PRINCETON UNIVERSITY

Report on Sustainability 2011

(PDF downloaded from www.princeton.edu/reports/2011/sustainability)

Princeton University Reports

Contents

Princeton's third Report on Sustainability describes a new phase in the implementation of the Sustainability Plan adopted by the University in February 2008. In the first and second reports, the University informed readers about the metrics established and refined to demonstrate that Princeton is continuing to make significant progress toward ambitious goals in the areas of greenhouse gas emissions reduction, resource conservation, and research, education, and civic engagement.

In addition to providing further statistical evidence that the University is making progress toward to reducing its carbon dioxide emissions to 1990 levels by 2020 through direct local reductions with no purchase of market "offsets," this latest update shows accelerated efforts to bridge the areas of operations and academics in sustainability problem-solving. One feature that sets Princeton's Sustainability Plan apart is this "campus as living laboratory" approach — an integration of the plan with the University's teaching, research and civic engagement.

This report, prepared over the summer and fall of 2011, also looks ahead to the short-term and long-term future.

Fourteen Princeton undergraduates confronted real-world environmental and health challenges in a critical region of the world during the summer of 2011 through a program sponsored by Princeton in Asia and the Princeton Environmental Institute. The students worked as interns for eight weeks in China, India and Thailand, enriching the local communities and their own environmental education. Here, Cameron White (left), a member of the Class of 2014, talks to a student in Jishou, China, about different ways to recycle. The Princeton undergraduates worked with students in China to implement several environmentally friendly projects, including celebrating an "Earth Week." In Thailand, they learned about forest management, and in India they helped with a community health program

(Photo courtesy of Christina Coll)

Key Achievements

Greenhouse Gas Reduction

Campus Energy

Progress

- Campus emissions have declined by 2.6 percent since 2008, even with the addition of more than 560,000 square feet of building space.
- Electricity usage by the campus increased only by 3.9 percent from 2008 to 2011.
- Since the Energy Master Plan was established in 2008, the University has invested $5.3 million in energy-savings projects, resulting in annual savings of about $1.7 million in energy costs and 10,000 metric tons of CO2.
- An additional 5 percent (equal to more than 3,000 metric tons of CO2) of the University's operational strategies for reducing greenhouse gas emissions were determined this past year, bringing the total of known strategies needed to achieve its 2020 goal to 84 percent. At the outset of the Sustainability Plan in 2008, the University had identified only 70 percent of the strategies needed to reach the goal.

What's Next

- Complete construction of a 5.2-megawatt solar collector field.
- Audit the remaining 20 of the top 50 energy-consuming buildings.
- Identify the remaining, currently unknown, 16 percent of the operational strategies needed to achieve the 2020 greenhouse gas reduction goal.

Green Building

Progress

- Life Cycle Cost Analysis (LCCA) studies, including a CO_2 tax, informed decision-making processes in selecting several sustainability elements in recent new construction, including graduate housing at the Hibben-Magie site; the High-Performance Computing Research Center; the Neuroscience and Psychology Buildings; and the Andlinger Laboratory.
- These same techniques have been used with major renovations, such as those at Jadwin Hall, where the work is designed to reduce energy costs by 45 percent compared to the original building; and Firestone Library.
- As an authorized U.S. Green Building Council Education Provider, the Facilities Organization has offered more than 30 hours of sustainability-related continuing education credits over the past two years, including in-depth coursework specific to Princeton. About 30 staff members are LEED-Accredited Professionals.

"As we — Princetonians, Americans and citizens of the world — move forward in this new century, the most important mission we must undertake is to act to preserve the planet for future generations. This century will see unprecedented demands for energy, clean water and food, for two reasons: (1) overpopulation and (2) the increasing desire of those in developing countries to live as we do. How to provide these necessities while protecting the environment is the grand challenge of our times.

"The problems our planet faces are complex and intertwined, involving not only science and engineering obstacles to overcome, but also requiring changes in human behavior, economic analyses and thoughtful policy. The Andlinger Center for Energy and the Environment, in partnership with many entities at Princeton including the Office of Sustainability, is engaging students, postdoctoral fellows, staff and faculty in moving locally and globally to a sustainable way of life. I look forward to many years of working with the Office of Sustainability to put into practice here at Princeton new technologies and policies that arise as a result of the work of the Andlinger Center."

—Emily Carter, founding director, Andlinger Center for Energy and the Environment, shown near a model of the Andlinger Laboratory

What's Next

- Test new materials (such as finishes) and processes (such as coordinated construction material recycling) in small renovations.
- Roll out updated Sustainable Building Guidelines in the March 2012 release of the Facilities Design Standards Manual, including refinements to construction waste management practices and electronic document management systems to reduce paper usage.
- Continue to apply LCCA to the development of major projects, as well as minor projects where appropriate. Continue to assemble an LCCA case library and apply accumulated LCCA knowledge to the development of building projects.

Transportation

Progress

- From 2010 to 2011, there was a 98 percent increase in the number of campus community members participating in Transportation Demand Management (TDM) programs. A majority of the 700 now involved are benefiting from program incentives.
- In the 2011 fiscal year, 186 commuters participated in the mass transit program, which provides a 50 percent subsidy to eligible commuters. This subsidy program was extended to include graduate students beginning in July 2011.
- From 2010 to 2011, more than 603,000 rides were taken on the campus shuttle service, an increase of about 2 percent, or 13,000 rides, over the previous year.
- There are 350 participants in the WeCar program implemented in March 2010. Six WeCars are available for faculty, staff and students to rent by the hour or the day.
- More than 150 bicycles (a combination of new and refurbished abandoned) are maintained by the student-run U-Bikes rental and bikeshare program for students, faculty and staff. In 2011, the waiting list exceeded 350 people for this campuswide service.

What's Next

- Further develop TDM incentive programs, including proposing a subsidy for train station parking; increasing the number of preferred parking spaces for car and van pool participants; and increasing car pool incentives.
- Conduct a study of more ways to share University-owned vehicles, including options for centralized charging stations for electric vehicles, with a goal of reducing the campus fleet by 5 percent in 2012.
- Consider lowering the WeCar rate one day a week, increasing the WeCar fleet and exploring electric WeCar options.
- Track vehicle miles traveled by commuter cars to report on related emissions reductions.
- Implement a campus Bike Master Plan.
- Continue to work with key external public transportation partners (e.g., New Jersey Transit) to identify methods to improve service and access for commuters.

Resource Conservation

Dining

Progress

- University sustainable food purchases increased from 36 percent in 2007 to 66 percent in 2011.
- Local food purchases (within 250 miles) increased from 27 percent in 2007 to 59 percent in 2011.
- The relative carbon footprint of approximately 150 common food items was determined over the past year in preparation for smartphone app development and dining hall displays.
- By summer 2011, the "tray-free" dining policy adopted by the Princeton Sustainability Committee was successfully implemented in all six residential dining halls. Tray-free dining (providing larger plates and glasses and eliminating trays) has the potential to reduce water usage and energy costs by $4,000 per year, save up to 1.2 percent on food purchases, reduce food waste by up to 30 percent, and avoid more than 23 metric tons of CO_2 emissions.
- All of Princeton's Dining Services food waste — 1,116 tons in 2010 — is recycled by a local pig farmer. And 100 percent of waste frying oil produced in the 2011 fiscal year (2,665 gallons) was recycled into biodiesel off site.

What's Next

- Develop a dining carbon-footprint display and an application for use on mobile devices.
- Devise a new tracking method to better quantify the amount of food waste generated per capita, and continue to evaluate on-site food waste recycling alternatives, including composting.
- Continue to explore the feasibility of a "daylight dining" program in which dining halls turn off overhead lights and rely on ambient lighting, with the potential to avoid 12.6 metric tons of CO_2 emissions.

Purchasing

Progress

- The University purchased 29 percent less paper in 2011 than in 2008. Campuswide deployment of multifunction copiers/scanners contributed to this 69-ton reduction.
- A total of 83 percent of the amount of paper the University purchased in 2011 was 100 percent post-consumer recycled chlorine-free paper, up from 81 percent in 2010 and 77 percent in 2009.
- More than 43 percent by volume (66 percent by dollars spent) of chemical cleaners and soaps purchased in 2011 were Green Seal certified. This represents a nearly 30 percent increase in volume and an 11 percent increase in spending over the previous year. The total volume of cleaning chemicals purchased decreased by 30 percent between fiscal year 2010 and 2011.
- In the spring of 2011, Purchasing held a Sustainability Fair that featured more than a dozen University departments and vendors. In June 2011, the Office of Finance and Treasury held its first Sustainability Fair.

