three elective courses from three categories: equity, environment, and economy. The final course will be a capstone course from a small list of classes. Due to the changing nature of this topic, the Minor's governing board will allow students to petition for courses to count towards the minor in Global Sustainability.

In addition to the Global Sustainability Minor, there are many other majors and minors around the University that have strong themes of sustainability, including the interdisciplinary Environmental Thought and Practice and undergraduate and graduate degrees in Urban and Environmental Planning. In the School of Engineering and Applied Science, the Technology and the Environment minor takes a technical approach to sustainability. The Darden Graduate School of Business, which does not offer minors, launched the Innovation for Sustainability concentration in fall 2010.

Morven Farm, a 2,913 acre historic estate locat-

ed 10 miles from Grounds, is home to a unique interdisciplinary teaching and research program with strong ties to sustainability. In spring 2010, five University of Virginia faculty members offered courses in Environmental Sciences, Architecture, History, and Landscape Architecture that investigate the benefits of rural landscapes for ecosystem stability and public health and explore how to measure, value, preserve, and protect those benefits. The Morven Summer Institute, scheduled for May 2011, is an intensive four-week program designed for people with interests in sustainability, design, food systems, and ecology. The program is open to UVA undergraduate and graduate students, students enrolled at other colleges or universities, rising high school juniors and seniors, and community members. The Institute will feature courses in Architecture, Interdisciplinary Food Studies, and a seminar co-taught by a multidisciplinary team of faculty from across the University. Alongside coursework, the 1-acre Morven Kitchen Garden will be both a highlight and focus of the student experience at the Morven Summer Institute.[1]

Research

Among the trademarks of sustainability research are interdisciplinary teams, unique partnerships, and projects that turn ideas into action. In 2008, the College of Arts and Sciences, the School of Engineering and Applied Science, and the Office of the Vice President for Research came together to create four Collaborative Sustainable Energy Seed Grants. The grants, worth $30,000 apiece, were designed to give new projects preliminary support to allow them to compete for much larger grants. The selected projects, which were required to be interdisciplinary, included nano-scale laser etching to improve the efficiency of solar panels, lifecycle impacts of algae-based biofuels, intelligent building climate control systems, and nano-tech fuel cell research.

Developed by a multi-disciplinary faculty and student team, the UVA Bay Game is a large-scale agent-based simulation of the Chesapeake Bay watershed that allows players to take the roles of stakeholders, such as farmers, local policy-

makers, watermen, and land developers, and to make decisions about their livelihoods and regulatory authority. Through this interaction, players are encouraged to generate innovative solutions for environmental and economic sustainability, solutions that may be applicable to the non-virtual Chesapeake Bay watershed as well. Publicly launched on Earth Day 2009, The UVA Bay Game has been hailed by federal and state agencies, NGOs, and corporate and education leaders as an important breakthrough, "the first of its kind." It has been used in classes throughout the University - in Architecture, the College of Arts and Sciences, Engineering and Applied Sciences, the Law School, and the McIntire School of Commerce - and soon will be shared through a regional university consortium.

University of Virginia researchers are working with Azure Worldwide and the Virginia Department of Education to bring the UVA Bay Game to K-12 teachers and to develop a K-12 version for use in schools in all six watershed states and the District of Columbia. The UVA Bay Game is also expanding to watersheds beyond the Chesapeake. Researchers are partnering with local catchment managers and university colleagues in Australia to develop a similar game for the Murray-Darling Basin. In September 2010, IBM named the UVA Bay Game as one of three projects (along with one each in Brazil and China) for a new World Community Grid research program that provides massive computing power for the development of techniques to produce cleaner and safer water.

In 2010, an interdisciplinary team of UVA researchers was awarded a four-year, $2 million grant from the National Science Foundation to develop "smart building" energy systems for residential and commercial buildings. The team consists of faculty from the Departments of Computer Science, Mechanical and Aerospace Engineering, and Systems Engineering, as well as those from the School of Architecture and Darden School of Business. The research is focused on reducing energy consumption by making building energy systems, particularly buildings' heating, ventilation, and

Carla Jones at the AASHE 2010 Conference in Denver

CARLA JONES
A student's experience of sustainability at UVA

"Growing up in a small town in southeastern Virginia, not exactly known for its efforts in promoting environmental stewardship, I came to UVA with little knowledge of the topic of environmental sustainability. In my first year, a friend suggested I take a seminar entitled "Designing a Sustainable Future." I was apprehensive and not even sure what the title "Sustainable Future" meant. Nevertheless, I enrolled. In just a few months, I went from being unable to define sustainability to conducting an energy audit on a municipal building. The course inspired me to refocus my studies around sustainability.

This new passion pushed me to become the teaching assistant for the Global Sustainability course and executive director of the Green Grounds Group, and to pursue dual master's degrees in Urban Planning and Public Health. I have also made it my mission to increase sustainability-related coursework at the University. With the help of students, faculty, and staff, we were able to successfully launch the Global Sustainability Minor.

The moral of my story is that courses and faculty support can really inspire students to create sustainable change in their communities."

air-conditioning systems, more responsive to occupant behavior. Ultimately, the researchers hope to reduce HVAC energy use by 30 percent to 50 percent with a startup cost of less than $500 per home and a return on investment for homeowners within two years. To meet the energy-reduction target, the researchers are developing a wide range of technologies, including wireless sensors, HVAC equipment, building envelope designs, and human-computer interfaces. They will use sensors to monitor electric and water loads, occupant motion in buildings, door and window positions, light, temperature, and humidity. The project is planning to prototype the system in Charlottesville-area homes, a disaster recovery home built through the School of Architecture's "Initiative reCOVER," and the Engineering School's Rice Hall Information Technology Engineering Building, currently under construction.

The Alliance for Research on Corporate Sustainability (ARCS) is a partnership among academic institutions created to provide data and networking opportunities to facilitate research on corporate sustainability. ARCS was launched in January 2009 and is housed at the Darden School of Business. The consortium also includes: Dartmouth College, Duke, Harvard, University of Michigan, and University of Western Ontario.[2]

Scientific understanding of the effects of nitrogen on the environment has expanded greatly due to research in the Department of Environmental Sciences. Nitrogen in its inert form is harmless and ubiquitous. But in its reactive form, nitrogen is responsible for significant and wide-reaching environmental impacts, including smog, acid rain, and aquatic dead zones, and is a contributor to global warming. For his research into the nitrogen cascade, Associate Dean for the Sciences and Sidman P. Poole Professor of Environmental Sciences James Galloway was one of two recipients of the 2008 Tyler Prize for Environmental Achievement. In February 2011, Environmental Sciences researchers and the International Nitrogen Initiative launched a personal nitrogen footprint calculator, N-Print, that enables individuals to quantify how their personal actions contribute to the nitrogen

dilemma. This research is also forming the basis of the upcoming nitrogen phase of UVA's Environmental Footprint Reduction Plan. The fourth phase of the Plan will quantify the University's nitrogen footprint, propose a reduction target, and develop strategies to reach that target.

The Harrison Undergraduate Research Awards provide funding for students to pursue independent research projects over the summer. While the $3,000 grants can be used to pursue projects of any topic, in the past years several grants have been awarded to students pursuing sustainability-related research projects. Projects have researched such topics as edible rain gardens, regional agriculture support systems, bioremediation to create drinking water, and storage of solar energy. The Harrison Awards can provide valuable support to extend course-initiated sustainability research projects and may serve as a model for programs targeting project implementation.[3]

RideForward is an interdisciplinary research project at UVA focusing on sustainable transportation. The project focuses on the conversion of conventional vehicles to electric drive, the installation of solar panel systems to offset the electricity usage of the vehicles, the construction of charging stations, and educational awareness initiatives in the community. Converted vehicles are used by the University and local government in place of standard internal combustion vehicles. In February 2010, RideForward installed a 1.2 kW solar panel charging system on the bus shelter at the Emmet/Ivy Garage.

2011 Opportunities: Academics and Learning

Action	Timeline	Synergies
Complete a comprehensive inventory of sustainability research initiatives.	Immediate	
Launch a regular sustainability speakers series.	Immediate	
Ensure that students have the necessary tools to extend course-initiated sustainability projects and research into multi-year efforts.	1-2 Years	
Determine the form of an interdisciplinary center for sustainability and initiate steps to fund and create.	1-2 Years	
Develop a standard approach to utilize the Grounds as a teaching tool through collaboration between operational and academic units on areas of shared interest.	1-2 Years	
Introduce an undergraduate student area requirement for sustainability.	2-4 Years	
Provide faculty incentives, e.g., tenure support, compensation, for the development of sustainability coursework and interdisciplinary collaboration on sustainability.	2-4 Years	

Synergies Legend

 Strategy for Sustainability   Governance and Culture   Management Centers

A hiking trail on Observatory Hill leads visitors through a few of the 375 forested acres on the Grounds of the University. Including both forests and urban vegetation, 51% of the University's 1,135 acres are under the canopy of trees.
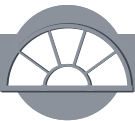
Seven management centers, first identified in the 2006 Sustainability Assessment, are utilized to assess progress towards sustainability in the physical management of the University. These sections focus on new and expanded initiatives that have emerged at the University since 2006. Many programs predate this period; coverage of these initiatives can be found in the 2006 UVA Sustainability Assessment.

Organizing University initiatives into seven management centers has distinct advantages and disadvantages. There is a natural desire to categorize numerous UVA initiatives into a more manageable and accessible format. On the other hand, cornerstones of sustainability are collaboration and systems thinking, so this categorization may create superfluous boundaries between programs. To mitigate this risk, icons indicating synergies, both among management centers and with the larger chapters of this report, are provided in the list of opportunities contained in each chapter.

The Assessment utilizes an identical format for each management center. An introduction provides general background on the topic. The "Current Activities" section provides highlights of notable sustainability initiatives that have been initiated or expanded since the completion of the 2006 UVA Sustainability Assessment. Each management center section also includes a "Progress on the 2006 Opportunities" sidebar, which provides a current update on the status of opportunities referenced in the 2006 report. Across all

management centers, 84% of the opportunities identified in the 2006 Sustainability Assessment have been fully or partially implemented.

Towards the end of each section, "Comparing Our Performance" highlights several best practice examples from other institutions of higher education. These highlights offer novel and innovative programs that may further inform University efforts. Finally, each section ends with a "2011 Opportunities" sidebar containing 6 to 9 opportunities to build on progress to date and further the advancement of sustainability at the University. Each opportunity is paired with an approximate timeline based on the difficulty of implementation, from "Immediate" to "2-4 Years," and icons indicating areas where synergies may exist between two or more programs to maximize effectiveness.

The Seven Management Centers

Land Use   Built Environment   Transportation   Food

Energy and Carbon   Water   Waste and Recycling

Connectivity, diversity of use, access to nature, and pedagogical function are inherent in the spatial order of Jefferson's Academical Village. Recent campus planning documents emphasize the importance of these qualities in modern planning.

Sustainable environmental design at UVA addresses the broad physical environs of the Grounds and management of University land use. The planned enrollment and interrelated facility growth of the University emphasizes the importance of cohesive planning, with a concern for impacts related to all aspects of development on Grounds. Sustainable development has the potential to improve opportunities for beneficial planning by taking into consideration such broad parameters as transportation, stormwater management, and utility infrastructure, in addition to the LEED qualifications for individual projects.

A university's land use mirrors that of a town or city, as it includes housing, dining, offices, classrooms, recreation, parking, health care facilities and such. The physical sense of place defined by the University's Grounds has several immediate effects, including providing an accessible network of buildings and activities, supporting academic functions, and cultivating the University's relationship with the surrounding community. Alone among U.S. college and university campuses, the University of Virginia's Academical Village has been designated one of 830 international World Heritage Sites by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Academical Village, as designed by Thomas Jefferson, is an early example of a tightly woven mixed-use campus, incorporating faculty and student housing, dining and teaching with social spaces. Jefferson's buildings enclose a commons area known as The Lawn. To this day,

the rooms, pavilions, hotels and adjacent gardens continue to serve residential, educational, food service and recreational purposes for students, faculty, and staff at the University. The Academical Village provides a model for mixed-use development and sustainable living.

The University has grown from 197 acres in 1817, to the 1,135 acres of the Grounds today. Serving over 20,000 students and the related broad activities of a traditional campus, the Grounds hosts a daytime population of approximately 35,000. While 1,135 acres is a generous amount of land to support the University community, planning for future demands of the academic programs indicates continued growth. To address this growth, the University plans to increase the density of the Grounds rather than to expand its acreage.

Current Activities

Since the 2006 UVA Sustainability Assessment, the Office of the Architect for the University (OAU) has developed a strategic set of planning documents to guide future growth and focus on supporting and progressing sustainability practices at UVA: The Grounds Plan, the Health System Area Plan, and the Precinct Plans.

The Grounds Plan, completed in 2008, is an updated campus framework plan for the University addressing the need to support academic growth for the next 20 years, while offering multiple opportunities for sustainable development through its principles.