What's Next

- Complete the pilot phase of the Vendor Practices Life Cycle Assessment tool and subsequent certification program, and integrate it into the University's purchasing system.
- Develop a program to promote the purchase of remanufactured toner cartridges and the recycling of toner cartridges.
- Increase departmental compliance with the University's 100 percent recycled paper purchasing policy, in part by investigating ways to reduce the price of the 100 percent recycled, chlorine-free paper.

Waste Reduction

Progress

- From 2006 to 2010, overall campus landfill waste decreased by 13 percent, from 842 to 732 pounds per capita.
- The University purchased about 4 percent less paper in fiscal year 2011 than 2010 (29 percent less than 2008), avoiding the use of an estimated 25 tons of wood products and the emission of 20 tons of CO_2.
- The total volume of cleaning chemicals purchased decreased by 30 percent between fiscal year 2010 and 2011, primarily due to the transition to "blue-cleaning" equipment that cleans with water.

What's Next

- Assemble a cross-departmental team to expand the "Print Less" initiative, which is reducing the number of sheets of office paper printed in printer clusters and public libraries.
- Evaluate a proposal for the elimination of 65 dumpster sites on campus in favor of centralized compactor locations.
- Pilot a single-stream recycling program and compare it with the existing sorting system to determine if there is resulting behavior change and increased recycling rates.

Landscape

Progress

- In the past year, more than five acres of woodlands were restored along Washington Road and the Boathouse Walk, and roughly four acres of green space was reconstructed along Shapiro Walk, the Sciences Green and the Ellipse. In total, 215 new trees and 197 new shrubs were planted.
- Synthetic fertilizer use decreased approximately by 20 percent this past year on the 635 acres of campus managed by the grounds and building maintenance department. Pesticide use on campus has decreased from more than 5,000 gallons in 2007 to slightly more than 1,500 gallons in 2010.
- Nearly 100 percent of the leaves and landscape trimmings collected on campus are composted. More than 1,500 cubic yards of soil excavated from campus construction sites in the past year was mixed with the University's compost, as well as on-site sand, and turned into a high-quality topsoil for reuse in ongoing landscape projects.
- To encourage walking and biking, nearly a mile of paths and walkways was added to the campus in the past year, contributing to a total of about 55 miles.

What's Next

- Complete restoration of four acres of woodland as part of the Washington Road stream project.
- Continue to provide better connections to campus for pedestrians and bicycles by extending sidewalks and constructing new walkways.
- Continue pursuing projects as guided by the Landscape Master Plan within the Campus Plan, including implementing long-term walkway and open space enhancements and the campus wayfinding program, and formulating a new list of landscaping projects.

Domestic Water

Progress

- Overall campus water usage was approximately 13 percent lower in fiscal year 2011 than in fiscal year 2006.
- Since 2006, water usage in the residence halls alone has declined by 30 percent (18 million gallons), due to the installation of low-flow fixtures and efficient clothes washing machines, among other water-saving measures.
- A rainwater and condensate collection system at the Frick Chemistry Laboratory has provided enough water for all toilet flushing needs since the building opened in fall 2010, reducing building water usage.
- A new "PowerPure" water treatment system is being piloted at the Baker Rink cooling tower to cool the rink ice. This system uses an electronic process rather than chemicals to remove dissolved solids from evaporated water. The system annually will save more than an estimated 140,000 gallons of water.

What's Next

- Implement the PowerPure system at the new High-Performance Computing Research Center.
- Track water usage reduction resulting from the rainwater collection system at the Frick Chemistry Laboratory.
- Compile and track installations of low-flow fixtures and aerators.

Stormwater Management

Progress

- As part of the University's Campus Plan, stormwater management practices have been integrated into the Frick Chemistry Laboratory and its surrounding landscape, including green space, rain gardens and a 12,000-gallon rainwater harvesting tank. On an annual basis, the Frick stormwater management project is estimated to reduce the volume of stormwater discharge by 583,270 gallons, with an additional 582,860 gallons of stormwater estimated to be reused annually.

- Real-time performance data from the Butler College green roofs are continuing to be monitored by faculty and students. In most cases, the green roof is delaying, lowering the rate and reducing the volume of stormwater runoff, compared to the conventional roof.

What's Next

- Complete the Washington Road stream restoration and study its impact on local water quality, and during peak runoff events.
- Install real-time green roof performance data at the electronic building performance dashboard in Butler College.
- Assemble and analyze data on Frick Chemistry Laboratory rainwater and condensate collection.
- Incorporate sustainable stormwater strategies into all upcoming major building projects.

Research, Education & Civic Engagement

Research & Education

Progress

- A total of 192 registered undergraduates — 19 percent more than in 2010 — representing 19 academic disciplines participated in the Program in Environmental Studies in 2011. Fifty-seven undergraduates received environmental studies certificates in 2011, quadruple the number in 2002.
- Princeton currently offers 60 unique undergraduate and graduate courses among four academic areas that address sustainability by exploring some aspect of the intersection between the environment, economics and society.
- During the 2010-11 academic year, eight Ph.D. candidates participated in the Princeton Environmental Institute (PEI) Program in Science, Technology and Environmental Policy. This program provides fellowship support for students to develop the environmental policy dimension of their graduate theses. A total of 49 students have enrolled since the program's advent in 2000.
- About 20 percent of graduating seniors in 2011 participated in PEI's undergraduate program during their four years at Princeton, including combined experiences pursuing certificates, coursework, internships and independent research.
- During the 2011 summer PEI/Grand Challenges season, 111 Princeton undergraduate students from 22 majors interned in 21 countries around the globe, researching and working to address a variety of environmental- and sustainability-related topics.
- Since 2008, assisted by the High Meadows Foundation Sustainability Fund, the Princeton Sustainability Committee, together with the Office of Sustainability, has awarded support for 11 often multiyear faculty research projects, and 37 grants to students and staff, to investigate sustainability solutions using the campus as a laboratory. Each faculty research project has engaged undergraduate and graduate student research teams.

What's Next

- Work with faculty to more specifically define what a sustainability-focused or -related course is.
- Continue to develop ongoing financial support for research fellowships, course-related fieldwork, internships and undergraduate research.
- Continue to define the role of sustainability in the existing University curriculum, both graduate and undergraduate, and explore how to develop a more cohesive curriculum around the environment and sustainability.
- Establish an annual call for proposals to encourage faculty to redirect research to target areas and develop courses and opportunities for mentoring undergraduate and graduate students; recruit faculty scholars in target areas.

Student Initiatives

Progress

- Since 2006, the Office of Sustainability has coordinated biweekly Princeton Environmental Network (PEN) meetings for all leaders of environmental- and sustainability-focused student clubs and organizations. The groups currently active in PEN represent more than 1,000 Princeton students.
- The recruitment and engagement of undergraduate student ambassadors for recycling and resource conservation in the residential colleges — the EcoReps — has continued. Under the sponsorship of the Office of Sustainability in partnership with Building Services and the student-based PEN during the past three years, there have been consistently more than a dozen active EcoReps.
- Student groups have organized activities ranging from recycling efforts at Reunions and a pilot residential education program on sustainability in Rockefeller College to the fourth annual Earth Week Fest and a panel discussion on "Food Access and Health in the Urban Context."

What's Next

- Increase student involvement in global/national climate change and sustainability campaigns.
- Explore new common student advertising/promotional spaces as an alternative to postering on campus to reduce waste.
- Develop a venue for students to present their initiatives and research using the campus as a laboratory for sustainability problem-solving.
- Expand community outreach activities, such as student involvement in the biennial campuswide Sustainability Open House.

Campus Programs

Progress

- In fall 2010, the Office of Sustainability partnered with several other offices to produce its second biennial Sustainability Open House for the campus and local community. More than 40 campus and community groups staffed interactive displays and demonstrations to showcase their sustainability efforts to an audience of more than 500 participants.
- The Office of Sustainability built upon its guided Green Tour launched in 2010 by developing a self-guided tour on the iPrinceton app.
- As part of the Universitywide "Drink Local" initiative, more than 60 existing fountains and common room sinks across campus were retrofitted with water bottle filling spouts during the summer of 2011, bringing the campus total to more than 140 stations.
- A pilot Sustainability Ambassador Program was carried out by the Office of Sustainability in partnership with the Facilities Organization to facilitate sustainability awareness and initiatives in the home offices of more than a dozen staff members in 2011.
- The Office of Sustainability has had more than 50 undergraduate coordinators over the past four years involved in numerous projects.

What's Next

- Expand campus Green Tour options for visitors and the campus community.
- Expand the staff Sustainability Ambassador Program into a campuswide endeavor by appointing sustainability leaders in additional administrative departments.
- Create a venue coordinated by the Office of Sustainability and the Princeton Environmental Institute for High Meadows Foundation Sustainability Fund grant recipients to share their results.

Communication

Progress

- The 2011 Sustainability Report is the third annual compilation of data available online for key audiences. The Office of Sustainability and the Office of Communications have begun the discovery phase of a process to build a new sustainability website that enhances and streamlines the management of information, including data that has been featured in the annual report, across multiple communications platforms.
- The University has signed on to the Sustainability Tracking, Assessment and Rating System (STARS), a transparent, self-reporting framework for colleges and universities to measure their sustainability performance.
- Lucid Design building performance touch-screen dashboards were installed in Frick Chemistry Laboratory and Butler College, providing access to performance data on green features such as green roofs, energy-efficient fume hoods and more.
- The Office of Communications produced nearly 20 postings (stories, photos and videos) focusing on sustainability for the University home page that also were provided to media and used on the Princeton University Facebook page, Twitter feed, YouTube channel and in the Princeton University Bulletin (faculty/staff newspaper), other University publications, and newsletters of academic programs.
- Since 2006, the Office of Sustainability has trained 39 students and interns through its Student Environmental Communication Network (SECN). Students have investigated the nuances of what is "green" and learned the research and technical skills needed to communicate them through podcast and video media.

What's Next

- Continue to document educationally valuable initiatives and community actions in sustainability to share with broader audiences.
- Continue to use SECN to increase the engagement of the undergraduate population with sustainability issues, and seek ways to integrate the program with academic objectives.
- Continue to develop a dynamic new sustainability Web presence that will incorporate tools such as databases, metric-gathering instruments and social media.




Greenhouse Gas Reduction

Overview

Princeton's primary greenhouse gas goal is to reduce direct carbon dioxide emissions to 1990 levels (95,000 metric tons) by 2020 — some 17,000 metric tons less than the current amount. This goal is to be accomplished while adding square footage and without the purchase of offsets.

The University seeks to achieve reductions through conservation, application of energy-saving technologies, renewable energy generation and behavior change. Additionally, the University aims to reduce emissions associated with transportation by modeling and promoting sustainable transportation alternatives to reach a goal of reducing the number of cars commuting to campus by 10 percent by 2020.

The strategies employed to reach the goals are included in the following three priority areas:

- **Campus Energy:** Invest $45 million between 2009 and 2017 to reduce overall utility usage on campus, in part by improving the efficiency of the high-performance central cogeneration plant and the buildings it serves (which account for approximately 85 percent of the University's emissions). These initiatives are being coordinated through an Energy Master Plan.
- **Green Building:** Increase building efficiency in new construction and major renovation projects using Life Cycle Cost Analysis and strive for LEED Silver equivalency wherever applicable; use on-site renewables and alternative energy technologies, as well as natural resource conservation technologies, wherever cost-effective; build internal expertise to ensure consistent application of the University's Sustainable Building Guidelines across all projects.
- **Transportation:** Encourage the use of public mass transit; develop and promote car pools and van pools; improve the on-campus transit system; provide and promote a car sharing service; improve the campus network of bicycle paths and walkways, and support and promote walking and biking; communicate information about the University's Transportation Demand Management programs; coordinate campus fleet management; standardize electric carts and ultra-low or zero-emission vehicles; track University-related air travel.

Campus Energy

Introduction

The University is committed to measurable greenhouse gas reduction through local verifiable action and no purchase of offsets. Princeton's goal is to reduce direct emissions to 1990 levels by 2020, even while expanding building square footage.

The University is investing $45 million to reduce overall utility usage on campus, in part by improving the efficiency of the high-performance central cogeneration plant and the buildings it serves.

Goals, Strategy & Progress

Goal: Reduce greenhouse gas emissions to 1990 levels (95,000 metric tons) by 2020. This reduction is some 17,000 metric tons less than the current amount, assuming no campus growth. When campus growth is taken into consideration, the amount of CO_2 reduction needed increases to an estimated 55,000 metric tons.

Strategy: Develop and implement the University's Energy Master Plan.

Progress (Overall):

- In 2008, the University established an Energy Master Plan to allow Princeton to approach its 2020 reduction goal while expanding square footage. The plan calls for investing $45 million between 2009 and 2017 in energy-savings projects in order to achieve $8.5 million in annual savings. In 2010-11, the University spent about $477,500, resulting in savings of about 1,000 metric tons of CO_2 and $193,000 in energy costs. Since the master plan was established, the University has invested $5.3 million in energy-savings projects, resulting in annual savings of about $1.7 million in energy costs and 10,000 metric tons of CO_2.

- Campus CO_2 emissions have declined by approximately 2.6 percent since fiscal year 2008, even with the addition of more than 560,000 square feet to the University's physical plant in the same time period (Figure 1). In the past fiscal year, emissions deviated from the reduction trend slightly, rising by 1.5 percent, to approximately 111,700 metric tons.* The increase is likely due to bringing the new Frick Chemistry Laboratory on line, while the old building, which will be converted to a less energy-intensive nonlaboratory building, was still on line, as well as a significant increase in campus heating and cooling demands due to more extreme weather (more cold or hot weather for longer than average periods of time) over the past year.
- Due to conservation efforts, electricity usage by the campus increased only by 3.9 percent from fiscal year 2008 to fiscal year 2011, even with the addition of Whitman College, Sherrerd Hall, Lewis Library, Roberts Stadium, the Fields Center and the Frick Chemistry Laboratory.
- An additional 5 percent (equal to more than 3,000 metric tons of CO_2) of the University's operational strategies for reducing greenhouse gas emissions were determined this past year, bringing the total of known strategies needed to achieve its 2020 goal to 84 percent. At the outset of the Sustainability Plan in 2008, the University had identified only 70 percent of the strategies needed to reach the goal. To date, the University has achieved 28 percent of the strategies necessary to reach the goal (Table 1).

**NOTE: Due to a refinement of the emissions data analysis by the utility from which Princeton purchases some of its electricity, fiscal year 2009 CO 2 emissions have been determined to be lower than previously reported. The decrease in emissions from fiscal year 2008 to 2009 was approximately 3.6 percent versus the less than 1 percent previously reported. Fiscal year 2010 CO 2 emissions have also been determined to be lower, making the decrease in emissions from fiscal year 2008 to 2010 approximately 4 percent versus 2.5 percent.*

Progress (Detailed):

Renewable Energy

- The University will begin installation of a 5.2-megawatt solar collector field in the fall of 2011 on 27 acres it owns in West Windsor Township. The system, comprising 16,500 photovoltaic panels, is expected to generate 8 million kWh per year — enough to power the equivalent of 700 homes, or enough to meet 5.5 percent of the total annual campus electrical needs while avoiding about 3,000 metric tons of CO_2 per year. Notably, no CO_2 emissions reductions will be claimed until the system is paid for (by 2020), and generated Solar Renewable Energy Credits (SRECs) are "retired" (no longer sold).

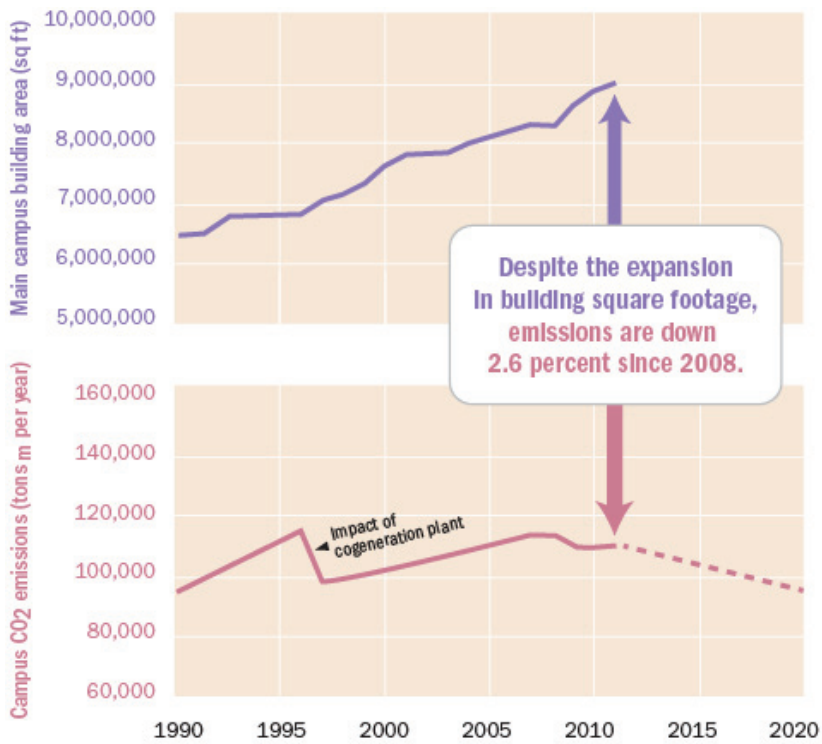
Existing Building Energy Conservation Projects

- A control system optimization technology was put into place in Robertson Hall, maximizing the academic building's energy efficiency. Similar technologies are planned for more than 40 existing buildings on campus.
- Energy audits were completed on 30 of the top 50 energy-consuming buildings. A total of 290 energy-efficiency projects have been identified; they are expected to result in more than 20,000 tons of CO_2 reductions once implemented, with a simple payback period of about five years.
- Of approximately 300 energy meters scheduled to be installed in the top 60 energy-consuming buildings on campus, 35 electrical meters, two chilled water meters and four steam meters have been installed to date.