Biodiversity Analysis   TDM Plan   UVA Grounds Plan

Precinct Plans   Health System Area Plan
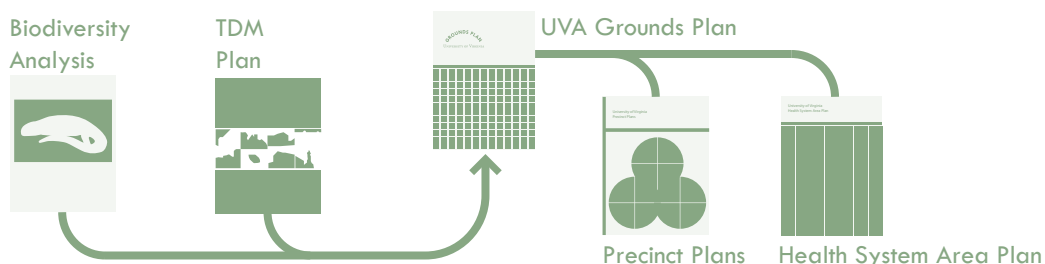
Numerous plans supported the Grounds Plan, which established a framework for finer scale plans

PROGRESS ON THE 2006 OPPORTUNITIES: LAND USE

ACTION	PROGRESS
Increase awareness about the University's activities in sustainable building and design, stormwater management, and environmentally friendly landscape treatments.	●
Continue improvements implemented through Fertilization Management Program.	◓
Establish formal commitment to habitat restoration and low maintenance landscape	◓
Commit to U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification or equivalency for all new or renovated buildings.	●
Collaborate with University of Virginia Foundation (UVAF) to advance sustainable building and environmental design and environmentally friendly landscape measures.	●
Work with the Commonwealth and its agencies to advance sustainable building and environmental design measures.	◓
Support the Commonwealth in developing a sustainability agenda, leveraging the University's expertise in the sciences, humanities, business, planning, and design.	◓

● Fully Completed   ◓ Partially Completed   ○ Barriers Encountered/Not Completed

Principles of the 2008 Grounds Plan

Environmental Quality
To protect and restore our natural environment
Connectivity
To increase the quality and continuity of linkages throughout the Grounds
Context
To promote beneficial physical relationships with the surrounding community
Multi-disciplinary Collaboration
To develop mixed-use facilities in support of academic interaction and collaboration
Preservation
To maintain and enhance the University's cultural, building, and landscape resources

Precincts and Redevelopment Zones

Residential Mixed Use · Academic Mixed Use · Structured Parking · Current Project · Connectivity Improvement
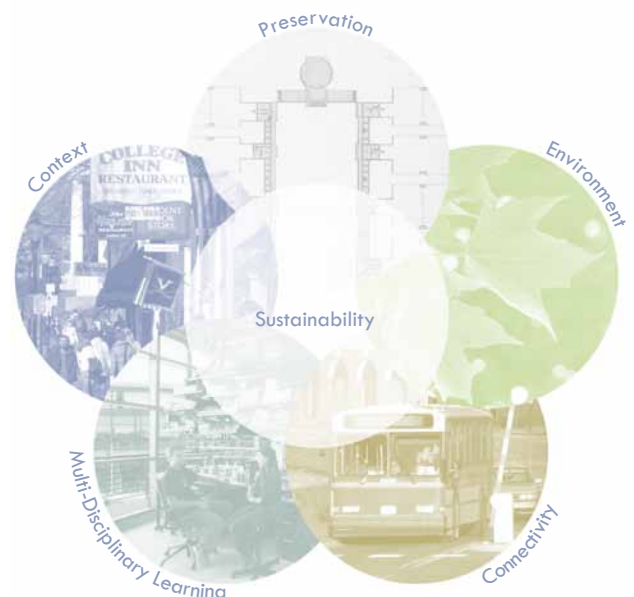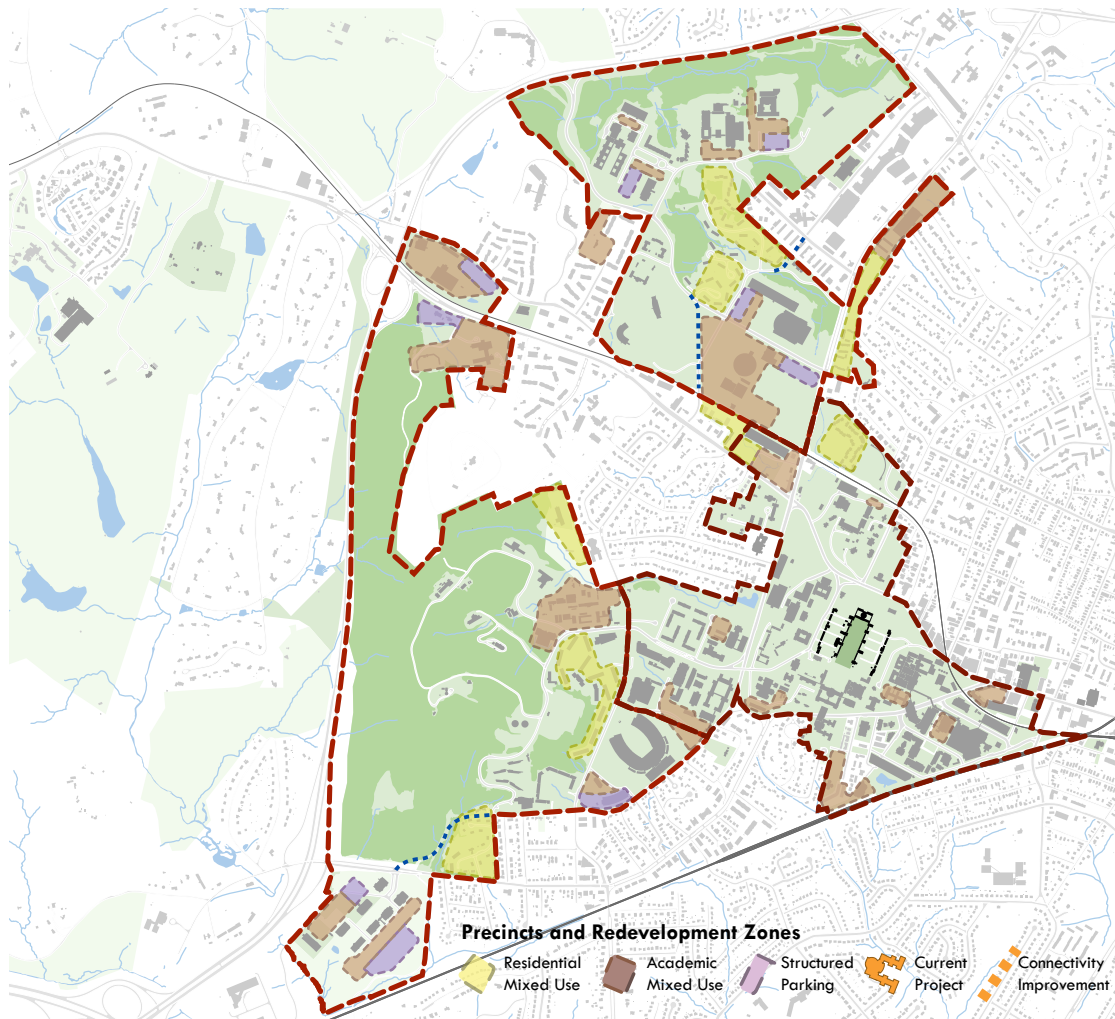
The Grounds Plan designates Redevelopment Zones in all three UVA precincts: Central, North and West

A conventional campus plan would focus on defining specific building sites for future growth. The Grounds Plan establishes a framework of redevelopment zones, a unique approach to campus planning. The redevelopment zones target future development to areas where mixed-used infill development and redevelopment of existing facilities will create the greatest possible benefits in accommodating the variety of spaces and uses that comprise the University now and in the future. The designation of redevelopment zones is based on a strategy of carefully planned infill and redevelopment that curtails outward expansion, preserves historic assets, promotes an intelligible aesthetic order, improves connectivity, protects natural environments, and leverages existing infrastructure resources. The redevelopment zones preserve the green space network that provides structure to the University Grounds, and highlight opportunities for development close to existing systems and supportive of adjacent programmatic functions. In this way the Grounds Plan provides an opportunity to knit the precincts of the University together with greater clarity, employing defined redevelopment zones and the green space network to bridge the precincts with a more consistent and active pattern of development.

The Health System Area Plan (HSAP) is the first unified planning effort for the UVA medical cen-

The South Lawn Project used an infill redevelopment strategy, turning a parking lot into academic space

ter. The 2010 plan comprehensively addresses the unique circumstances of supporting a research and patient-serving community in the context of the University Grounds and City of Charlottesville environs. The HSAP focuses on the overall environment to create a district emphasizing health and wellness for its total population of patients, visitors, faculty, staff, and students; with a particular emphasis on creating a caring and health-filled sense of place.

The Precinct Plans complement the Grounds Plan in addressing overall physical development of the Grounds, providing detail of existing conditions and patterns of the natural systems, green spaces, and circulation systems and projecting how these places might develop holistically, addressing building form, views, circulation, servicing, parking, and other aspects of the physical environment. While encompassing the entirety of the Grounds, these guidelines focus on areas of

The Whitehead Road Redevelopment Zone seen prior to construction and in a post-construction rendering

change, emphasizing the important relationships between green space and built form to ensure that all elements are considered in an integrated manner and to assist in identifying and enabling opportunities for coordination of concurrent projects. These plans emphasize the importance of linking woodlands and waterways, enhancing bicycle and pedestrian circulation systems, preserving and improving green space, and scaling building massing to the context. They are actively used in the process of new and redevelopment planning.

Intertwined with the development of these strategic planning documents are areas of focused sustainability implementation. These focused efforts often overlap with the efforts of other management centers. Since land use is comprehensive in its breadth, sections on related management centers should be consulted.

The University committed in 2007 to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification for all new buildings or major renovations. The LEED certification contributes broadly to multiple aspects of land use planning, and the University has developed a set of campus-wide credits that can be used as a standard for all LEED projects.

In 2007, UVA established the Grounds Improvement Fund (GIF) to support projects that enhance the appearance, sustainability, functionality, and safety of the University's environs. This fund seeks to enhance conventional physical infrastructure on Grounds, including streets, paths, pedestrian and bicycle facilities, landscape, lighting, signs, site furnishings, and public art. Funding for GIF comes from a 1.5% assessment on all capital projects. Schools and Vice Presidential units are invited to submit project proposals annually to the GIF committee. Projects are ranked based on their fulfillment of GIF objectives, and $1 million is spent annually on as many projects as possible. The funding program covers the construction as well as the advance design efforts that support these projects.

A GIF-funded stream restoration project

Phases 1 and 2 of the UVA Transportation Demand Management Plan have been completed and are actively being implemented across Grounds. While the broad measures aim to link transportation resources and land uses to effect a more efficient and sustainable transportation system, the programs address all aspects of mobility and range from extended bus service to the Zipcar program, employee flex schedules, intercept parking facilities, and bicycle and pedestrian improvements. The programs focus primarily on reducing single-occupancy vehicle rates among faculty and staff, as 95% of the undergraduate students use transit, bicycle, or walk to Grounds.

The updated UVA Bicycle Master Plan has been completed and provides guidance on improvements, enhancements and education across Grounds – including the regularly updated SMART Transportation map used by the University and the community.

The first Biodiversity Analysis for UVA has been completed, providing a data inventory of land cover, habitat, stream habitat, species occurrence, soil type, and regional context to enhance the environmental health and quality of the University. The analysis and a GIS-based software tool - NatureServe Vista - will be used to develop the next steps for UVA land use decisions.

UVA tracks impervious surfaces on a project by project basis as part of the stormwater management water model addressing the two watersheds on Grounds – Meadow and Moore's Creeks. Use of green roofs and on-site stormwater detention and retention are addressed in LEED and encouraged in all projects. Permitting rules require that new development must result in a net decrease in runoff; however, reduction of total impervious surfaces on Grounds is not as yet a policy.

The Tree Replacement Program replaces trees on Grounds that are lost to natural causes. The program has been running for 40 years and typically replaces 25-100 trees per year, based on the location, species and age of the tree being replaced. In fall 2010, the Program targeted plantings that had been designed by capital projects but never implemented, planting 206 trees.

UVA collaborates with the University of Virginia Foundation (UVAF) to advance sustainable building, landscape, and environmental design practices in projects developed for the University and the community.

The University is actively coordinating with the Commonwealth and its agencies to advance sustainable building and environmental design measures and to comply with those advocated by the State.

Comparing Our Performance

The following section notes best management practices being implemented at peer institutions as exemplified by current trends and case studies.

The Cornell Climate Action Plan extends the planning elements of the Campus Master Plan with recommended actions that would reduce capital construction, impacts of single-occupant vehicles, space per person, and energy use. The Plan commits to a framework for future physical development of the campus within a compact footprint that would help reduce infrastructure and decrease the vehicle miles traveled on campus. The Plan also calls for better integration of landscape with infrastructure and naturalization efforts that

would improve campus aesthetics and further support carbon-reduction goals. By proposing more effective use of building space, the Plan aims to reduce the material, energy, and land resources consumed by new buildings; slow overall campus growth in building-square-foot terms; and increase utilization rates and building space efficiency. Implementation would begin through selective utilization studies of existing space, as well as the specification, purchase, and use of a facilities information management system.[1]

The Carolina North Plan for the University of North Carolina at Chapel Hill envisions a sustainable, mixed-use research and academic campus to spur economic development locally and throughout the state. Phase 1 of the plan involves the redevelopment of 228 previously disturbed acres currently used as an airport and runway. Approximately half of the first 800,000 square feet of buildings will be academic, one quarter will be for private research and development, and one quarter for compact multifamily housing for University use. The plan establishes a goal of maintaining or increasing the total amount of tree canopy coverage with a tree-planting hierarchy of young trees for working landscapes, mid-age trees for streetscapes, and mature trees for permanent landscapes. To limit parking, there will be aggressive use of transportation demand management strategies, such as local and regional public transit, bicycling, walking, and park-and-ride, and a maximum of 1,525 parking spaces to be constructed to serve the first 800,000 square feet of buildings. The six most ecologically sensitive areas of the site will be protected in perpetuity, with 311 acres, 32 percent of the total property, put into conservation easements.[2]

Sustainable Stanford is a university-wide effort to reduce environmental impact, preserve resources, and show sustainability in action. Crucial knowledge and direction for this effort comes from the Sustainability Working Group and its ten subject-focused teams. The goals of the program are to advance sustainability knowledge, reduce greenhouse gas emissions, foster land stewardship, conserve water resources, create environmentally

sound buildings, encourage alternative transportation, minimize waste, and purchase sustainably.[3]

Stanford has set a goal to recover 5-10% of existing building space through improved space utilization. To encourage more efficient use of office space, Stanford requires selected schools to pay a charge for underutilized space, with several schools working to reduce their space charge.

In 2007, 90 percent of the 300,000 gross square feet of academic development was redevelopment and infill, and all 425 new housing units resulted from redevelopment of existing facilities.

2011 OPPORTUNITIES: LAND USE		
ACTION	**TIMELINE**	**SYNERGIES**
Establish a program to recommend best practices for sustaining natural systems on Grounds – addressing tree canopy preservation and enhancement, reduction of impervious surfaces, and stormwater quality improvements.	Immediate	💧
Revise the Project Initiation Form to include a section on compliance with LEED and allow for early planning input and discussion on projects pertaining to specific and broad sustainability issues on Grounds.	Immediate	🌿
Establish a sustainability tour of Grounds that highlights sustainability features that have been implemented and provides an information website, coordinated with interpretive signage.	1-2 Years	🏛 🌿
Initiate a study on the use of existing buildings/space to identify opportunities to minimize the need for expanded facilities.	1-2 Years	🌿 ⚡
Develop a growth management model to analyze and plan for impacts of growth in support of student enrollment increases through increased density, utilization of facilities, or other means.	1-2 Years	🌿
Continue to implement the planned reconfiguration of McCormick Road, from an automobile-focused road to a pedestrian and transit-focused travelway, to provide improved pedestrian experience, safer access, enhanced aesthetics, and additional transportation options.	2-4 Years	🚶
Develop a program identifying sustainability priorities and a means to implement through building/utility capital projects, independent projects, or maintenance strategies.	2-4 Years	🌿 ⚡

SYNERGIES LEGEND

🏛 Governance and Culture   🌿 Built Environment   🚶 Transportation   ⚡ Energy   💧 Water

Bavaro Hall, part of the Curry School of Education, was completed in July 2010. The Robert A. M. Stern and Associates-designed facility is the University's first LEED Gold Building. See graphic at right detailing Bavaro's performance.

The past decade has seen remarkable growth in the University's built environment. Measuring by square footage of buildings, the University is now over 30% larger than it was just ten years ago. This rate of growth outpaces most other measures: the student body has only grown by about 13%; faculty and staff have increased by less than 20%. This growth has brought the University new capabilities in research, the arts, and medicine. It has also added significantly to the University's environmental footprint.

The energy needed to power and condition buildings contributes to 85% of the University's greenhouse gas emissions. Lifecycle impacts stemming from the manufacture, transport, and disposal of construction materials are known to be significant, but have yet to be fully tallied.

For more than a decade, steps have been taken to reduce energy consumption in existing buildings and improve the efficiency of new buildings. These efforts have brought noteworthy results, but are facing a battle against two strong trends.

The first is that colleges and universities have directly tied growth of new construction to academic and research excellence. Simply put, more (new) space equals a better program. Better programs attract and retain top faculty, staff, and students. For an institution that consistently ranks in the top three "Best Public Universities" and has always remained in the "Top 25 of All Public/Private Universities" in the U.S. News &

World Report Rankings,[1] this is a powerful driver of new construction. The University's energy conservation measures, even though they are successful, cannot keep pace with this paradigm.

The second major impediment to reduced energy consumption is that most new buildings at UVA consume more energy than existing University buildings. This is not to say that new buildings are inefficient. Rather, a distinction has to be made between energy efficiency and energy consumption. New UVA buildings, many LEED-certified and equipped with innovative energy technologies, are more efficient than the same buildings would be without these technologies. But new University buildings are being designed to accomplish much more than their older peers. From specialized laboratory equipment in new research facilities to ubiquitous air conditioning in new residence halls, the expectations placed on new buildings are driving absolute energy consumption up, not down.

The current economic climate and pressures to increase enrollment may force the University to do more with less. This will shift the focus from high-performance new construction to sustainable building renovation, operation, and maintenance. While even renovations typically drive energy consumption upwards, they can significantly reduce the lifecycle impacts of construction by preserving the energy already embodied in building materials. Renovations also preserve the University's rich cultural heritage and can enhance the

Bavaro Hall - Gold LEED Building Performance Numbers

22%	46%	57%	66%	92%
Energy Use*	Water Use*	Regional Materials	FSC-Certified Wood	Construction Waste Recycled
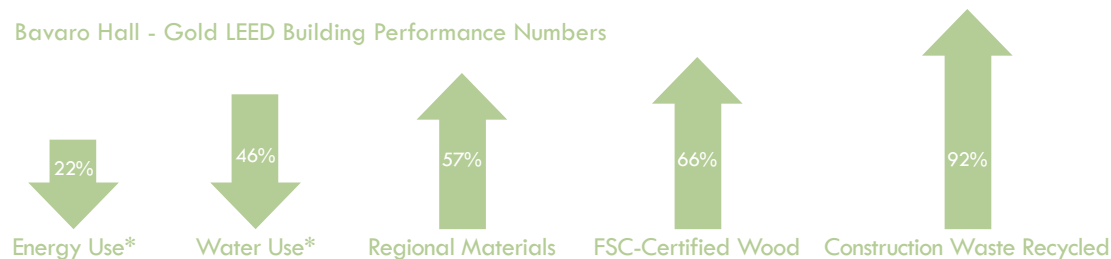
*Percentage Reduction Compared to Baseline Building

PROGRESS ON THE 2006 OPPORTUNITIES: BUILT ENVIRONMENT

ACTION	PROGRESS
Coordinate criteria from Sustainable Building Guidelines with Facilities Design Guidelines.	◑
Develop sustainability checklist for University code, constructability and life-safety reviewers to ensure implementation of sustainable building guidelines and criteria.	◑
Expand educational and public relations outreach to students, donors, alumni and community members regarding importance of green design and University leadership.	●
Increase the number of LEED accredited architects and engineers at the University through an incentive program.	●
Establish minimum LEED certification or equivalency for all new and renovated buildings on the University Grounds, Health System and Foundation properties.	●
Assess life-cycle costs and savings of sustainable buildings in value management process.	●
Track operational savings of sustainable building projects, cost avoidance and payback.	◑

● Fully Completed   ◑ Partially Completed   ○ Barriers Encountered/Not Completed

utilization of existing space, helping to reduce the need for new construction.

While building energy consumption is a critical factor in advancing built environment sustainability, it is only one of many. Buildings cannot be evaluated solely on their energy consumption because buildings are not built solely to consume energy. Rather, University buildings provide the necessary shelter to foster new ideas, educate minds, and heal patients. The University's most valuable resources, its people, spend most of their time indoors. Therefore, the health and productivity of the University community should be the primary objective of our built environment, and of the tools we use to evaluate it. In this context, buildings must sustain our mission as efficiently and effectively as possible.

Current Activities
The Leadership in Energy and Environmental Design (LEED) was publicly launched in 2001 by the United States Green Building Council (USGBC) with the release of its first rating system, LEED for New Construction Version 2.0 (LEED-NC). Focusing on new construction and major renovations, LEED-

NC evaluated buildings using criteria in six areas: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process. By earning points for specific credits, projects can work their way through the levels of certification: base, silver, gold, and platinum. Since 2001, US-GBC has continued to develop the LEED-NC system, currently on version 3, as well as to introduce eight new rating systems, such as LEED for Existing Buildings: Operations and Maintenance and LEED for Healthcare.

During the design phase of the South Lawn Project, the College of Arts and Sciences decided to pursue LEED Silver certification for the 114,000 square foot complex. A short time later, the Board of Visitors approved language in February 2007 requiring all new buildings and major renovations to achieve at least base LEED certification upon completion. As a result, all major projects approved since that time have pursued LEED certification, most using the LEED-NC rating system. Four years later, the University has certified 7 buildings and has 12 buildings currently under construction that are targeting certification. Although the South Lawn Project was the first UVA project to seek LEED certification, its longer construction schedule allowed several smaller projects to jump the queue. The March 2010 dedication of the

Daylight sensors control lights in the South Lawn
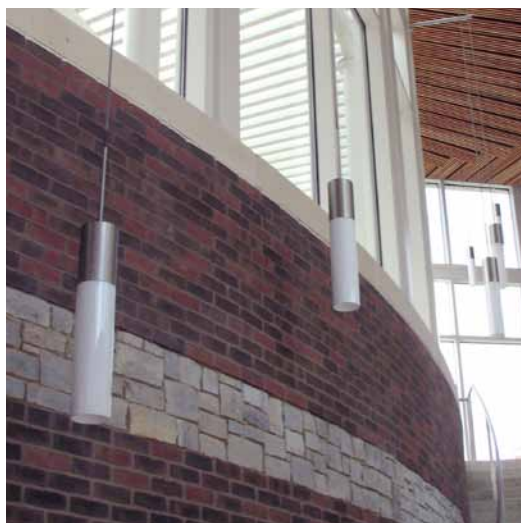
The LEED Silver PCS Addition

Printing and Copying Center Addition marked it the first UVA building certified under LEED. The 15,000 square foot addition earned a Silver-level certification. The PCS Addition also marked a trend of UVA projects exceeding their base level certification requirements to achieve higher level certifications with regularity. In 2011, Bavaro Hall became UVA's first Gold-level certified building.

The Grounds of the University — dense, walkable, and well-served by transit — give many projects a head start in the Sustainable Sites category of LEED. This sustainable development pattern is reflected in the 2008 UVA Grounds Plan, which calls for redevelopment on in-fill sites already served by transportation and utility infrastructure. The University's Facility Design Guidelines, implemented prior to LEED requirements, require projects to meet standards that are more stringent than standard building codes and, in many cases, similar to LEED requirements or recommendations. When the requirement for LEED certification was implemented, projects were instructed to set aside 1.5% of their project budgets to obtain certification. With the experience of over 20 projects, costs for obtaining LEED certification are now estimated to be closer to 0.5%.

While inherent conditions and existing procedures have helped UVA obtain certain LEED credits, the

implementation of LEED into the standard practices of design and construction has also led the University to enhance existing initiatives and to create new ones. The most substantial, from a total mass standpoint at least, is the focus LEED brought to construction waste management and recycling. The inclusion of Materials and Resource Credit 2 led both UVA and the construction industry at large to focus on enhanced recycling of construction and demolition waste. Assisted by the availability of local construction waste sorting facilities, the University has seen a significant increase in the recycling of construction and demolition (C&D) waste. In 2009, over 3 million pounds of C&D waste from UVA projects was recycled. Most projects are able to recycle upwards of 80% of their waste, leading to the substantial diversion of materials from landfills.

Due in part to LEED requirements and in part to the overall focus on sustainability at the University, important changes have occurred during the planning, design, and construction process that contribute to better building performance. In building programming—an early process where the type and distribution of spaces in a new building are defined—greater awareness is paid to matching the design to intended uses of the building. In the new College of Arts and Sciences (CAS) Research Building, this added attention enabled the design team to physically separate wet lab space from lab write-up areas. As a result, the amount of high-intensity lab space requiring single-pass outside air is reduced in favor of lab write-up areas with recirculating air. These write-up areas also afford graduate students greater freedoms, such as the ability to eat and drink.

The value management stage—the process of rectifying a building's design with its budget— used to be the graveyard of energy-efficient equipment and reduced maintenance materials. Previously, this process only looked at first-cost considerations in the project budget, meaning that items that cost more initially but delivered savings in operation were typically discarded in favor of cheaper, less efficient equipment. Now, the value management process is instructed to re-

tain all items that deliver a return on investment of less than 10 years and to consider items that have a longer payback as well. Since LEED now dictates that most University projects create an energy model, practical information about potential energy savings is now readily available.

The Post-Occupancy Evaluation (POE) process is a "lessons learned" exercise to improve the design, construction, operation, and user satisfaction of future buildings by providing an assessment of completed projects. The process identifies the architectural, engineering, and functional components that work well and those that are problematic. The POE process assists the University's sustainability program by meeting the criteria for the thermal comfort verification credit of the LEED certification process. POE information is gathered through 1) a building tour, 2) a web-based survey distributed to faculty, staff, graduate students, and undergraduate students, 3) an assessment by the maintenance staff, and 4) a post-survey meeting with building stakeholders.

Comparing Our Performance

Recognizing that campus greenhouse gas inventories did not measure lifecycle carbon emissions resulting from university purchases, in 2007 the University of California at Berkeley became the first U.S. university to calculate its supply chain carbon footprint. The initial study found that including supply chain impacts in Berkeley's inventory increased emissions by almost 150%. Further studies by Berkeley's Renewable and Appropriate Energy Laboratory showed that in 2008, supply chain emissions accounted for 217,000 metric tons (MT) of greenhouse gas emissions, compared to 207,000 MT that were reported using conventional accounting practices. Of the 217,000 MT, supply chain impacts related to construction activities represented 80,000 MT. This makes construction activities, which Berkeley spent $143 million on in 2008, the second largest generator of greenhouse gas emissions at Berkeley, representing 17% of the total of reported and unreported emissions.[1]

In 2007, as Atlanta was in the midst of a 100-

year drought, Georgia Governor Sonny Perdue mandated a 10% reduction in water use for the state. Georgia Tech responded aggressively to this mandate, convening a water conservation task force and implementing numerous initiatives to reduce potable water use. Within three years, Georgia Tech's consumption of potable water had declined by 30%. The Clough Under-graduate Learning Commons (CULC) Building, a 230,000 square foot classroom and lab building opening in August 2011, will feature a million-gallon underground cistern fed by stormwater runoff and condensate. In addition to irrigation, the cistern's water will be used to flush toilets in the CULC through use of a dual plumbing system installed with the new construction.[2]

2011 OPPORTUNITIES: BUILT ENVIRONMENT

ACTION	TIMELINE	SYNERGIES
Make mandatory specific LEED credits and/or energy performance requirements for University building projects that support larger sustainability goals.	Immediate	⚡
Expand efforts to communicate and inform building occupants and the general community about sustainable building and landscape features.	Immediate	🏛 ⚡
Certify two existing University buildings under the LEED EB: Operations and Maintenance rating system or equivalent process as a pilot project to establish an overall approach.	1-2 Years	⚡ 💧 ♻
Make use of the POE program to identify building performance measures that consider occupant productivity, satisfaction, and health alongside building energy performance and use to evaluate new and existing University buildings.	1-2 Years	🏛
Comprehensively document the lifecycle impacts of construction materials and activities.	1-2 Years	⚡
Develop an incentive approach to space utilization and begin a process to apply to all University units.	2-4 Years	🏛 🌳 ⚡
Prototype a dual plumbing system in an upcoming capital project to serve as model for future construction.	2-4 Years	💧

SYNERGIES LEGEND

🏛 Governance and Culture   🌳 Land Use   ⚡ Energy and Carbon   💧 Water

♻ Waste and Recycling

PUSH BUTTON
FOR
CROSSWALK
WARNING
DEVICE

CROSS WITH
CAUTION

A student activates in-ground LED warning lights at a mid-block crosswalk on Emmet Street. UVA has installed these pedestrian safety devices at nine crosswalks on and adjacent to Grounds; the City has added three on the Corner.

Every day, UVA commuters cover a combined 300,000 miles in trips to and from work. Trips originate from homes directly adjacent to Grounds, and others 50 or more miles away. The University must accommodate the diverse mobility needs of its faculty, staff, students, and visitors, while simultaneously maintaining a cohesive campus environment, making best use of available land, and limiting parking and transportation expenditures.

The Department of Parking and Transportation provides essential services to the daily operation of the University of Virginia. Parking and Transportation manages over 18,000 parking spaces across Grounds and within the University Health System, and provides transit service to over 3 million passengers per year. The Department takes a proactive approach to reducing single-occupancy vehicle use to reduce congestion in the Charlottesville area, minimize greenhouse gas emissions, offset parking expansion to allow better land use, and improve the overall quality life on Grounds through its Transportation Demand Management (TDM) program. TDM seeks to meet the University's transportation needs associated with future growth by reducing the demand of vehicular use and encouraging options for travel, including walking, bicycling, and use of public transportation.

In addition to Parking and Transportation TDM initiatives, the Department has also implemented a strict Environmental Management System (EMS)

program. An EMS policy is defined by the University Office of Environmental Health and Safety as "an integrated organized set of policies and procedures under which the University of Virginia can remain compliant with all applicable environmental regulations, and in addition, manage and lessen our impacts on the environment, thereby improving the University's overall environmental performance."[1] Parking and Transportation's EMS policy is designed to minimize its environmental impacts by encouraging recycling, using cleaner fuel sources, reducing waste and energy consumption, and integrating environmentally friendly practices into day-to-day operations.