Lighting Upgrades

- New fluorescent fixtures with built-in occupancy sensors were installed in the cogeneration plant; these are estimated to reduce energy consumption by 340,000 kWh per year, or 112 metric tons of CO_2.

Figure 1: Campus Growth and Greenhouse Gas Emissions History



Between 2008 to 2011, campus emissions have declined by 2.6 percent, despite a corresponding expansion of more than 560,000 square feet. Reaching the Sustainability Plan goal without additional square footage expansion will require reducing direct emissions by some 17,000 metric tons over the next 10 years.

- LED lighting has been installed in the theater and dance studios and around the east building entrance of New South, the small conference room of the MacMillan Building, and the food servery at the Center for Jewish Life. LED task lighting will also be used in Frick Chemistry Laboratory offices.
- LED lighting has been approved for installation in the main Dillon Gym as well as the two multipurpose rooms; it is expected to result in approximate savings of 43,000 kWh and 16 metric tons of CO_2 per year.

Heating, Ventilation and Air-Conditioning (HVAC) Replacement

- HVAC system upgrades to reduce air changes were made in two large research laboratories (Thomas and Icahn) using advanced air sensor control.

Distribution System Improvements

- The University worked with the New Jersey Board of Public Utilities to modify existing regulations to allow Princeton to distribute efficient cogeneration power to remote parts of campus using the utility grid.
- More than 290 steam traps — some of the 10,000 devices in the University's distribution system that hold steam vapor into the pipe while letting water drain out — were replaced in the last fiscal year, resulting in expected savings of nearly 800 metric tons of CO_2 emissions annually.

Plant Efficiency Improvement

- A grant of $500,000 from the New Jersey Clean Energy Smart Start Program was applied to a heat recovery project in the cogeneration plant, which is expected to result in an annual savings of 4,700 metric tons of CO_2 emissions.

Computing

- During the 2011 fiscal year, the Office of Information Technology (OIT) "virtualized" 110 physical servers, bringing the total to more than 380, or nearly 65 percent of servers, that have been virtualized since 2007, saving more than 1.9 million kWh annually, or 737 metric tons of CO_2.
- OIT also installed desktop power management software for 2,500 computers this past year. The automated shutdown at night and on weekends has achieved an annual savings of 1.6 million kWh, or 620 metric tons of CO2.

What's Next

Short Term

- Complete construction of a 5.2-megawatt solar collector field.
- Upgrade lighting in at least 12 buildings during fiscal year 2012, including Dillon Gym.
- Audit the remaining 20 of the top 50 energy-consuming buildings.
- Complete installation of approximately 150 (out of 300) energy meters in top 60 energy-consuming buildings
- Begin installation of control system optimization technologies in more than 40 buildings across campus.
- Increase server virtualization target to 75 percent.
- Migrate servers and storage from less-efficient data center rooms to the new High-Performance Computing Research Center.
- Investigate the feasibility of additional desktop energy-savings (e.g., expanding the number of desktop computers using power management software).

Long Term

- Identify the remaining, currently unknown, 16 percent of the operational strategies needed to achieve the 2020 greenhouse gas reduction goal.
- Complete energy audits in the top 50 energy-consuming buildings and implementation of identified energy-efficiency projects

"The Princeton engineering team is clearly expert at cost-benefit analysis, having designed and implemented the most innovative and cost-effective energy plant of any university we've seen. The solar project met all of Princeton's tough criteria and should prove to be a crowning jewel."
—Tom Leyden, former managing director, SunPower Corp., the global solar technology company that will design and build the 5.3-megawatt solar collector field the University is installing on land it owns in West Windsor

(Photo by Tom Grimes Photography for SunPower)

Table 1: Strategies to Reach 2020 Greenhouse Gas Reduction Goal

Reduction Strategies	Goal (Metric Tons)	Actual Completed (Metric Tons)	Percent Completed
Biodiesel	4,773	–	0%
Automated Building Optimization	2,771	282	10%
Demand Controlled Ventilation	1,230	117	10%
Distribution System Improvements	4,608	4,792	104%
Grid CO_2 Reductions	5,000	–	0%
Ground Source Heat Pumps	5,035	–	0%
Heat Recovery	353	252	71%
Improve Plant Efficiency	4,920	4,535	92%
Increase Plant Runtime	2,800	–	0%
Jadwin Hall HVAC Renewal	1,969	2,588*	131%
Lighting Improvements	5,320	722	14%
Low Flow Fixtures	810	810	100%
Other Building Retrofit HVAC Renewals	2,363	471	20%
Solar Collector Field	N/A	3,091	0%
Undetermined	10,468	1,237	12%
Total	**55,511**	**15,806**	**28%**

*Projected

- Implement HVAC system upgrades in Thomas Laboratory, and HVAC and lighting system upgrades in Icahn Laboratory.
- Complete installation of control system optimization technologies in more than 40 buildings across campus.
- Continue to install motion sensors integrated with lighting, room heating and cooling systems.
- Continue installation of more than 600 steam traps as well as adding heating and cooling piping insulation.
- Expand LED lighting as improved aesthetic, cost-effective options become available; standardize LED task lighting where feasible.
- Continue to pursue, as financially feasible, the use of biodiesel in the cogeneration plant. (Princeton acquired the first permit in the state to burn biodiesel in stationary boilers, and the first permit in the world to burn biodiesel in an LM1600 gas turbine engine.)
- Optimize plant operations and utility distribution to reduce energy use.
- Investigate the feasibility of local offshore wind power as part of the University's renewable energy portfolio.

Green Building

Introduction

Princeton's campus design standards (.pdf) include sustainability guidelines as well as expectations that all new projects and major renovations will achieve significant energy cost reductions versus comparable off-campus buildings. These standards require a series of stringent Life Cycle Cost Analyses (LCCA) to evaluate sustainable features that maximize building energy and sustainability performance. As a result, many projects typically include strategies for envelope upgrades, energy-efficient heating, ventilation and air-conditioning (HVAC) systems, upgraded lighting, sophisticated building controls, and low-flow plumbing fixtures.

Goal, Strategy & Progress

Goal: Increase building efficiency and sustainability performance.

Strategy: Increase building efficiency in new construction and major renovation projects using LCCA, including a CO_2 tax, as a major influence in decision making. Strive for LEED Silver equivalency wherever applicable.

Progress: LCCA studies informed decision-making processes in selecting several of the following sustainability elements in recent new construction and renovation projects:

New Construction:

As the needs of the University grow, so does the demand on its existing building stock. By strategically planning and building new state-of-the-art facilities, the University is able to increase building efficiencies through an integrative design process. This approach also frees up existing buildings for future renovation. Below are some of the more unique strategies employed on current projects:

- New graduate housing at the Hibben-Magie site: Planners for this redevelopment will be seeking Silver certification under LEED for Homes (Lowrise and Midrise).
- High-Performance Computing Research Center: This facility, slated for completion in 2011, is designed to save 33 percent more energy than the previous computing center with a Power Usage Effectiveness (PUE) of 1.5. It will feature an energy-efficient cogeneration system that will provide both power and cooling via an innovative pairing of gas engine and absorption chiller; heat recovery; free cooling when outdoor air conditions permit; a high level of detailed energy monitoring; and the capability for fully automated operation.
- Neuroscience and Psychology Buildings: These structures, scheduled to be finished in spring 2013, will include natural lighting; automatic dimming controls; a stormwater reclamation system for nonpotable use; an energy-efficient HVAC system featuring multiple heat recovery technologies and active chilled beams for cooling; and a high-performance exterior façade featuring outer ribbed glass sunscreen and inner high-performance glass.
- Andlinger Laboratory: The first step of a four-year process to build this new complex was completed in summer 2011. It will feature building massing and design efficiencies to locate offices with ample access to daylight; glazed interior partition walls that allow for daylight penetration; portions of buildings located below grade to minimize heating/cooling loads; exterior solar shade; an energy-efficient HVAC system featuring heat recovery, radiant panels and cascading airflow (from office to lab); stormwater and condensate storage and reuse systems; and green roofs to enhance stormwater management.