In association with the UVA Center for Survey Research (CSR) and the Office of the Architect, Parking and Transportation conducted an employee survey in 2008 to assess the basic commuting practices of UVA employees and determine the use and awareness of existing programs offered at UVA. The survey was also conducted to help determine the current level of satisfaction that employees had with the various modes of transportation and what factors might allow for a shift in mode. Employees in the target pool included Faculty and Administration, Clerical and Technical, and Service and Maintenance.[2]

While the survey provided a great deal of data, perhaps the most notable figure obtained from the survey was employee mode choice, the primary means of commuting to work. The survey found that 78% of respondents drove alone to work,
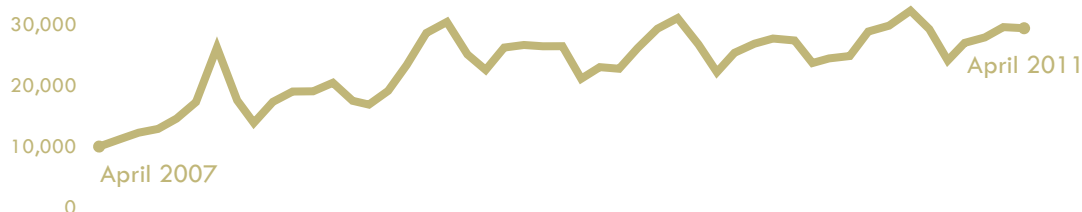
Monthly UVA student, staff and faculty ridership on CAT since the April 2007 launch of fare-free transit

PROGRESS ON THE 2006 OPPORTUNITIES: TRANSPORTATION

ACTION	PROGRESS
Increase safety awareness among automobile drivers in regard to bicyclists.	○
Host annual bicycle awareness day including tune-ups and bicycle route and safety information.	●
Improve bicycle safety on specific roads and determine new routes.	◐
Establish central locations for bicycle corrals throughout Grounds.	○
Implement creative advertising to increase use of alternative modes of transportation.	●
Offer discounted and/or priority parking for carpools and vanpools.	●
Ensure equitable parking rate structure and transportation options	◐
Work with Human Resources Department to support flex-time programs, parking cash-out, carpooling programs and other transportation demand management strategies.	◐
Expand and promote Occasional Parker Program.	●
Establish a fare-free bus pass system on City bus system for University ID holders.	●
Establish car-sharing program for University members (e.g., Zipcar or Flexcar).	●
Conduct biannual assessment of work-residence commuting patterns to reassess needs.	●
Conduct assessment of alternative fuel vehicle procurement.	◐
Establish procurement process to realize economies of scale for alternative vehicles.	○
Establish University and Health System parking ratios to guide decision-making.	◐

● Fully Completed   ◐ Partially Completed   ○ Barriers Encountered/Not Completed

10% carpooled, 8% used public transit, 3% biked, and 1.5% walked. The survey also gauged employees' knowledge of, satisfaction with, and ideas for improving the transportation resources available to them. In many cases this data showed a need to better market programs to the UVA community. For instance, the study showed that 71.5% of respondents were unaware of the Occasional Parking Program, but 88% of respondents felt Occasional Parker Permits were an important step in improving carpooling/vanpooling as a viable option.[3]

Current Activities

To prepare the transportation component of the 2008 UVA Grounds Plan, the University retained Vanassee Hangen Brustlin, Inc. (VHB) to develop the UVA TDM Plan - Phase I. The Phase I study identified existing commuting and transportation conditions at the University and created a series of scenarios that could be implemented to help reduce the use of single-occupancy vehicles over a reasonable timeline based on the unique conditions in the UVA area. The study identified several levels of aggressiveness that the University could follow to implement TDM strategies. Results of the TDM Phase I study served as the basis for much of Parking and Transportation's TDM planning.

A second, Phase II, study was conducted by VHB in the Winter of 2009/2010 to assess programs implemented since Phase I and identify strategies moving forward. A large portion of the study dealt with identifying mode-shift packages, funding for current and new strategies, and gauging the need for a full-time TDM coordinator. Results of this study were presented to the UVA TDM Steering Committee, comprised of various administrators including the Vice President and Chief Financial Officer, Associate Vice President for Business Operations, and the Architect of the University among others. As a result of the Phase I and Phase II studies, and with the approval of the Steering Committee, UVA was able to move forward with expanding its TDM program.

Parking and Transportation operates its own transit system, the University Transit System (UTS),

which provides fare-free transportation to over 3 million passengers per year. UTS provides service to students, faculty, staff, and the local community on seven fixed routes that cover virtually all areas of Grounds and provide connections to Charlottesville Area Transit (CAT, formerly CTS). In 2008, UTS made significant changes to its route system to provide more efficient and expedient service. Each route was designed to meet the needs of a target audience, with focus on providing transportation from housing densities to classroom space and transporting employees from satellite parking locations to their places of employment both on Grounds and in the University Health System.

After a successful reciprocal ridership pilot program with the Charlottesville Area Transit (CAT) system in 2005 and 2006, the University entered into an agreement with CAT to offer fare-free transit to all UVA employees and students with a valid University ID. By paying a set subsidy to the City, UVA provides for a larger fare-free transit networking allowing students to easily access areas off Grounds and enables employees living in areas of the City and County to reach the University without use of their own vehicle. The University also subsidizes part of the City's Free Trolley route, which provides fare-free service to all passengers between the University and Downtown Charlottesville. The reciprocal ridership program also allowed CAT to reallocate its services to other areas in Charlottesville and Albemarle since all passengers are able to ride UTS fare-free, eliminating the need to duplicate service in most corridors.

The reciprocal ridership program between CAT and UTS has seen very positive results, with ridership numbers consistently increasing each year. Since its inception in FY2008, the UVA ridership on CAT has increased from 209,784 to 311,179 in FY2010. Total ridership on CAT has increased from 1,701,813 in FY2008 to 2,195,455 in FY2010.

In a measure to make transit use more accessible, convenient and safe, Parking and Transportation worked with the City of Charlottesville in 2008

to contract with Connexionz, a technology company specializing in Automated Vehicle Location (AVL) technology. Connexionz provides a system in which all buses are equipped with Global Positioning System (GPS) radio devices that allow the buses to be tracked by each service's dispatch system. The location data, in conjunction with programmed route data, creates arrival predictions which are available to passengers via a local phone number, on the web and mobile web, and at Bus Finder push-button devices located at certain stops through the transit network. This service enables passengers to determine how far away a bus is from their desired stop, allowing them to decide when to head out to their stop, or if they want to wait for the bus or begin walking to their destination. Access to this system was expanded by the development of an iPhone mobile application by a UVA graduate and an Android mobile application by a UVA fourth-year student.

Real-time bus info displayed by HoosBus app
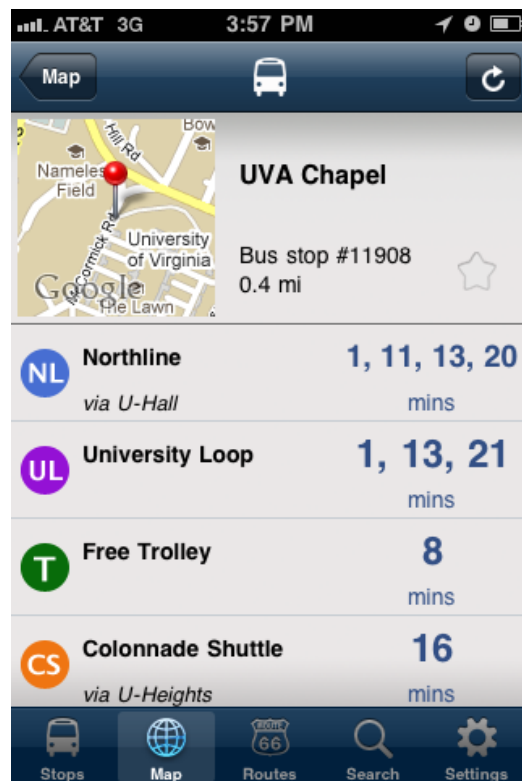
During the summer of 2008, in response to peak gas prices and the need to encourage carpooling as a viable option to employees, Parking and Transportation began to develop a carpool incentives program. Launched in August of 2008, the Cavpool program created an incentives package for UVA employees carpooling or vanpooling with other UVA employees that included a discount on the price of their parking permit based on the number of riders in the carpool, free Occasional Parking Permits, and enrollment in the region's Guaranteed Ride Home Program. The Guaranteed Ride Home Program (GRH) is administered by RideShare, a program of the Thomas Jefferson Planning District Commission. GRH provides cab fare, or in some cases free vehicle rental, for employees who need a ride home in the event of an emergency.

The first inception of the Cavpool program featured a 10% permit price discount for carpools with two riders, a 25% discount for carpools with three riders, and a 100% discount for carpools/vanpools with four or more riders. As the program continued to grow, changes were made to the incentives to make the program more rewarding and attractive to employees not currently in the program. Between January 2009 and May 2010, the permit price discounts were increased to 25% with two riders and 40% with three riders. The number of Occasional Parking Permits issued per person was also increased to 10 reserved permits and 10 commuter permits per year. With the launch of the Zipcar program in late 2009, Cavpool members received an additional incentive in the form of a driving credit bonus for the Zipcar program.

To further encourage use of transportation alternatives, Parking and Transportation contracted with an online ride matching and commuter reward program called NuRide. The NuRide program was launched in September 2010 to the entire Charlottesville Metropolitan Statistical Area (MSA) and made available at no cost to virtually all commuters in the MSA, not just UVA students and staff. NuRide allows users to sign up for free, create an online profile, set their commuting ori-

A convenient Zipcar location

gin, destination and preferences, and post their desired commute trips to the NuRide database.

In November of 2009, Parking and Transportation launched Zipcar, the largest provider of car sharing services. Zipcar provides access to six fuel-efficient cars on Grounds by the hour or by the day. Additionally, members over the age of 21 may reserve Zipcar vehicles in 32 states, and even London! Hourly and daily reservation rates include gas, insurance, roadside assistance, and 180-miles per reservation/day.

Three of the Zipcars are hybrid vehicles meeting the EPA's SmartWay Elite status while the other three cars are SmartWay Certified. The makeup of the fleet changes based on fleet needs across the larger Zipcar network, but the ratio of 50% hybrid and 50% SmartWay is always maintained. Two Zipcars are located in each of three pods on Grounds. Currently, Zipcar pods are located near Alderman Library, Gilmer Hall and the Hereford Residential College.

In response to the issues of awareness shown in the CSR Survey, Parking and Transportation has put an emphasis on outreach and marketing. Information regarding its TDM initiatives is now readily available online, presented in an organized and easily accessible format. With the

hiring of a full-time TDM Coordinator, information on initiatives and available resources is now presented at various information fairs, orientation sessions, student events and employee communication council meetings. Flyers, posters, and ads are also placed throughout Grounds, on buses, and in other high traffic areas. Print publication ads and Facebook ads have also been used to market programs and events.

The TDM Coordinator also works closely with other divisions of Auxiliary Services at UVA to cross-promote services and initiatives. Some collaborations have included the 2010 Transportation Resource Fair and Bike Festival and UTS Rider Appreciation Day, at which morning bus commuters were treated to free coffee, tea, and pastries provided by UVA Dining.

While much of Parking and Transportation's TDM focus has been on transit and carpool use, a definite need to better accommodate bicyclists in the UVA area indeed exists. In working with the Green Grounds Group and the Office of the Architect, a SMART Transportation Map was developed in 2007 to visually represent the types of bike routes through Grounds (e.g., quiet routes, routes with bicycle lanes, dismount zones, etc.) and where storage racks could be found. The map also showed all UTS routes, highlighting key destinations and stops that feature Bus Finders. The SMART map is regularly updated and now includes Zipcar parking locations, Occasional Parking Permit locations, and other information.

Parking and Transportation is currently in the process of evaluating the current deployment of bicycle racks throughout Grounds to identify areas in need of new racks, additional racks, or upgraded racks. Underutilized racks are also being relocated to areas without racks or in need of an additional rack. Many older UVA bicycle racks feature narrow spacing that makes bicycle placement difficult. To address this concern, newly placed movable and permanent racks are using a minimum spacing of twenty-four inches, and preferably thirty-six inches, to allow ample room for bicycles to be parked side by side.

In 2010, Parking and Transportation entered into an agreement with a local non-profit bike organization, Community Bikes, to create a fleet bicycle program for UVA employees. Parking and Transportation impounds dozens of bicycles each year that are never claimed by their owners. After sixty days, these bicycles are transferred to the surplus warehouse to be auctioned. Through this new agreement, unclaimed bicycles are donated to Community Bikes rather than being auctioned. Community Bikes then refurbishes an agreed-upon number of bicycles to be returned to the University. These newly refurbished bicycles are then assigned to departments wanting to provide bicycle transportation for their employees. Employees who are interested in using the fleet bicycles are required to take a 2-hour safety course, taught by an instructor certified by the American League of Bicyclists. The first set of bicycles was donated in late 2010, with the fleet bicycle program expected to start in summer 2011.

Although students frequently bring a bicycle with them to Grounds, many forget to bring a pump and tools to fix them. As a result, bicycles frequently fall idle or are abandoned after a flat or stuck chain. In April 2011, Parking and Transportation installed a Fix-It bicycle repair station near Clark Hall. The rack is equipped with a heavy-duty bicycle pump and a variety of bicycle re-

The Fix-It rack offers air and bicycle repair tools

pair tools, a convenient option for students and others looking to keep their bicycles in working order.

Comparing Our Performance

The University of Washington's U-PASS program makes a wide array of campus and regional TDM programs available to students, staff, and faculty through one portal. The pass, part of UW's ID card, gives holders free access to regional bus programs, light rail, and commuter rail. The pass also provides discounts at local businesses. Because all UW parking facilities feature access controls, holders can form impromptu carpools by scanning 2 or more cards at facility entrances for an 80% discount over normal daily parking rates.[4]

To join Stanford University's Commute Club, members must agree not to drive alone to Stanford's campus. In return, Commute Club members are showered with numerous benefits, including being paid up to $282 per year, Zipcar driving credits, occasional parking permits, and more. The program is designed to reduce Stanford's peak-hour commute trips, which is mandated by state and local regulations under the terms of Stanford's expansion plans. From 2002 to 2010, the percentage of employees driving alone to Stanford reduced from 72% to 48%.[5]

Nearly one third of Stanford's 1,021 fleet vehicles are electric, and the number of hybrid vehicles is increasing each year. The fleet also includes one experimental solar vehicle. There are two public electric vehicle charging stations (a total of four chargers) located on campus.