The new High-Performance Computing Research Center has been designed to replace select existing less efficient centers on campus, and also will take full advantage of server virtualization — consolidating applications and services running on individual physical machines onto fewer, more powerful servers.

Major Renovations:

- Existing buildings account for a large percentage of the University's carbon footprint. Renovating the aging systems within these buildings is a way to use the University's resources more wisely and to create a better environment for those who work there. Below are some of the more unique strategies employed on current major renovations:
- Jadwin Hall: This renovation is designed to reduce energy costs by 45 percent compared to the original building. An energy-efficient HVAC system features heat recovery and chilled beams. The project also involves energy-efficient lighting, window replacement and reuse of existing building furniture.
- Firestone Library: This 10-year renovation project features an energy-efficient HVAC system including heat recovery and chilled beams; energy-efficient lighting strategies tested for mass rollout throughout the library stacks; and new skylight glazing to reduce heat loss. Building finishes will be upgraded using sustainable products and, in some cases, refurbishing existing finishes to maintain the period look in signature spaces.

Strategy: Build internal expertise to ensure consistent application of Sustainable Building Guidelines across all projects.

Progress:

- The University is committed to continuing education for its staff. As an authorized U.S. Green Building Council Education Provider, the University's Facilities Organization has offered more than 30 hours of sustainability-related continuing education credits over the past two years. In addition to education for LEED credentialing maintenance, the organization has offered more in-depth coursework on Princeton-based solutions for elements such as stormwater management, water conservation and energy management.
- About 30 staff members in the offices of design and construction, facilities engineering, grounds and building maintenance, and the Office of the University Architect are currently LEED-Accredited Professionals.

What's Next

Short Term

- Evaluate the pilot of continuous post-occupancy building system performance in Frick Chemistry Laboratory and adjust building parameters as necessary.
- Test new materials (such as finishes) and processes (such as coordinated construction material recycling) in small renovations.
- Refine furniture reuse and recycling programs.
- Roll out updated Sustainable Building Guidelines in the March 2012 release of the Facilities Design Standards Manual, including refinements to construction waste management practices and electronic document management systems to reduce paper usage.
- Continue to apply the University's 95 percent construction debris recycling policy to projects, and explore synergies between University services and large-scale job sites collecting household recyclables.

Long Term

- Continue to apply LCCA to the development of major projects, as well as minor projects where appropriate. Continue to assemble an LCCA case library and apply accumulated LCCA knowledge to the development of building projects.
- Continue to refine Sustainable Building Guidelines (e.g., continue to target a 95 percent recycling goal on large projects and utilize a greater percentage of more sustainable materials) to maximize energy and sustainability performance.
- Explore updating energy modeling guidelines in the Design Standards Manual to better capture smaller renovated buildings.

Transportation

Introduction

Transportation is the second-largest source of carbon emissions associated with the University. While the emissions impact is small compared to those from heating, cooling and electrifying the campus, the transportation sector as a whole is a major contributor to the carbon footprint of the United States. It is important for Princeton University to model sustainable transportation alternatives to encourage a shift in culture.

The catalyst for Princeton's transportation goals is a Transportation Demand Management (TDM) program implemented to reduce the number of single-occupant vehicles coming to campus. Alternatives to single-occupant vehicle transportation are essential, as is promoting alternative modes of transportation such as bicycle commuting.

"One of the guiding principles of the High-Performance Computing Research Center project was to make sound design decisions based on total cost of ownership and sound architectural and engineering practices. Through smart design decisions, careful planning and effective execution, the building is also currently tracking LEED Silver with the potential of Gold certification without incurring additional project costs."

—Alan Mougey, owner's representative, CS Technology, the project manager for the High-Performance Computing Research Center program

Goals, Strategies & Progress

Goal: Reduce the number of cars commuting to campus by 10 percent by 2020 through a Transportation Demand Management program (baseline year is 2008).

Strategy: Encourage participation in TDM programs.

Progress:

- From 2010 to 2011, there was a 98 percent increase in the number of campus community members participating in Transportation Demand Management (TDM) programs. A majority of the 700 now involved are benefiting from program incentives (see Table 2). In 2010, there was a total of 353 participants. Further information about these programs can be found on the Transportation and Parking Services website.

Strategy: Encourage the use of public mass transit through a University subsidy program.

Progress:

- In the 2011 fiscal year, 186 commuters participated in the mass transit program, which provides a 50 percent subsidy to eligible commuters.
- The mass transit subsidy program was extended to include graduate students beginning in July 2011.

Strategy: Develop and promote car pools and van pools to campus community members.

Progress:

- The van pool program, which was launched in 2009 for faculty and staff members, currently has six active van pools.
- In 2011, preferred parking was added as an additional benefit for participants in the car and van pool programs.
- A rideshare database created in 2010 continues to allow students to search online and car pool with others going to nearby areas during school breaks. This tool is a companion to the rideshare database developed for faculty and staff members in 2008.

Strategy: Improve the on-campus transit system (TigerTransit).

Progress:

- From 2010 to 2011, more than 603,000 rides were taken on the campus shuttle service, an increase of about 2 percent, or 13,000 rides, over the previous year.
- Shuttle stops were analyzed during the fall and spring semesters, resulting in more effective and efficient routes.
- The campus shuttle system currently features 14 buses that run on 20 percent biodiesel made from soy. While biodiesel made from soy benefits local air quality, Princeton continues to seek options for sustainable biofuels made from waste products.

Strategy: Provide and promote a car-sharing service for campus community members.

Progress:

- Since March 2010, WeCars have been available for faculty, staff and students to rent by the hour or the day. There currently are six WeCars and 350 participants in the program.

Strategy: Improve the campus network of bicycle paths and walkways, and support and promote walking and biking as means of transportation to and on campus.

Progress:

- Nearly a mile of paths and walkways was added to campus in the past year, contributing to a total of about 55 miles. The new walkways suitable for bikes include those constructed at the Sciences Green, from the Elm Drive Circle to the Boathouse on Lake Carnegie, and on a portion of Faculty Road.
- Future sidewalk extensions were approved for Faculty Road, Washington Road, FitzRandolph Road, Western Way and Broadmead Street.
- More than 150 bicycles (a combination of new and refurbished abandoned) are maintained by the student-run U-Bikes rental and bikeshare program for students, faculty and staff. In 2011, the waiting list exceeded 350 people for this campuswide service.
- During the 2010-11 academic year, about 200 bikes were salvaged on campus and either donated to U-Bikes or a nonprofit organization, or scrapped if beyond repair.
- As part of a campuswide strategy to improve pedestrian and vehicular wayfinding, new signs for buildings and parking information were designed and are expected to be put in place during 2011-12.

Strategy: Communicate information about the University's TDM programs to the campus community with incentives for participation.

Progress:

- Since its launch in 2010, the TDM electronic newsletter has attracted 300 campus community members as subscribers, 20 percent of whom have signed up this past year.
- TDM programs were promoted at several sites in the past year, including Freshman Orientation, staff benefits fairs, the Frist Campus Center and the Sustainability Open House.

Table 2: Participation in TDM Programs

Program	Description	Participants in FY 2011
Car Pool Incentive	$25 gas cards available to qualifying car pools	140
Mass Transit Subsidy	50 percent of monthly pass	186
WeCar	Car-sharing program	350
Van Pool Program	No fuel cost for driver; fuel cost shared between 4+ passengers	36

Goal: Increase efficiency and reduce emissions associated with transportation.

Strategy: Coordinate campus fleet management to reduce the number of vehicles.

Progress:

- As the first step in helping to coordinate and maximize the efficiency of the fleet, an inventory of campus vehicles was carried out. Approximately 600 vehicles, including 25 different types, have so far been identified among 51 departments.

Strategy: Standardize electric carts and ultra-low or zero-emission vehicles when University vehicles are replaced or purchased new.

Progress:

- Electric golf carts are now standardized for all new cart purchases.
- A task force was assembled to evaluate central oversight of University-owned vehicle purchases to maximize efficiency and minimize carbon footprint.
- Regarding electric vehicles overall, since 2007, 41 percent of campus vehicles purchased were electric or hybrid.

Strategy: Track University-related air travel to assess carbon footprint and consider air travel alternatives where feasible.

Progress:

- Air travel-related emissions represent less than 2 percent of the University's carbon footprint.
- For fiscal year 2011, total air passenger miles for University travel arranged through the central travel services office were tracked at 15,246,364 miles — an increase of about 573,630 miles (132 metric tons of CO_2), or about 4 percent, from fiscal year 2010. Between fiscal year 2007 and fiscal year 2011, there has been a 17 percent increase in miles traveled.