Stanford University is also notable as the only platinum-level Bicycle Friendly University, a new program of the League of American Bicyclists.[6] The program, modeled after the League's Bicycle Friendly Community program, evaluates each campus on the 5 E's: engineering, education, encouragement, enforcement, and evaluation and planning. Since May 2008, Charlottesville has been designated as a bronze-level Bicycle Friendly Community.[7]

2011 OPPORTUNITIES: TRANSPORTATION

ACTION	TIMELINE	SYNERGIES
Begin implementation of sheltered bicycle parking, interior bicycle rooms, and/or corrals at commuter parking lots and popular destinations. Target three installations per year.	Immediate	
Host educational sessions for University members to learn about safe cycling, vanpooling, area transportation planning and initiatives, car-sharing, and other transportation demand management (TDM) programs.	Immediate	
Explore future investments in Charlottesville Area Transit to create more opportunity for UVA commuter mode shifts.	1-2 Years	
Increase employee carpool mode split by 1% per year through marketing and continued implementation of recommended TDM programs.	1-2 Years	
Introduce bicycle sharing to the Central Grounds and develop plan for larger system.	1-2 Years	
Achieve a bronze-level, or higher, Bicycle Friendly University certification from the League of American Bicyclists.	1-2 Years	
Document actual occurrences of employee telecommuting and expand existing initiatives.	1-2 Years	
Calculate greenhouse gas and other environmental implications of UVA-sponsored travel.	1-2 Years	
Move towards pay-per-use parking at each parking facility to provide an incentive for permit holders to carpool and use other TDM programs when convenient.	2-4 Years	

SYNERGIES LEGEND

 Governance and Culture   Land Use   Energy and Carbon

The UVA Community Garden, located on the corner of Alderman and McCormick Roads, was planted in spring 2009. The result of a student initiative, the garden fosters the growth of community as well as food.

Dining services occupy a unique position at the University with regard to advancing sustainability. Few University operations interact with students, faculty, staff, patients, and visitors as frequently and personally as dining services. As a result, dining services are well positioned to promote healthy and sustainable practices directly to the UVA community. Dining operations are also energy intensive, with dining ranking below only research buildings in carbon intensity of University buildings.[1] Lastly, dining operations are major purchasers who can strongly influence supplier markets, especially local ones.

Several organizations are involved in providing dining services on Grounds. The largest, UVA Dining Services/ARAMARK, operates three residential dining halls as well as retail and specialty dining locations across Grounds, serving 9,000 meals per day. In the Health System, the Department of Nutrition Services/Morrison Management Specialists (MMS) operates two cafeterias, provides patient meals, and manages multiple retail locations, serving an average of over 4,000 meals per day. Darden Hospitality is the self-operated dining services provider at the Darden School of Business, serving approximately 100 to 300 meals per day depending on business and occupancy levels.

Interest in sustainable food is increasing nationwide, and the Central Virginia region offers an active community of local farms, food processors, and sustainable food advocates. There are sig-nificant opportunities to create new and expand existing UVA-community partnerships in our regional foodshed.

Current Activities

Since the initial 2006 Sustainability Assessment, dining administrators and students have worked together to form the Green Dining Committee. The committee, consisting largely of students with staff representation from UVA Dining/ARAMARK and other departments, is responsible for establishing priorities, goals, and policies relating to sustainable dining efforts within the parameters of a balanced budget.

An early outcome of the Committee was an explicit policy for purchasing organic and/or locally grown food called the "Green Dining Bull's Eye." The purchasing guidelines established the following sustainable purchasing goals, in order of priority:

1. Local, Virginia Grown
2. Seasonal
3. Organically Grown
4. Humanely Raised
5. Fairly Traded

Working with the Green Dining Committee, UVA Dining/ARAMARK has also implemented an impressive array of outreach, incentive, and education programs aimed at communicating Dining's sustainable dining practices and encouraging positive behavior. Regularly held events and

11%
2007

15%
2008

17%
2009

26%
2010

UVA Dining/ARAMARK Sustainable Food Purchases as a Percentage of All Food Purchases

PROGRESS ON THE 2006 OPPORTUNITIES: FOOD

ACTION	PROGRESS
Establish University priorities to assist UVA Dining in expanding sustainability initiatives.	●
Support the University's participation in ARAMARK's pilot program of purchasing local foods.	●
Incorporate educational and marketing signage provided by ARAMARK.	●
Track and promote sustainable dining procurement and initiatives.	●
Host special events and establish specific dining outlets to promote local organic foods.	●
Expand procurement of local and organic foods in all dining facilities.	●
Expand coffee purchasing to include shade-grown and organic blends.	●
Expand procurement of environmentally friendly paper and cleaning products, take-out containers and energy-efficient machines.	●
Work with UVA Recycling to implement (on- or offsite) composting program.	●
Examine feasibility of recycling fryer oil to power vehicles on grounds.	●
Explore opportunities for establishing a University demonstration garden/farm.	●

● Fully Completed   ◒ Partially Completed   ○ Barriers Encountered/Not Completed

themed meals highlight local food and farmers, food labels identify sustainable food at residential dining halls, and an incentive program rewards those who use reusable mugs, to-go containers, and bags.

UVA Dining/ARAMARK's punch-card incentive program was launched in October 2009 to reward users who filled their reusable mugs with drinks purchased at retail dining locations. Complementing the standard reusable mug drink discount, frequent customers have the opportunity to earn two free drinks for every eight purchased in a non-disposable mug. The punch-card incentive program has since been extended to include participants in the reusable to-go container program,

detailed below, and those who use a reusable bag for convenience items.

UVA Dining/ARAMARK, Nutrition Services/MMS, and Darden Hospitality all procure a portion of their produce and other goods through the Local Food Hub, a Charlottesville-based non-profit that works to support local farmers through a local-food-only wholesale operation. The three organizations also work directly with dozens of farmers and local food producers.

Since 2008, Nutrition Services/MMS has operated the Cafeteria Farm Stands, offering fresh, local produce from the Local Food Hub for staff and visitors to purchase and take home. The market is offered on Thursdays and Fridays from June to Labor Day.

Nutrition Services/MSS is run by Morrison Health-care, which was the first contract food service company to sign on to Healthy Food in Health Care, an initiative of the national program Health Care without Harm. Criteria include the use of sustainably-sourced fish and seafood, cage-free eggs, hormone-free milk and yogurt, antibiotic-free poultry, fair trade coffee, and many other sustainable practices.

In February 2011, Darden Hospitality provided interest-free capital to construct a 2,600 square foot hoop house at Appalachia Star Farms in Nelson County. The hoop house will expand the availability of produce in cooler months and Darden will be repaid via a discount on purchased items.

At the height of the growing season, up to 60% of food purchased by Darden Hospitality comes from local sources. In addition, Darden Hospitality hosts an all-local lunch for students, staff, and faculty each spring and fall.

Charlotteville's Quality Community Council (QCC) is a citizen-driven community coalition dedicated to improving the quality of life in Charlottesville's most challenged neighborhoods. QCC Cooks! is a partnership between QCC and Nutrition Services/MMS to provide culturally competent, hands-
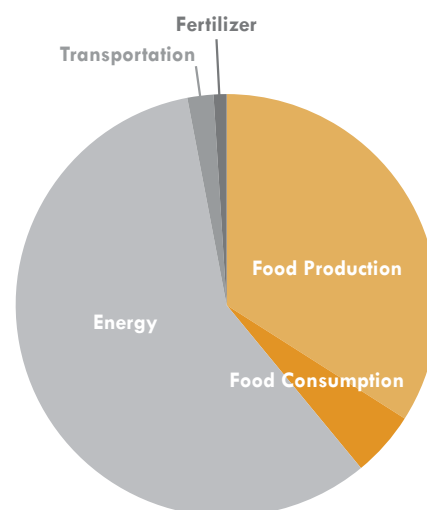

UVA Dining/ARAMARK's Punch-Card Incentive Program

Construction of hoop house at Appalachia Star Farms

Nitrogen footprint of the University of Virginia by source[11]

Rows of compost at Panorama Paydirt, the destination of UVA's pre- and post-consumer food waste

on healthy cooking demonstrations and tastings. Courses utilize ingredients from QCC's urban farm, QCC Farms!, and are taught by chefs and dieticians from Nutrition Services/MMS.[2]

In August 2010, UVA Dining/ARAMARK implemented a Meat-Free Monday station at its three residential dining halls, with the goal of complementing existing sustainability and nutrition programs and increasing students' healthy food intake. The station arose from a student-expressed need for dining programs that integrated environmental and nutrition initiatives. Varied stakeholders collaborated on this effort, including students, ARAMARK, and UVA Environmental Sciences Department researchers who developed a Nitrogen footprint tracking tool to measure N inputs/outputs for individuals and communities. The N-print tool was employed to create a range of acceptable Nitrogen levels for Dining's vegetarian recipes, and to analyze those recipes against a sample conventional N (and protein)-heavy dining hall meal.

Although food preparation and service require significant consumption of energy, water, and materials, a number of initiatives have been implemented to reduce consumption and waste. Since fall 2008, UVA Dining/ARAMARK has composted pre- and post-consumer food waste at the Observatory Hill Dining Hall. The composting program is structured as a joint student/operations program, and students are involved in monitoring all phases of the composting program. The program was expanded to include the Newcomb Hall Dining Hall in spring 2010, and on average the two

dining halls divert and compost roughly 5 tons of materials per week. In April 2010, UVA's composting program earned a Silver Award from the Governor's Environmental Excellence Program. In another waste reduction action, used fryer oil is collected from UVA Dining/ARAMARK and Darden Hospitality by Greenlight Biofuels for reuse as biodiesel fuel.

UVA Dining/ARAMARK was awarded the Virginia Environmental Excellence E3 Designation. The state-wide environmental program was developed in 2000 in order to recognize facilities for systematically establishing environmental goals and evaluating their environmental performance in order to make improvements. Organizations throughout the state that impact the environment through their processes or operations are invited to participate in the application and vetting process. E3, or Exemplary Environmental Enterprise, is indicative of a department that the Virginia Department of Environmental Quality recognizes

UVA Reusable To-Go Container

as innovative and successful in its environmental program.

In an initial move to reduce the negative environmental effects of disposable products, UVA Dining/ARAMARK replaced styrofoam and plastic materials with compostable cups and other "green" materials. Given the lack of compost collection outside of dining halls, this initiative provided only a partial solution. Compostable products end up either in landfill trash or improperly in recycling bins, which threatens contamination of the recycling stream. To address these issues, UVA Dining returned to using #1 plastics, a high-value plastic that is recyclable in all UVA and City recycling streams, for beverage and other appropriate containers. Compostable containers remain where a recyclable alternative is not available. To further address disposable products, UVA Dining introduced a reusable to-go container program in fall 2009, one of the first large institutions to do so. Participants pay a small deposit ($5) and receive 2 tokens that can be exchanged for clean, plastic to-go containers. After use, participants return their dirty containers to a residential or participating retail location in exchange for a token. UVA Dining cleans the containers and thus keeps take-out materials in its food cycle and out of the landfill.

Trayless dining was introduced in the fall of 2008 at UVA Dining/ARAMARK, with the dual purpose of reducing energy and water consumption from tray washing and reducing food waste. Food waste audits conducted before and after the removal of trays suggest that food waste declined by approximately 25%. University students have also launched the UVA chapter of the Campus Kitchens Project[3] to repurpose unutilized food from UVA Dining/ARAMARK into meals for area non-profits that serve to combat hunger. APO, the University's service fraternity, also collects unused pastries and other food items from UVA Dining/ARAMARK retail locations to donate to similar hunger-fighting organizations.

The unique combination of faculty experts, student interest, geographic location, community

KENDALL SINGLETON
Sustainability Coordinator
UVA Dining Services

As UVA Dining/ARAMARK's Sustainability Coordinator, Kendall Singleton takes the lead role in coordinating and organizing all sustainability efforts for UVA Dining Services. She markets to and educates the student body on all sustainability actions by Dining, including overseeing the Green Dining group meetings, maintaining the Green Dining blog and calendar, and updating the sustainability section of the UVA Dining and UVA Sustainability webpages.

Other efforts include analyzing and evaluating potential waste mitigation initiatives, integrating sustainability and nutrition programs, and promoting and supporting Dining's increasing local food purchasing efforts. Key collaborators include UVA sustainability staff (Energy & Utilities, Office of the Architect, UVA Communications, Environmental Health & Safety, UVA Food Collaborative, Parking & Transportation, etc.), UVA students, and ARAMARK staff (managers and head chefs, as well as hourly employees).

Harvard volunteers at an event compost station

awareness, and administrative support led to the creation of the UVA Food Collaborative in January 2010. The Collaborative works to promote research, teaching, and community engagement in pursuit of more sustainable and place-based food systems.[4] Consisting of faculty, staff, and students from a multidisciplinary array of departments and units, the Collaborative has identified a tri-part role of research, teaching, and community outreach. The Collaborative receives support from the University of Virginia and a number of local businesses.

Comparing Our Performance

While the University of Virginia is a leader in sustainable dining, a number of other institutions have implemented practices that provide further opportunities to enhance sustainability at UVA.

Stanford Dining, the self-operated dining service of Stanford University, has developed a zero-waste option for catered events.[5] Event organizers can choose to hold a zero-waste catered event, and Stanford Catering will supply compostable meal containers and flatware, as well as clearly marked collection containers. Zero-waste events to date have included a commencement picnic for 6,000 graduates and their families and a box lunch for all incoming students.