What's Next

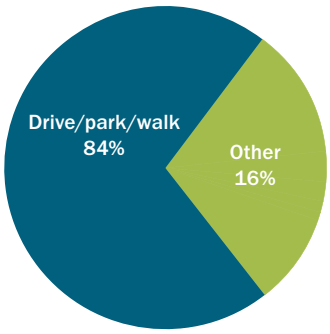
Short Term

- Further develop TDM incentive programs, including proposing a subsidy for train station parking; increasing the number of preferred parking spaces for car and van pool participants; and increasing car pool incentives.
- Adjust shuttle routes as needed.
- To promote use, lower the hourly rate of WeCar during one day of the week and provide bike commuters with a WeCar discount.
- Update TDM marketing materials by developing interactive tools to promote programs at orientation events and open houses.
- Conduct a study of more ways to share University-owned vehicles, including options for centralized charging stations for electric vehicles, with a goal of reducing the campus fleet by 5 percent in 2012.
- Track vehicle miles traveled by commuter cars to report on related emissions reductions.
- Evaluate the U-Bikes program and usage data and track the fate of abandoned bikes.
- Implement a campus Bike Master Plan.

Long Term

- Continue to reduce the campus fleet, and create maintenance and repair programs.
- Increase the WeCar fleet on campus beyond six cars, and explore electric WeCar options.
- Continue to investigate biodiesels that are cost-effective and sustainably produced.
- Continue to work with key external public transportation partners (e.g., New Jersey Transit) to identify methods to improve service and access for commuters.
- Continue investment in a sidewalk network that will better connect graduate student and faculty/staff housing communities to campus.
- Continuously assess ridership of the shuttle system and evaluate strategies to maximize its efficiency, while also maintaining service.
- Study telecommuting policy and determine the most effective way to communicate videoconferencing and Web-based conferencing alternatives to the campus community.

Figure 2: Modes of Transportation



The vast majority of faculty and staff drive to the University as the sole occupant of a passenger vehicle. Click to enlarge. According to data compiled by a traffic consultant as part of the Campus Plan effort, an average of 4,700 cars traveled to and from campus each weekday in 2008.

Awards & Achievements

For the third year in a row, Princeton received the 2011 New Jersey Smart Workplaces Award, Platinum (highest) Level, from the state Department of Transportation for efforts to provide alternative transportation programs for employees who commute.




Resource Conservation

Overview

Princeton has been a leader in resource conservation for decades. Under the 2008 Sustainability Plan, the University aims to continue this tradition by encouraging sustainability in the supply chain of the goods and services it purchases, while decreasing its production of landfill waste. Princeton also strives to reduce its demand for water on campus — in the residence halls, in academic and administrative buildings, and in landscaping — and to create a vibrant and sustainable landscape through an integrated, campuswide ecosystem approach as guided by the Campus Plan.

The strategies employed to reach the goals are included in the following six priority areas:

- **Dining:** Increase sustainable food purchases to 70 percent by 2012, while prioritizing local foods; develop and display carbon footprint information for different types of food items; raise awareness about sustainable dining options through outreach and events; transition to tray-free dining across all six dining halls; recycle food waste and cooking oil.
- **Purchasing:** Develop a Vendor Practices Life Cycle Assessment tool to aid in sustainable purchasing decisions; standardize on electric carts and ultra-low or zero-emission vehicles; encourage compliance with the 100 percent post-consumer recycled chlorine-free paper policy; transition to Green Seal-certified daily cleaning products; increase purchases of remanufactured toner cartridges; raise awareness about sustainable purchasing options.
- **Waste Reduction:** Reduce hand towel waste by transitioning to proportioning dispensers; reduce paper usage on campus; reduce corrugated delivery box waste associated with University orders; increase household recycling to 50 percent by 2012; increase donation and recycling options during the 20-day period of year-end move-out; increase reuse and recycling options for items including electronics, office furniture and dorm mattresses; transition to "blue-cleaning" equipment that cleans with water to reduce the need for cleaning chemicals.
- **Landscape:** Enhance green space with new plantings and local soils as needed and restore selected woodlands; minimize the use of synthetic fertilizers and pesticides; create compost from campus leaves, landscape trimmings and construction site topsoil when available, and reuse for landscape projects; improve the campus network of bicycle paths and walkways, and promote walking and biking as a means of transportation; implement a wayfinding program to direct motorists and pedestrians to their destination by the most efficient means possible.
- **Domestic Water:** Reduce water usage in residencel halls by installing efficient fixtures and appliances and transitioning to tray-free dining; reduce water usage in academic and administrative buildings by installing efficient fixtures and equipment and rainwater storage and reuse systems; reduce water usage associated with campus heating and cooling; track and reduce potable water use for irrigation.
- **Stormwater Management:** As part of the Campus Plan, implement "best stormwater management practices," including rain gardens, rainwater harvesting tanks, porous paving, green roofs and others to promote on-site stormwater retention and improvement of stormwater quality prior to entering streams and the lake.

Rain gardens and biofiltration areas have been positioned near the Frick Chemistry Laboratory to retain and filter building and site stormwater. The new landscaping replaces a large asphalt parking lot, reducing the impervious surface.

Dining

Introduction

University Dining Services has worked successfully with students since 2002 in an effort to "green" its operations and purchasing. The University continuously adopts precedent-setting practices and communication techniques to expand campuswide education about sustainable dining.

Goals, Strategies & Progress

Goal: Increase sustainable food purchases to 70 percent by 2012, while prioritizing local foods, and raise awareness about green dining initiatives.

Strategy: Identify and make use of additional locally produced foods, working with vendors and other partners.

Progress:

- Sustainable food purchases increased from 36 percent in 2007 to 66 percent in 2011. Local (within 250 miles) food purchases increased from 27 percent in 2007 to 59 percent in 2011 (see Figure 3).
- Dining Services worked with its primary vendor, U.S. Foods, to further define the source of certain dry and frozen products, resulting in more accurate identification of local products.
- In the fall and spring, fresh produce was provided to Dining Services by the student-run Princeton Garden Project, which cultivates gardens at both Forbes College and the Frist Campus Center.

Strategy: Develop and display carbon footprint information for different types of food items served in student dining facilities.

Progress:

- The relative carbon footprint of approximately 150 common food items was determined over the past year as part of the Princeton Environmental Institute/Grand Challenges internship program in preparation for smartphone app development and dining hall displays. These food items are now identified with low-, medium- or high-carbon emission icons on the interactive menu feature of the Dining Services website, allowing students to compare the relative carbon impact of their food choices.

Strategy: Raise awareness about sustainable dining options through outreach and events.

Progress:

- Dining Services' Chef Rob Harbison prepared two tastings as part of a Princeton School Gardens Cooperative program for two elementary schools in the fall and spring semesters, educating local students, parents and school staff about meals with locally produced ingredients and how the University uses local sustainable food.
- Dining Services featured its sustainable dining initiatives and offered a variety of food samples at several public events this past year, including the University's 2010 Sustainability Open House, campus farmers markets and Earth Day Fest.

Goal: Reduce and recycle food waste.

Strategy: Transition to tray-free dining across all six dining halls and continue to monitor associated reductions and savings.

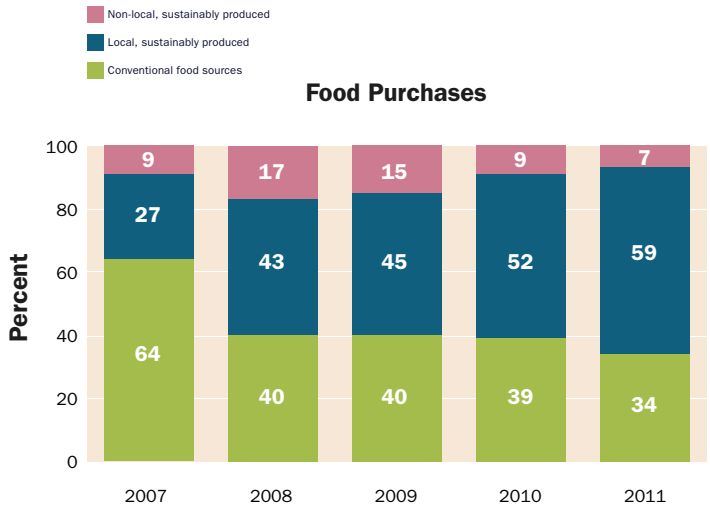
Progress:

- By summer 2011, the "tray-free" dining policy adopted by the Princeton Sustainability Committee was successfully implemented in all six residential dining halls. Tray-free dining (providing larger plates and glasses and eliminating trays) has the potential to reduce water usage and energy costs by $4,000 per year, save up to 1.2 percent on food purchases, reduce food waste by up to 30 percent, and avoid more than 23 metric tons of CO_2 emissions.

"No one can deny that eating plays a central role in the Princeton experience — but few realize how truly we embrace Princeton's unofficial motto, 'In the Nation's Service and in the Service of All Nations.' With each swipe into the dining hall, we do just that, thanks to Dining Services' ever-increasing use of local sources and initiatives, which are serving to reduce our 'foodprint.'"

—Lily Alberts, Class of 2013, a member of the Greening Dining student group

Figure 3: Food Purchases



Sustainable food purchases increased from 36 percent in 2007 to 66 percent in 2011, and local (within 250 miles) food purchases increased from 27 percent to 59 percent in the same time period.

Strategy: Recycle food waste, including cooking oil.

Progress:

- Currently, all of Princeton's Dining Services food waste — 1,116 tons in 2010 — is recycled by a local pig farmer.
- This past year, Dining Services, Building Services and the Office of Sustainability piloted a food waste dehydration system at Forbes College as part of an ongoing evaluation process analyzing on-site alternatives.
- 100 percent of waste frying oil produced by Dining Services in the 2011 fiscal year (2,665 gallons) was recycled into biodiesel off site (see Figure 4). Between fall 2009, when the collection program began, and spring 2010, 70 percent, or 1,901 gallons, of collected waste oil was recycled.

What's Next

Short Term

- Associate each food type evaluated for carbon footprint with one of three icons (most sustainable, somewhat sustainable, least sustainable) and display in dining halls across campus.
- Build upon current carbon footprint information to include additional food items as well as ingredient listings, and develop a downloadable app.
- Track and quantify the amount of produce used from campus gardens.
- Determine an accurate measure of food waste.
- Evaluate on-site or immediately local food waste conversion system options.
- Continue to explore the feasibility of a "daylight dining" program in which dining halls turn off overhead lights and rely on ambient lighting, with the potential to avoid 12.6 metric tons of CO_2 emissions.

Long Term

- Continue working with major manufacturers to trace product sources to better identify local purchases that may not currently be classified as such.
- Partner with the Chef's Move Program endorsed by the White House and First Lady Michelle Obama to provide educational information to local schools based on Princeton's sustainable dining initiatives.

Purchasing

Introduction

The Purchasing Department works with vendors to encourage more efficient manufacturing and delivery processes that conform to the University's evolving sustainability requirements. The department has developed a Vendor Practices Life Cycle Assessment Initiative that it is testing with a number of nearby partner institutions. The ultimate goal is for these to serve as a model and to accelerate the rate of adoption of sustainable practices in various industries.

Goals, Strategies & Progress

Goal: Encourage sustainability in the supply chain and procurement of purchased goods and services.

Strategy: Develop a Vendor Practices Life Cycle Assessment tool to aid in sustainable purchasing decisions.

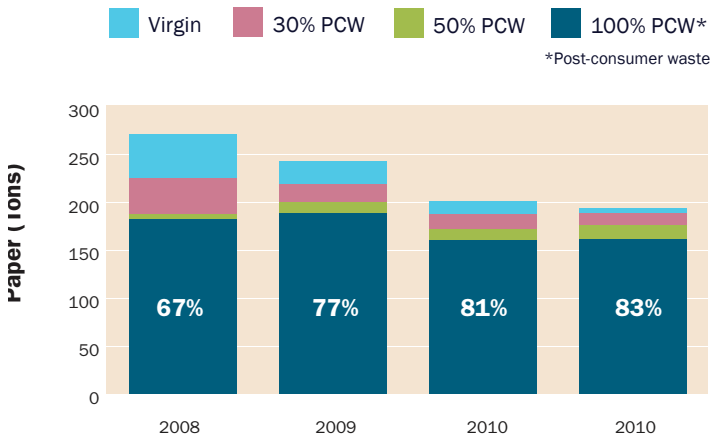
Progress:

- Evaluation profiles have been created for seven types of vendors, including food service, lodging service, manufacturing, off-campus service, on-campus service, supplier/distributor and vehicles.

Awards & Achievements

Princeton's Purchasing Department was awarded a 2011 Achievement of Excellence in Procurement Award, which is based in part on environmental purchasing. The department has now earned this award for eight consecutive years.

Figure 5: Paper Purchases



The University purchased 7 fewer tons of paper in 2011 than 2010, avoiding the use of 25 tons of wood products and the emission of 20 metric tons of carbon dioxide..

- The vendor certification program resulting from this evaluation is currently being tested by neighbor institutions including Rutgers University and the University of Pennsylvania.

Strategy: Standardize electric carts and ultra-low or zero-emission vehicles when University vehicles are replaced or purchased new.

Progress:

- Electric golf carts are now standardized for all new cart purchases.
- A task force was assembled to evaluate central oversight of University-owned vehicle purchases to maximize efficiency and minimize carbon footprint.
- Overall, 41 percent of campus vehicles purchased since 2007 were electric or hybrid.

Strategy: Encourage compliance with 100 percent post-consumer recycled chlorine-free paper policy.

Progress:

- A total of 83 percent of the amount of paper the University purchased in 2011 was 100 percent post-consumer recycled chlorine-free paper, up from 81 percent in 2010 and 77 percent in 2009 (Figure 5).
- The University purchased 69 fewer tons of paper in 2011 compared to 2008. Campuswide deployment of multifunction copiers/scanners contributed to this 29 percent reduction.
- In fiscal year 2011, 74 percent of departments complied with the 100 percent post-consumer recycled chlorine-free paper policy.*

**NOTE: A comparatively higher cost for this type of paper has contributed to a decline in compliance over the past two years: In fiscal year 2010, 84 percent of departments complied with the policy; in fiscal year 2009, 86 percent complied.*

Strategy: Transition to Green Seal-certified daily cleaning products.

Progress:

- More than 43 percent by volume (66 percent by dollars spent) of chemical cleaners and soaps purchased in 2011 were Green Seal certified. This represents a nearly 30 percent increase in volume and an 11 percent increase in spending over the previous year. The total volume of cleaning chemicals purchased decreased by 30 percent between fiscal year 2010 and 2011.

Strategy: Increase purchases of remanufactured and recycled toner cartridges.

Progress:

- In fiscal year 2011, 11 percent of the University's 6,364 toner/ink cartridges were remanufactured, about the same proportion as 2010. This is an increase of almost 10 percentage points from fiscal year 2009, when just 1.2 percent purchased were remanufactured.
- The percent of printer toner cartridges recycled in fiscal year 2011 was 41 percent; in 2010 it was 43 percent, and in 2009 it was 32 percent.

Strategy: Reduce corrugated delivery box waste associated with University orders by participating in the OfficeMax reusable box program.

Progress:

- Princeton's Purchasing Department continued to provide OfficeMax with reusable boxes for office supply deliveries in 2011, avoiding the use and disposal of about 470 corrugated boxes per month.

Strategy: Raise awareness about sustainable purchasing options through outreach and events.

Progress:

- At its annual Purchasing Supplier Fair, the Purchasing Department has featured a section for environmentally preferable products since 2002, with increasing interest from the University community since the adoption of the Sustainability Plan in 2008.
- In the spring of 2011, Purchasing held a Sustainability Fair that featured more than a dozen University departments and vendors, showcasing everything from the University's Surplus Program, which facilitates reuse and recycling, to refillable pens and farm-fresh produce.

What's Next

Short Term

- Complete the pilot phase of the Vendor Practices Life Cycle Assessment tool and subsequent certification program, and integrate it into the University's purchasing system.
- Develop a program to promote the purchase of remanufactured toner cartridges and the recycling of toner cartridges.
- Increase departmental compliance with the University's 100 percent recycled paper purchasing policy, in part by investigating ways to reduce the price of the 100 percent recycled, chlorine-free paper.
- Explore the feasibility of a Universitywide pen recycling program through a pilot test at 701 Carnegie Center.
- Conduct a pilot program to consolidate office supply deliveries to campus from five days to four days per week and reduce the number of deliveries on those days, in turn reducing transportation emissions.
- Continue to seek options for specialty cleaning products that are Green Seal certified, or equivalent.

Long Term

- Incorporate the Vendor Practices Life Cycle Assessment model into the Purchasing Department's bidding process.
- Develop campus procurement standards for various classes of electric and low-emission vehicles.
- Increase departmental compliance with 100 percent recycled paper purchasing policy from current 74 percent.
- Develop campus standards for remanufactured toner cartridges and make them available in place of new cartridges through University ordering systems.
- Continue to look for opportunities to utilize contract suppliers that strive to reduce campus waste.