Dickinson College in Carlisle, Pennsylvania, operates the Dickinson College Farm. The Farm began as a modest 200 square foot student-run garden in 1999, expanding incrementally to a half-acre before moving 6 miles in 2007 to an under-utilized 187-acre plot of land owned by the College. The Farm maintains 6 to 8 acres in food production, 85% of which is supplied to the campus dining hall. In February 2011, the Farm earned USDA Organic certification and plans to soon add cattle. The Farm and dining staff coordinate planting schedules and, in exchange for discounts, dining staff agreed to give top priority to Farm produce before looking elsewhere.[6] In the 2009-10 academic year, Dickinson's self-operated dining hall purchased $15,057 in produce from the Dickinson Farm.[7] In addition, an impressive 50% of dining's food budget is spent on local items.[8]

In fall 2010, Duke University broke ground on the Duke Campus Farm, starting with a one-year, one-acre pilot project. Using a ten-acre fallow field in the Duke Forest located six miles from the main campus, the Duke Campus Farm will provide Duke University with both an educational farming facility and produce for its dining halls. A paid farm manager will oversee student interns and volunteers.[9]

At the University of Richmond, an overlap between employees' interest in local food and the University's desire to promote the health and well-being of employees led to the creation of a payroll deduction program for community-supported agriculture (CSA). The Department of Human Resource Services implemented the program to remove the one-time barrier of a $450 fee by spreading the cost over a number of months through an automatic payroll deduction. Participants in the program have the choice of a half or full share from the Rural Market Virginia CSA, which offers a convenient weekly pickup location on Richmond's campus.[10]

2011 OPPORTUNITIES: FOOD

ACTION	TIMELINE	SYNERGIES
Ensure that catering operations utilize recyclable plates and materials and provide products in bulk as opposed to single-serving containers.	Immediate	♻
Implement sustainable dining programs consistently across all UVA food-service facilities, such as reusable take-out containers, incentive programs, and local, vegetarian, and organic food options.	1-2 years	
Implement practice to always provide recycling containers at catered events, and introduce an option for local food and/or zero-waste.	1-2 years	♻
Provide additional filtered water bottle filling stations at 10 or more locations around Grounds, including at athletics venues.	1-2 years	💧
Initiate a large-scale garden on underutilized University or Foundation properties to provide fresh produce to the University and farming-related educational opportunities to the University Community.	2-4 years	📖 🌍
Implement food waste composting at 80% or more of University dining locations.	2-4 years	♻

SYNERGIES LEGEND
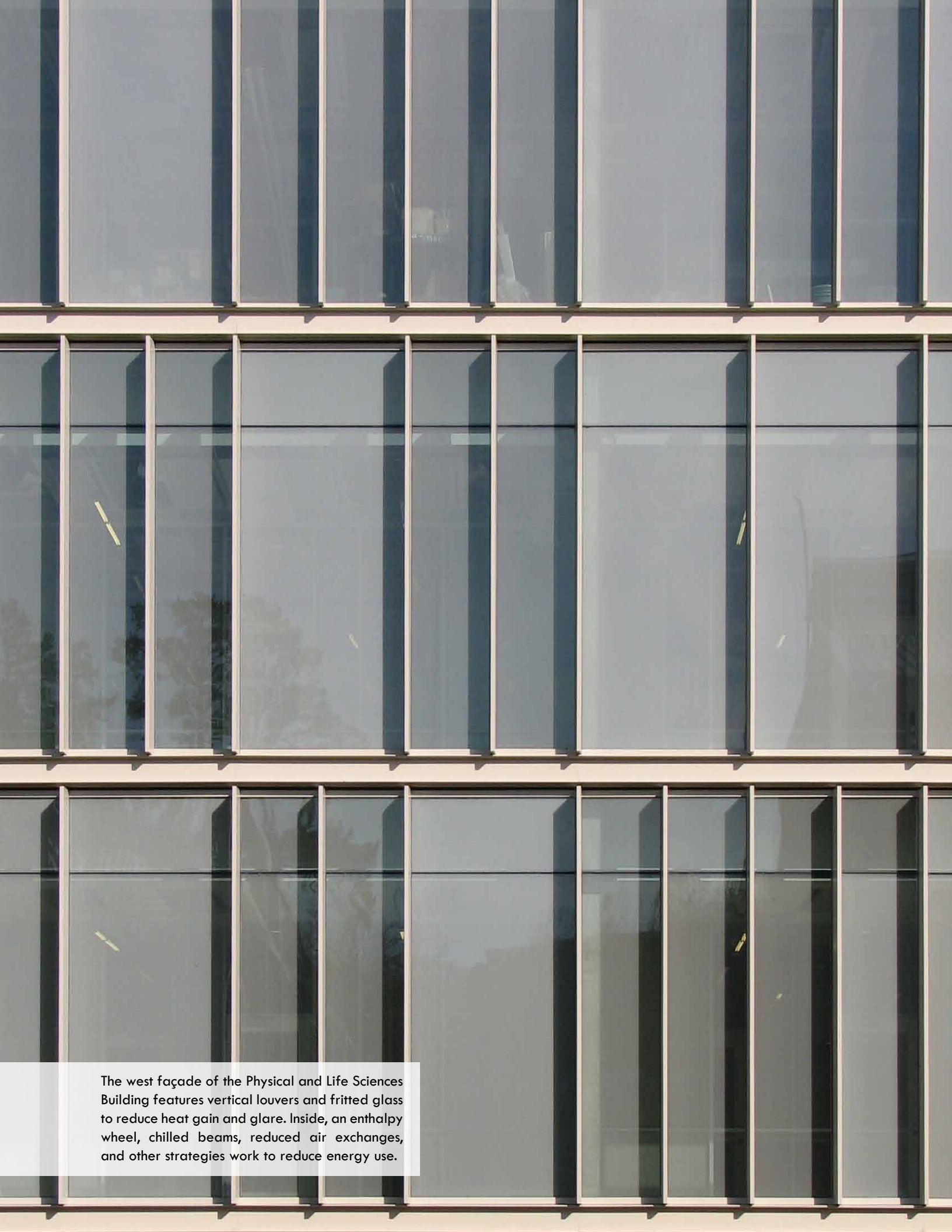
📖 Academics and Learning   🌍 Land Use   💧 Water   ♻ Waste and Recycling

The west façade of the Physical and Life Sciences Building features vertical louvers and fritted glass to reduce heat gain and glare. Inside, an enthalpy wheel, chilled beams, reduced air exchanges, and other strategies work to reduce energy use.

In its history, the University has observed dramatic changes in the United States. The number of states has doubled, population is 25 times greater, and energy consumption has increased by 75 times.[1] In 1826, the University of Virginia's major source of energy consumption was wood for heating and cooking. Today, the University relies on numerous sources of energy for nearly all of its activities, from conditioning of buildings to powering medical equipment. In 2009, the University consumed close to 4.9 trillion BTUs, enough energy to power 64,000 homes for a year.[2]

Energy consumption brings economic and environmental consequences; utilities cost the University tens of millions of dollars each year and generate hundreds of thousands of tonnes of carbon emissions. Growing energy needs also increase the University's exposure to risks from energy price and supply volatility. With proper planning and investment, the University has the ability to reduce the economic, environmental, and risk consequences of energy consumption, while offering research and education opportunities that support the University's mission.

Dominion Resources generates and distributes electricity to the UVA-owned substations and directly to some outlying UVA facilities. In 2009, Dominion provided 69% of the direct energy used by UVA. This electricity was generated primarily from nuclear (42%) and coal (41%), with natural gas (14%) a distant third. The remaining

3% is distributed among wind, oil, biomass, and hydroelectric.[3] At the University, electricity is used to power buildings and create chilled water for cooling.

Energy for heating, domestic hot water, dehumidification, and sterilization comes from the University's heating plants. As its name suggests, the Main Heating Plant supplies the greatest amount of heating energy to the University in the form of steam and hot water. The Main Heating Plant is base-loaded with coal (70%), with natural gas (20%) and oil (10%) available for peak loads and emergency backup. The University does not purchase coal from companies that practice mountaintop removal. Steam can be distributed at a higher temperature and in smaller pipes than hot water, but steam distribution is less efficient than hot water distribution. For this reason, the University is expanding its hot water distribution infrastructure except for certain applications, such as sterilization, which require steam. Two smaller heating plants, producing only high-temperature hot water, are located in North Grounds adjacent to the Law School and the John Paul Jones Arena. These plants are fueled by natural gas and oil.

Cooling for building air conditioning and research equipment is provided through eight chilled water loops. Chiller plants, powered by electricity, feed cold water into underground loops, where pumps distribute the water to multiple buildings. Once passing through a heat exchanger, the water returns to the chiller plant for reuse.

Annual Greenhouse Gas Emission Reductions From "Delta Force" Retrocommissioning
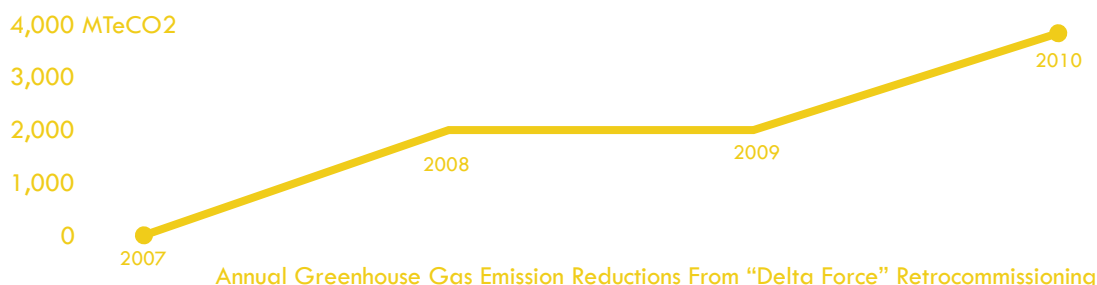
PROGRESS ON THE 2006 OPPORTUNITIES: ENERGY

ACTION	PROGRESS
Advance strategies identified in Built Environment and Transportation sections.	●
Implement campaign to turn off unnecessary lights and eliminate use of incandescent lights.	●
Increase user awareness of energy through real-time energy monitoring in buildings.	◑
Expand energy conservation measures and educational outreach.	●
Enforce existing energy conservation policies and plan.	○
Add "night setback" settings to all heating and cooling systems.	◑
Eliminate simultaneous heating and cooling in building heating and cooling systems.	◑
Adjust Variable Air Volume Boxes to 20% or lower, instead of typical 50% of maximum flow.	N/A
Establish sub-metering for better management and increased awareness.	○
Support students in advancing sustainability and conservation measures.	●
Purchase a portion of electricity from renewable sources.	○
Install lighting controls and variable flow controls on fans and pumps.	◑
Add carbon dioxide (CO_2) sensors to control the amount of outside air needed in buildings.	◑
Install insulating jackets on all steam valves and fittings.	◑
Conduct steam trap testing and repair annually.	●
Recommission building heating and cooling systems.	◑
Conduct assessment of greenhouse gas (GHG) emissions.	●
Establish specific measurable and time-bound GHG reduction goals.	◑
Evaluate the benefits of a combined heat and power (CHP) cogeneration plant and implement if economically feasible.	◑

● Fully Completed   ◑ Partially Completed   ○ Barriers Encountered/Not Completed

Installation of RideForward's Solar Vehicle Charging System at the Emmet/Ivy Garage

By relying primarily on centralized utility systems, the University has avoided redundancy in heating and cooling equipment, been able to provide more reliable utilities at a lower cost, reduced exposure to fuel price and supply volatility, and captured production and maintenance efficiencies of scale in utility generation.

Since 1995, Energy and Utilities Department team leaders have had energy efficiency and conservation goals included in each position description. These individual goals reinforce overarching UVA goals in areas of cooling, heating, and electricity.

Current Activities

In 2007, student leaders from the Environmental Sciences Organization collaborated with the Office of Environmental Health and Safety to complete the University's first greenhouse gas emissions inventory using Clean Air-Cool Planet's (CACP) Campus Carbon Calculator. The widely-used CACP tool inventories emissions from University-owned equipment as well as indirect emissions from purchased electricity, student commuting, solid waste, and more. The Office of Environmental Health and Safety (EH&S) has since updated UVA's inventory to include calendar years 2008 and 2009. To ease data collection efforts, the Energy and Utilities Department has created automated reporting processes to generate and publish emissions data.

Quantification of the University's greenhouse gas emissions set the foundation for comprehensive planning to reduce emissions. Beginning in late 2008, the Environmental Impact Subcommittee of the Presidential Committee on Sustainability began work on the Environmental Footprint Reduction Plan – Phase 1. The draft version of the Plan, completed in November 2009, put forth a greenhouse gas reduction target and identified

Newcomb Hall's energy dashboard

3 major strategies, along with a variety of tactics, to reduce University emissions. Strategies include: 1) a focus on mitigating growth in emissions through improved space utilization, reuse of existing buildings, and green building practices; 2) enhancement of existing energy efficiency and conservation efforts through behavior change, building retrocommissioning, transportation demand management, and more; and 3) development of renewable energy and innovative energy technologies.[4]

Building on the recommended strategies of the Environmental Footprint Reduction Plan, the Department of Energy and Utilities engaged a consultant to identify renewable and innovative energy technologies that would be appropriate for UVA based on availability, economics, and qualitative measures. The Renewable and Innovative Energy Technologies Study, completed in February 2011, identified numerous opportunities to reduce GHG emissions while reducing costs and improving reliability. Specific recommendations included use of geothermal, heat recovery, and combined heat and power (cogeneration).[5]

Working from the Environmental Footprint Reduction Plan – Phase 1 and the Renewable and Innovative Energy Technologies Study, the Presidential Committee on Sustainability developed a sustainability commitment that set a specific greenhouse gas reduction target for UVA and reaffirmed the University's broader commitment to sustainability in operations, outreach, research, and education. On March 3, 2011, the sustainability commitment was approved unanimously by the Committee on Sustainability. The sustainability commitment was endorsed by the Faculty Senate, Student Council, General Faculty Council, and all four Employee Councils before being unanimously approved by the Board of Visitors on June 10, 2011. The full text of the commitment is included on page 19.

In 2008, Dean Robert F. Bruner of the Darden Graduate School of Business committed Darden to become a zero waste, carbon neutral enterprise by 2020. The carbon neutral goal covers scope 1 and 2 emissions of the Darden School [5,295 MTeCO2 in 2009], and will most likely be reached through a combination of actions to reduce energy use, generate on-site renewable energy, purchase renewable energy credits, and pursue carbon offsets. To date, resulting actions include issuing a contract with an HVAC consultant to retrocommission Darden facilities, installation of new control systems, relamping, installation of motion sensors, and the creation of a voluntary carbon offset program for MBA students. Darden keeps annual metrics showing progress towards stated goals on its website.[6]

This lecture room in Gilmer Hall has been retrofitted with LED can lights

As a major component of the Leadership in Energy and Environmental Design (LEED) program, the energy performance of new and renovated buildings has seen increased attention since UVA implemented its LEED requirement in February 2007. New buildings must now prove that their designs meet the minimum energy performance requirements for LEED, which are based on percentage reductions in energy costs as compared to a building built to minimum ASHRAE standards.

The University operates more than 15.5 million gross square feet of buildings, ranging in age from brand new to 200 years old. This considerable physical plant offers many opportunities for energy conservation and efficiency improvements. With age, a building's designed efficiency often declines as systems go out of calibration. The process of retrocommissioning revisits buildings with the aim of returning systems to their designed state and reducing energy consumption.

In 2008, the Energy and Utilities (E&U) Department launched the Delta Force, a cross-functional team-based approach to retrocommissioning existing buildings with a focus on energy and water conservation. Each building's Delta Force Team includes members of the E&U Sustainability Team, area maintenance staff, the building coordinator, and external support professionals with expertise in commissioning and HVAC system testing and balancing.[6] The Delta Force Team has prioritized energy-intensive facilities, starting with older research labs and dining halls. Retrocommissioning each building takes approximately 12-15 months. Through May 2011, the Delta Force Team has realized cumulative energy cost savings of over $2 million.

The University's auxiliary units (e.g., UVA Health System, Dining Services, Parking and Transportation, etc.) reimburse E&U for their utility and energy consumption. As a consequence, E&U has offered a program to fund conservation and efficiency projects in auxiliary buildings without any upfront costs to these units. Participating departments continue to pay utility bills at pre-project levels until the initial investment is repaid, then

NINA MORRIS
Sustainability Outreach Coordinator
Department of Energy and Utilities

As Sustainability Outreach Coordinator, Nina Morris promotes sustainability at UVA through marketing, branding, education, and outreach. As part of the Sustainability Programs Division of the Department of Energy & Utilities, she supports department sustainability initiatives related to reducing energy, water and waste at UVA.

Nina also participates in strategic planning and collaborates on the implementation of sustainability projects. The position also works closely with department heads, facility coordinators and sustainability partners on developing green operations and sustainable behaviors in the work place.

In order to promote sustainability among the student body, the Sustainability Outreach Coordinator manages a team of 9 student employees to coordinate events, student groups, and other sustainability initiatives at UVA. She also oversees the Sustainability Advocates program, a volunteer network of 50 students.

are able to realize savings from that point on. A recent participant in the program was the Department of Parking and Transportation, which replaced the existing metal halide lamps in three of its parking garages with more efficient compact fluorescent lamps. In the Emmet/Ivy Garage, savings [1995 MMBTU/$42,300/302 MTeCO2 annually] are expected to return the initial investment in three years.[8]

Beyond physical changes, occupant behavior can have a significant impact on a building's energy consumption. Occupant behavior is not limited simply to turning lights off. It can include everything from choice of computer equipment to purchase, to how space is assigned and scheduled. A host of University outreach initiatives have sought to engage students, faculty, and staff in working to reduce energy consumption.

Now in its fourth year, the Dorm Energy Challenge pits first-year residence hall areas against each other in a friendly competition to reduce consumption. In the 2010 edition, the McCormick Road Residence Area cut their consumption by 19% during the month-long competition, besting the 13% showing of the Alderman Road Residence Area. The winners received a hot cocoa, cookies, and cake party; and everyone could celebrate saving energy, money, and emissions [1032 MMBTU/$23,900/156 MTeCO2].[10]

In May 2011, Observatory Hill Dining Hall was one of 245 buildings selected to compete in the U.S. Environmental Protection Agency's "Battle of the Buildings." The competition pits buildings from across the country against each other to see who can generate the greatest reduction in energy consumption between two consecutive years. The winner of the competition will be announced in November 2011.

Comparing Our Performance

Volatile fuel prices and the likelihood of more stringent air quality standards led Ball State University to reconsider its decision to replace aging coal boilers with more of the same. Instead, the University decided to pursue an ambitious plan to replace their coal boilers entirely and instead meet its heating and cooling needs through district geothermal energy. The two-phase project, with the first phase in construction currently, will create 3,600 boreholes that will circulate water to geothermal heat pumps. Once fully implemented, the geothermal energy system will reduce Ball State's carbon emissions by nearly 80,000 metric tons annually and utility bills by at least $2 million a year.[11]

Many universities were sited based on their proximity to cities or charming locations, not the availability of renewable energy. However, universities have the opportunity to go beyond their borders to find sources of renewable energy. Harvard University did just that when it signed a 15-year power purchase agreement with First-Wind, a wind energy company focused exclusively on the development, ownership, and operation of wind energy projects. Harvard's 2009 commitment to purchase electricity helped FirstWind secure financing and move forward with construction of turbine facilities in northern Maine. With the project now complete, Harvard's purchase of electricity and renewable energy credits from the turbines amounts to more than 10% of the total electricity consumed by the Cambridge and Allston campuses. Harvard's Executive Committee for Greenhouse Gas Reductions does not intend on counting the power purchase towards Harvard's 30% reduction by 2016 greenhouse gas goal, instead the Committee is focusing on internal efficiency and behavior change to meet the target.

Introduced in 2004, Stanford University's Energy Conservation Incentive Program shifts responsibility for electricity costs from the central Budget Office to academic schools and business units. The Budget Office provides each unit with a electricity allotment based on up to five years of past data. If units reduce their electricity usage, they are free to keep the savings. If consumption rises, units must pay the difference. In the first three years of the program, participants as a whole used 3% less electricity than budgeted.[14]

2011 OPPORTUNITIES: ENERGY AND CARBON		
ACTION	**TIMELINE**	**SYNERGIES**
Make information on building energy consumption and carbon emissions at all University buildings publicly available using a user-friendly web application or similar format.	1-2 Years	🏛
Implement the high-priority recommendations of the Renewable and Innovative Energy Technologies Study, including energy conservation, green building, solar thermal, geothermal, heat recovery, and cogeneration projects.	Varied	
Increase consideration of building energy consumption in all stages of project design and construction, including value engineering and post-occupancy measurement and verification of building performance.	1-2 Years	🌱
Continue to expand upon Delta Force efforts to retrocommission University buildings.	1-2 Years	🌱 💧
Continue to evaluate potential for shared energy savings.	1-2 Years	🏛 🌱
Initiate capital projects to renovate 2 or more energy-intensive buildings to reduce air exchange rates, remove unused fume hoods, retrofit remaining fume hoods, and replace constant volume air handling units.	2-4 Years	💧

SYNERGIES LEGEND

🏛 Governance and Culture   🌱 Built Environment   💧 Water

On the site of a former parking lot, water now cascades through weirs behind the South Lawn Project. This daylit stream, serving to aerate water and educate, is one of several innovative stormwater management facilities on the site.

Although fresh water is an essential resource for all life on earth, the supply of fresh water on earth is limited. 97% of water on earth is found in oceans. Freshwater accounts for only 2.5% of the remaining water supply, most of which is locked up in glaciers and polar ice caps. Only about 0.3% is found in rivers and lakes, the most common municipal water source, with groundwater making up the remainder of the freshwater supply.[1] In the United States, this freshwater supply is readily available to the public, with almost 85% of the U.S. population receiving their water supply from public sources.[2]

Locally, the future of the water supply has come into question, as recent droughts have forced community leaders to take a hard look at the future of area water resources. Water needs at the University of Virginia are served by the Ragged Mountain Reservoirs, located just two miles west of UVA. Two dams on an unnamed tributary to Moore's Creek form the Upper and Lower Ragged Mountain Reservoirs.[3] Water in the reservoirs supplies the Observatory Water Treatment Plant, located within UVA Grounds, which supplies water to the University.

Current Activities

Recent droughts and aforementioned community debates about the future of the local water supply have ensured that water conservation efforts remain an important part of sustainability within the local community. To that end, the University of Virginia has undertaken many efforts to reduce water consumption since the 2006 Sustainability Assessment was completed.[4]

The built environment plays a key role in the usage of water. Stormwater management decisions influence how rainwater flows through the water cycle, while the design of plumbing fixtures and cooling systems determines how building occupants use water to perform their daily functions. In 2007, the University of Virginia Board of Visitors adopted a mandate that all new building projects and major renovations would seek Leadership in Energy and Environmental Design (LEED) certification. The LEED process promotes sustainable water usage through points dedicated to water conservation, water recovery and reuse, low maintenance landscaping, and alternative forms of stormwater management.

Water conservation efforts in buildings have included a variety of small and large scale building upgrades and retrofits combined with educational outreach campaigns to educate students, faculty, and staff on water conservation opportunities. The Energy and Utilities Department has worked to install water meters at individual buildings, which allows for better tracking of the effectiveness of water conservation efforts and helps identify problem areas. The Delta Force program has retrocommissioned several existing buildings with a focus on reducing both energy and water consumption. A significant number of bathrooms have been retrofitted with low flow toilets and urinals. Water-conserving fixtures, such as sink
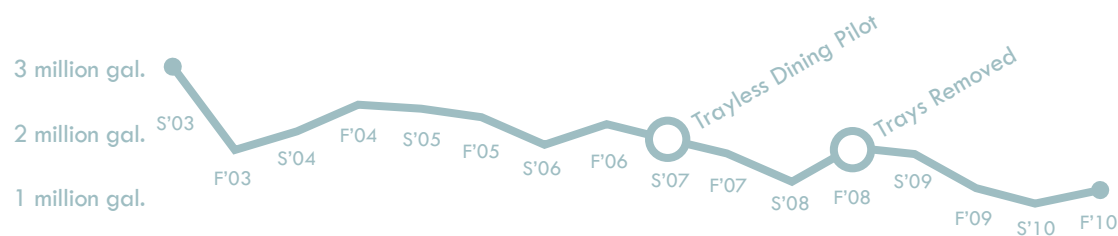
Runk Dining Hall Water Consumption by Semester: 2003-2010

PROGRESS ON THE 2006 OPPORTUNITIES: WATER	
ACTION	PROGRESS
Expand educational outreach on water conservation issues and opportunities.	●
Conduct comprehensive assessment of potable water use in research facilities.	◐
Establish prioritized action steps to reduce improper use of water resources.	◐
Conduct assessment of system leaks (faucets, pipes, etc.) and implement remediation measures, following up on 2002-2003 system analysis.	◐
Install and monitor dual-flush toilets pilot program; determine large-scale application.	○
Identify opportunities to install large-scale water saving devices.	◐
Identify opportunities to install greywater recycling system(s).	○

● Fully Completed   ◐ Partially Completed   ○ Barriers Encountered/Not Completed

aerators and low flow fixtures, have also been installed in many locations across Grounds, including all residence halls. Additionally, water-conserving laundry equipment has been installed in many residence halls. Process chilled water lines are also being installed to service water-cooled research and clinical equipment, allowing for this water to be recirculated along the chilled water loops.

The University has adopted Facilities Design Guidelines with specific design requirements for domestic water systems for all replacements, retrofits, renovations, and new construction. Such guidelines supplement mandatory codes, industry standards, and other authoritative resources applicable under the laws of the Commonwealth of Virginia and the Federal Government. These include prohibiting use of domestic water in single-pass air-conditioning units, mandating the use of central chiller plants, requiring the recirculation of chilled water systems as a source of cooling, mandating the installation of individual metering for all new buildings, and mandating the use of flow aerators for faucets as well as low flow toilets, urinals, and shower heads.

UVA Dining/ARAMARK has also focused efforts on reducing their water consumption. All dining halls went trayless in 2007 in an effort to eliminate water usage associated with the washing of trays. UVA Dining/ARAMARK also prioritizes water use reduction efforts. One of the company's corporate goals, known as Green Stakes, required UVA Dining to implement an Energy and Water Conservation program on site by 2010.

UVA Dining/ARAMARK has installed several hy-

A low-flow pint-per-flush urinal in Gibson Hall

dration stations in retail locations to allow students to easily refill their reusable water bottles instead of buying bottled water. Along these lines, Intramural Recreational Sports has also installed several bottle filling stations in their recreation facilities. UVA Housing has also begun retrofitting some existing water fountains with bottle fillers to allow students to refill reusable bottles in the residence halls. Additionally, all water fountains in new residence halls will have built-in bottle fillers. While bottle fillers may increase usage of local water supplies, overall they result in a decrease in consumption as the water and energy used to produce and ship disposable water bottles is eliminated.

The results of all of these water conservation efforts have been positive. The 2009-2010 Energy and Utilities Annual Report indicates that "water usage in FY 2010 is down 21% from its peak in 1999 despite a 19.8% increase in gross square feet and a 15.7% increase in the number of faculty, staff, and students since that year."[5] The report notes that the central plants, which generate heating and cooling for University buildings, are responsible for over 20% of all water consumption at UVA. The report also tracks progress on UVA's goal of reducing water consumption on a per square foot basis each year.

In addition to potable water conservation efforts, UVA has also worked for more than a decade on innovative stormwater management on Grounds. Traditional ways of handling stormwater centered on piping the water away from the site as quickly as possible. This has had negative impacts on streams and waterways, where increased flows cause channel erosion and carry pollutants, such as oils and nutrients, from impervious surfaces.

In 2007, an Engineering Excellence Honor Award was given to Nitsch Engineering for the Meadow Creek Regional Stormwater Management Plan.[6] In 2008, the Society of College and University Planning gave a landscape architecture merit award to the University of Virginia and Nitsch Engineering for the Meadow Creek Regional Stormwater Management Master Plan.[7] In addition to the Dell pond, this award encompassed the constructed wetland at the Emmet/Ivy Parking Garage as well as a series of stormwater management systems at the John Paul Jones Arena. The features at the arena include biofilters, vegetated swales, and a reconstructed flood plain. The stormwater management master plan, combined with other University sustainability initiatives, also led to an award for Outstanding Achievement for Pollution Prevention for a State Agency from Businesses for the Bay in 2007 and a silver Governor's Environmental Excellence Award in 2008.[8,9]

The Dell Pond, a stormwater management system

Following the success of the stormwater features along Meadow Creek, UVA has installed other management practices that allow rain water to infiltrate or be taken up by plants, which supports the natural water cycle. Green roofs have been installed at Robertson Hall, the Claude Moore Nursing Education Building, and the South Lawn Complex. Biofliters and vegetated swales have been used at the Bice Parking lot, South Lawn Complex, Campbell Hall, Printing and Copying Services addition, and Clinical Lab Building.

Efforts to recover water for reuse have also figured prominently in the University's sustainability efforts. Cisterns, which capture and store rainwater for use in landscaping applications, have been installed at the Amphitheater, the Hunter Smith Band Building, and the South Lawn Complex. In some locations, water-condensate from air conditioning units is captured and used for landscape irrigation. A collection sump has also been installed in the Chemistry building to collect air handler condensate for use in the central chilled water plant cooling towers.

Comparing Our Performance

Although the University of Virginia has undertaken many initiatives to reduce water consumption, other colleges and universities have tried different approaches which may serve as examples to increase sustainability on Grounds.

The Building Sustainability at Cal program at the University of California, Berkeley, completed audits of sink aerators in the public restrooms of thirteen buildings. The audits identified more than 300 faucets whose flow was greater than 1.0 gallons per minute (GPM), as a result of the lack of an aerator in the faucet or the existing aerator flowing at a higher rate. In spring 2009, East Bay Municipal Utility District donated 0.5 GPM aerators for these faucets. The students then partnered with the campus plumbing shop to install the aerators. These efforts are estimated to save almost three million gallons per year and pay back the campus investment in approximately two months.[10]

Installation of pervious pavers over a cistern

In 2009, the University of North Carolina at Chapel Hill constructed a reclaimed water system that serves facilities on the University's main campus.[11] The reclaimed water system provides non-potable water which has received advanced treatment at the nearby Wastewater Treatment Plant. This advanced treatment includes filtration and disinfection with ultraviolet light and chlorine. The new system will enable the University to reduce its use of drinking water for make-up water at cooling towers by about 660,000 gallons per day in Fiscal Year 2010. The University also plans to extend the reclaimed water system in the near future to serve additional cooling tower, toilet flushing, and irrigation needs on the main campus.

UNC-Chapel Hill has been a leader in stormwater management and reuse. Cisterns and other innovative stormwater management features are prominently used across the campus. In one location, a cistern has been installed to collect runoff from an artificial turf field and roof runoff from several nearby buildings. The collected water is then used for irrigation of nearby natural turf fields. A cistern located at the Rams Head Plaza collects roof runoff for landscape irrigation in the plaza. Another cistern at the new FedEx Global Education Center provides water for toilet flushing in the building. Infiltration beds in parking lots, athletic fields, and intramural fields have been in-

stalled to encourage groundwater recharge. The 500,000 gallons infiltration bed at Hooker Field has a unique design that allows water to either infiltrate into the ground or be pumped out for irrigation purposes.[12] Other stormwater management features on campus include porous pavement, vegetated roof systems and roof gardens, stormwater plantings, and vegetated swales.

2011 OPPORTUNITIES: WATER		
ACTION	TIMELINE	SYNERGIES
Launch departmental and building water consumption challenges to drive water conservation initiatives and implement sustainable practices.	Immediate	🏛️
Construct two or more stormwater management features annually, outside of capital projects. Features include: vegetated roofs, vegetated swales, biofilters, permeable pavement and other infiltration practices.	1-2 Years	🌳 🌿
Quantify reductions in groundwater recharge caused by impervious surfaces on Grounds and identify opportunities to increase recharge rate.	1-2 Years	🌳
Require rainwater and condensate collection for all new facilities, and prototype at least one greywater collection system. Use collected water for landscape irrigation, flushing toilets, and other greywater applications.	2-4 Years	🌳 🌿
Capture and reuse cooling coil condensate and/or rainwater as make-up water in heating and chiller plants - among the largest water users at UVA.	2-4 Years	⚡

SYNERGIES LEGEND

🏛️ Governance and Culture   🌳 Land Use   🌿 Built Environment   🍴 Food

⚡ Energy and Carbon

The South Lawn Complex includes designated recycling rooms on each floor in the three wings. Together, total recycling space provided nearly doubles the recommendation of LEED Prerequisite MR1: Storage & Collection of Recyclables.

The University has collected and diverted recyclables for 21 years, and in that time, recycling has become the most tangible individual contribution to UVA's sustainability efforts. Students, faculty, and staff assertively guard their right to recycle. Given the high visibility of recycling at the University, it may come as a surprise that those materials most commonly thought of as recyclable — paper, bottles, cardboard, and cans — represent just 10% of the total materials diverted from landfills by the University.

As a major institution, the University generates a significant amount of waste from operations beyond individual activity. The construction of new buildings, operation of utility plants, daily functions of the UVA Hospital, maintenance of Grounds, and running a transit service all generate significant amounts of waste. Fortunately, an extensive range of programs have been implemented to recycle or divert the vast majority of this waste from landfills.

Opportunities still exist to improve UVA's downstream recycling rate. Dumpster audits suggest that approximately 40% of the municipal solid waste (MSW) disposed of at UVA could be recycled. Reducing this number will require increasing the convenience of recycling and expanding education efforts to drive behavior change.

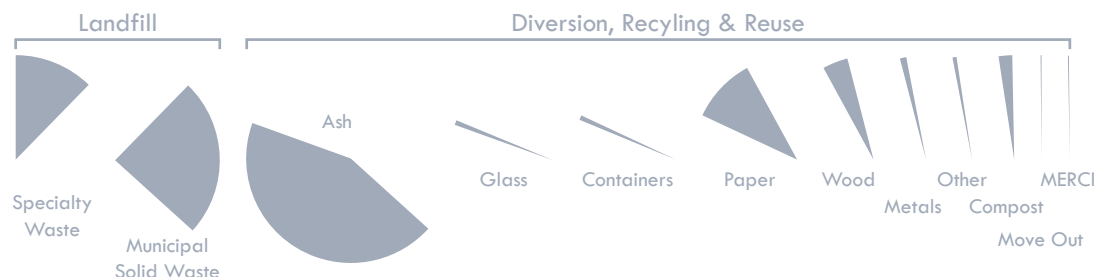Beyond individual action, a key to reducing the University's environmental impacts from waste disposal is having an understanding of where the waste comes from and why it exists. As many businesses have found, waste is a symptom of inefficient practices; reducing and eliminating waste results in both improved environmental performance and increased profitability. In the four R's of waste minimization - refuse, reduce, reuse, and recycle - the first two R's refer to upstream decision making - meant to eliminate or limit bringing a material to UVA. Simply, the best disposal option is to have nothing to dispose of.

Current Activities

As the 4 R's of waste minimization suggest, the first step in reducing waste is refusing to accept a disposable product. This strategy applies to purchasing decisions ranging from the coffee shop to the copy room.

UVA Dining Services/AMARARK has introduced several programs to provide or promote waste-free containers in dining halls and retail dining outlets. The reusable to-go container program provides a zero-waste alternative to compostable to-go containers and a reusable punch-card incentive program offers rewards such as free coffee and meals to participants who use a reusable mug, bag, or to-go container.

The Reusable Office Supply Exchange (R.O.S.E.) offers a warehouse space both to dispose of gently- or never-used office supplies and to find such supplies instead of purchasing new ones. The exchange is open to all faculty, staff, and students and stocks a variety of common office supplies,

Landfill — Diversion, Recyling & Reuse

Specialty Waste · Municipal Solid Waste · Ash · Glass · Containers · Paper · Wood · Metals · Other · Compost · MERCI · Move Out

In 2009, 63% of waste was diverted/recycled. If construction waste is included, diversion rate is >75%

PROGRESS ON THE 2006 OPPORTUNITIES: WASTE AND RECYCLING

ACTION	PROGRESS
Identify opportunities to expand Chuck It For Charity (move-out program).	●
Define game day reduction goals and incorporate recycling information and activities, such as "Get Caught Recycling."	●
Assess and identify opportunities to minimize waste and increase recycling at special events, including sporting, fund-raising and educational symposiums.	◒
Advance implementation of Source Reduction policy, including minimizing packaging, ordering in bulk and aligning newspaper and phonebook production and circulation.	○
Define environmentally and economically preferable beverage container types in all contract renewals and track results.	○
Define sustainable packaging guidelines or requirements in all contract renewals and track results.	○
Commit to purchasing recycled content products, thereby closing the loop.	◒
Establish specific, measurable and time-specific waste reduction goals to meet Facilities Management waste reduction goals and Recycling Policy.	○
Work with UVA Dining to implement (on- or off-site) composting program.	●
Create incentive program to further encourage contractors to recycle construction and demolition (C&D) waste and establish tracking mechanism.	●
Establish process, policies or incentives for expanding the reuse of materials.	◒
Demonstrate institutional support for University recycling through advertisements and public service announcements (PSA's) from the President's Office, Administration and Athletics.	◒

● Fully Completed   ◒ Partially Completed   ○ Barriers Encountered/Not Completed

The Reusable Office Supply Exchange (R.O.S.E.)

such as binders, clips, and printer cartridges. The program also encourages departments to create their own R.O.S.E. closets and then reach out to the recycling division's R.O.S.E. program.

In 2009, construction and demolition (C&D) projects generated over 18,000 tons of waste. However, the vast majority of this waste is recycled, thanks to the University's requirement of Leadership in Energy and Environmental Design (LEED) certification for all new buildings and major renovations. In LEED 2.2, Materials and Resources Credit 2 offers projects 2 points for diverting 75% of construction waste, with an exemplary performance credit available for projects that divert 95% or more. Thanks to several local C&D sorting facilities, almost all University construction projects are recycling upwards of 80% of their C&D waste.

Since fall 2008, UVA has composted pre- and post-consumer food waste at the Observatory Hill Dining Hall. The program was expanded to include the Newcomb Hall Dining Hall in spring 2010 and will expand to Runk Dining Hall in the near future. On average, the two dining halls divert and compost roughly 5 tons of materials per week. Not only is food waste composted, but used fryer oil is collected by Greenlight Biofuels for reuse as biodiesel fuel.

The MERCI (Medical Equipment Recovery of Clean Inventory) Program diverts clean and unused surplus medical supplies and equipment from UVA Health System's waste stream to local, national, and foreign organizations and humanitarian projects. Founded as a pilot program in 1992 by a UVA Operating Room nurse, Helen French, the MERCI Program officially became part of the UVA Recycling initiative in 1996. Today, participating sponsors of MERCI have further expanded to include countless other units and departments throughout the Health System and University. MERCI also partners with other hospitals and medical organizations to recycle their clean and unused supplies. In 2009, over 50,000 pounds of clean and unused medical supplies, with a value of over $5.2 million, were kept out of landfills and medical incinerators.[1]

In 2008, Dean Robert F. Bruner of the Darden Graduate School of Business committed Darden to become a zero waste, carbon neutral enterprise by 2020. This commitment has required Darden to think critically about how to significantly reduce its roughly 380,000 pounds in annual solid waste while the School continues to grow. To date, resulting actions include co-location of trash and recycling containers, trash audits, reduced meal packing and use of plastic water bottles, waste minimization contests, and conversion of

roll carpet to carpet tile to minimize waste by enabling targeted carpet replacement in high traffic areas. Darden keeps annual metrics showing progress towards stated goals on its website.[2]

The University hosts a vast array of special events, from May's annual graduation ceremony to Saturday football games. Each of these events presents special challenges with regard to waste minimization and recycling, including first-time and infrequent visitors, large crowds, and varying locations. Beginning in 2009, the John Paul Jones Arena introduced recycling containers and signage throughout the arena. On October 16, 2010, UVA participated in its first EPA Game Day Challenge, a friendly competition between schools to increase recycling at college football games. Over 50 student volunteers canvassed Scott Stadium and surrounding parking areas to promote recycling. The University led the ACC in the amount of recyclables collected per capita.[3]

To reduce the amount of waste generated by students moving out of their residences, two programs have been implemented to collect unwanted items for donation to local charities. For on-Grounds students, UVA Recycling runs Chuck-it-for-Charity at the end of each semester. The program, first created in 2000, collects a wide array of items, from white boards to televisions, for donation. For the past four years, the Office of Community Relations has run a similar program, the Sofa Shuffle, to collect unwanted furniture from off-Grounds students at the end of each school year. In May 2010, Chuck-it-for-Charity collected more than 34,000 pounds of furniture, clothing, household items and food, while the Sofa Shuffle collected more than 500 significant household items for donation to the Salvation Army and the Habitat Store.

Comparing Our Performance
Game day at Folsom Field at the University of Colorado features many of the things you would expect to see at a college football game, but there is one familiar object that is missing: trash cans. Since the 2008 season, Folsom Field has been a zero-waste stadium, the first of any major collegiate or professional sports program in the United States. All packaging, containers, and serving ware sold at the stadium are recyclable. Recyclables and compostable materials are collected at over 50 locations both inside and outside the stadium, each staffed with student volunteers to advise guests on proper disposal. The "Green Stampede" does not stop there: energy use during games is offset by the purchase of renewable energy credits and a valet bicycle corral is available to encourage fans to ride bikes to the game.[4]

Zero-waste goals are not limited to football stadiums; many universities have established campus-wide zero-waste goals (see also the-zero waste goal of UVA's Darden School of Business above). In 2007, the University of California system put forth aggressive goals to increase the portion of waste diverted from landfill to 50 percent by 2008, 75 percent by 2012, and ultimately "zero waste" to landfill by 2020.[5] Although absolute zero waste may be impossible to achieve, these policies advocate for a lifecycle philosophy that consciously plans the proper disposal of materials before they are manufactured, to avoid sending any materials to landfills.

University of Maryland-College Park's "Can the Can" program flipped the burden of effort from recycling to trash in order to increase office recycling rates. In implementing the program, UMD's Facilities Management replaced all office garbage containers with quart-sized mini-cans and stopped collecting trash from individual offices. At the same time, Facilities Management offered recycling bins to each office. To stress individual responsibility at all levels of the university, the program was piloted in none other than the Main Administration Building. Waste audits show that recycling rates increased from 49% before the program to 71% after the mini-cans were distributed.[6]

Princeton University found that its major office goods supplier, OfficeMax, delivered 16,000 cardboard boxes a year to the campus. The boxes, used to contain each order, would be left

behind, to be reused, recycled, or thrown out. To reduce the sheer number of boxes used for this purpose, Princeton's Purchasing Office provided OfficeMax with custom-made fold-flat reusable boxes with instructions on how to use and return the boxes to OfficeMax.[7]

Composting at Harvard University is not limited to dining halls. Dorms, events, cafés, offices, and entire schools have introduced a compostable waste stream to collect organic matter and boost

diversion rates. One participant, the Harvard School of Public Health (HSPH), started its composting program in 2008 with the collection of food waste and compostable disposal ware at the School's café. The composting program soon expanded to include a composting station on each floor of the building, along with a movable bin for use in meetings and events. Since the start of the program, HSPH has composted over 67 tons of organic waste.[8]

2011 OPPORTUNITIES: WASTE AND RECYCLING

ACTION	TIMELINE	SYNERGIES
Establish a campaign to reduce use of bottled drinks and encourage tap water drinking.	Immediate	🏛 🍴
Establish measurable goals for waste reduction and introduce a zero-waste philosophy to University processes.	Immediate	🏛
Create a handbook for sustainable purchasing and highlight products in online purchasing catalogs that utilize recycled materials, reduced packaging, energy-efficient design, or are locally produced.	Immediate	⚡
Send UVA's non-recycling municipal solid waste stream to a sorting facility to increase capture of recyclable materials.	1-2 Years	
Build upon success of "Game Day Challenge" by featuring high-visibility recycling efforts at major UVA athletic events.	1-2 Years	🏛
Ensure complete co-location of recycling and waste containers, featuring recognizable and larger recycling containers.	1-2 Years	🏛
Expand post-consumer composting collection to include a larger component of the University population.	2-4 Years	🍴
Establish a standard protocol and education materials for zero-waste events and implement zero-waste commitments for all major events.	2-4 Years	🏛

SYNERGIES LEGEND

🏛 Governance and Culture   🍴 Food   ⚡ Energy and Carbon

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Andrew Greene LEED-AP
Sustainability Planner
Office of the Architect
Secretary, Committee on Sustainability

Appendix A: Referenced Resources

Appendix B: Image Credits

Appendix A: Referenced Resources

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Page 22 - Sheffield Hale
Page 23 - Greek Recycling
Pages 23 & 24 - Cole Geddy
Page 26 - Sarah Oehl
Page 29 - Kendall Singleton
Pages 32 & 34 - Andrew Greene
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Page 39 - Bill Palmer
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Page 56 - UVA Student Garden
Page 59 (Punch Card) - Kendall Singleton
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Page 60 (Compost) - Andrew Greene
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The cover graphics are of a mature white oak that grows outside of Alderman Library, a portion of the James River Watershed, and vectorized photographs of the UVA community.

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