Waste Reduction

Introduction

Princeton continues to seek and test innovative solutions to reducing its total waste stream while increasing the percentage of recycling across all categories including "household" items, demolition and construction debris, and food waste.

Goals, Strategies & Progress

Goal: Reduce overall waste from campus.

Progress:

- From 2006 to 2010, overall campus landfill waste decreased by 13 percent, from 842 to 732 pounds per capita (faculty, staff and students). When comparing 2009 and 2010, waste declined by 2.5 percent. The most precipitous annual drop (69 pounds per capita) occurred between implementation of the Sustainability Plan in 2008 and 2009.

Strategy: Reduce hand towel waste by transitioning to proportioning dispensers.

Progress:

- By converting bathroom hand towel dispensers to non-electric proportioning versions, paper towel usage has decreased about 14 percent per capita since the project was implemented in fiscal year 2008. Cumulatively, some 1,750 miles of hand towels have been saved. In the past year, paper towel usage increased slightly — from 1,818 to 1,895 feet per capita, a 4 percent increase.

Strategy: Reduce paper usage.

Progress:

- The University purchased about seven fewer tons of paper in fiscal year 2011 than 2010 (69 fewer tons than in 2008), avoiding the use of an estimated 25 tons of wood products and the emission of 20 tons of CO_2.
- Through the "Print Less" initiative spearheaded by the Office of Information Technology and the University Library, the number of sheets of office paper printed in printer clusters and public libraries has decreased by 22 percent, from 11 million to 8.6 million sheets, since fiscal year 2009.
- The average amount of paper used by the University's Print and Mail Services decreased from 6.9 pounds per order in fiscal year 2010 to 6.2 pounds in fiscal year 2011. This was accomplished in part by maximizing cutting configurations in order to increase page yield per sheet.

Strategy: Reduce corrugated delivery box waste associated with University orders by participating in the OfficeMax reusable box program.

Progress:

- Princeton's Purchasing Department continued to provide OfficeMax with reusable boxes for office supply deliveries in 2011, avoiding the use and disposal of about 470 boxes per month.

Goal: Increase reuse and recycling.

Strategy: Increase household recycling to 50 percent by 2012.

Progress:

- Since 2007, the household-items recycling percentage has increased from 38 percent to 45 percent.
- Campus recycling guidelines were updated, and 500 copies were posted in restrooms and common rooms throughout residence halls.

Strategy: Increase donation and recycling options during the 20-day period of year-end move-out.

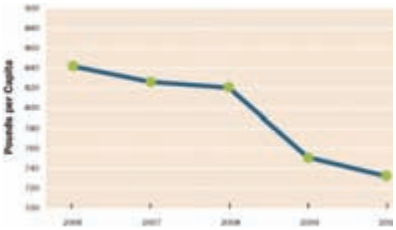
Progress:

- The amount of landfill waste collected during the 20-day period of move-out has decreased from 77 pounds per capita in fiscal year 2006 to 59 pounds per capita (faculty, staff and students) in both fiscal years 2010 and 2011, representing more than a 23 percent decrease (see Figure 7).*

**NOTE: The baseline year has been updated to 2006 from 2001 to better track changes that took place following the adoption of the Sustainability Plan in fiscal year 2007 and to conform with the requirements of the Sustainability Tracking and Rating System (STARS), a self-reporting framework for colleges and universities to measure their sustainability performance development by the Association for the Advancement of Sustainability in Higher Education. To better align the tracking of move-out waste with overall annual waste, move-out data now includes recycling waste and is now being reported in per capita terms; in fiscal year 2010, only move-out landfill waste was reported.*

The Orbio 5000-Sc generates a multipurpose cleaning solution on-site using tap water and salt, eliminating the need for traditional cleaners. Michael Carson, Building Services supervisor in Frick Chemistry Laboratory, demonstrates the device.

Figure 6: Total Waste (Including Recycling) Generated



From 2006 to 2010, overall campus landfill waste decreased by 13 percent.

Figure 7: Total Waste (Including Recycling) During 20 Days of Year-End Activity

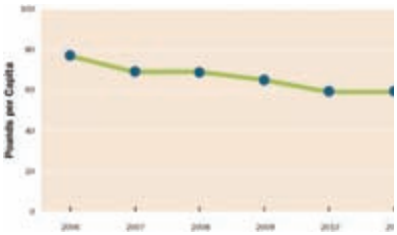


Figure 7: Total Waste (Including Recycling) During 20 Days of Year-End Activity

- Donation collection sites for student move-out have expanded from six in 2008 to 19 in 2011 with the continuation of four "super sites" accepting furniture, clothing, school supplies, books, and unopened food and toiletries.

Strategy: Increase reuse and recycling options for items including electronics, office furniture and dorm mattresses.

Progress:

- The University's "Surplus Program," coordinated by the Purchasing Department to facilitate reuse and recycling, resulted in about 21 percent of discarded furniture, electronics and other specialized equipment being donated, reused or sold in the past fiscal year.
- A dorm mattress recycling program was introduced in spring 2011. The program is expected to result in approximately 400 mattresses — more than seven tons — being recycled each year.
- "Curb-side" electronics recycling was expanded to the student body for items including computers, televisions, cell phones, MP3 players, PDAs and other peripherals.
- A total of 41 percent of printer toner cartridges were recycled in fiscal year 2011, a slight decrease from the previous year, when 43 percent were recycled, but an increase from the 2009 fiscal year, when 32 percent were recycled. *(Due to an increase in the estimate of toner cartridges per bin ordered, the percentage of toner cartridges recycled in fiscal year 2010 was adjusted from 35 percent to 43 percent.)*

Strategy: Recycle food waste, including cooking oil.

Progress:

- Currently, all of Princeton's food waste — 1,116 tons in 2010 — is recycled by a local pig farmer.
- Dining Services, Building Services and the Office of Sustainability evaluated a food waste dehydration system at Forbes College. The system proved too challenging to adopt due to cost, energy use and sanitary issues related to utilizing dehydrated meat waste. Other options continue to be evaluated.
- 100 percent of waste frying oil produced by Dining Services in the 2011 fiscal year (2,665 gallons) was recycled into biodiesel off site (see Figure 4). Between fall 2009, when the collection program began, and spring 2010, 70 percent, or 1,901 gallons, of collected waste oil was recycled.

Strategy: Employ a 95 percent construction debris recycling policy and encourage a greater percentage of recycled debris on large projects.

Progress:

- The Office of Design and Construction took steps this past year to apply the University's 95 percent construction debris recycling policy for major projects to smaller projects, by identifying potential local waste/recycling haulers.

Goal: Reduce overall chemical usage in building maintenance.

Strategy: Transition to "blue-cleaning" equipment that cleans with water to reduce the need for cleaning chemicals.

Progress:

- The total volume of cleaning chemicals purchased decreased by 30 percent between fiscal year 2010 and 2011.
- Over the past year, four additional ionizing floor cleaning machines and five additional hand-held ionizing spray bottles were purchased, bringing the totals to nine floor cleaning machines and 11 spray bottles. The equipment, used for general purpose cleaning, uses ionized water instead of cleaning chemicals.
- A new device, the Orbio 5000-Sc, was installed in the Frick Chemistry Laboratory on a pilot basis. The Orbio converts water and salt to a nonchemical safe cleaning agent and degreaser.

What's Next

Short Term

- Continue to evaluate on-site food waste recycling alternatives, including composting.
- Devise a new tracking method to better quantify the amount of food waste generated per capita.
- Increase donation opportunities through the University's Surplus Program.
- Increase move-out donation options for items including clothing, food, toiletries, school supplies and books, and create donation opportunities during move-out at graduate housing sites.
- Pilot automatic hand dryer systems and carry out a cost-benefit analysis.
- Place recycling receptacles for bottles and cans in specific dormitory rooms.
- Develop a program to promote the purchase of remanufactured toner cartridges and the recycling of toner cartridges.
- Assemble a cross-departmental team to expand the "Print Less" initiative.
- Monitor the efficacy of the Orbio cleaning system and consider implementing it in other large campus buildings.
- Consolidate all campus food waste into one centralized container by 2012. Anticipated benefits include reduced truck traffic on campus, and increased feasibility of implementing an on-site composting operation with reusable end-products.
- Evaluate a proposal for the elimination of 65 dumpster sites on campus in favor of centralized compactor locations. Anticipated benefits include increased campus green space, improved local air quality with transition to electric transport vehicles, reduced road maintenance, and reduced heavy load sanitation trucks from the current five to three by 2012 with anticipated reduction in fuel use by 40 to 50 percent.

Long Term

- Pilot a single-stream recycling program and compare it with the existing sorting system to determine if there is resulting behavior change and increased recycling rates.

Landscape Stewardship

Introduction

The landscape of Princeton's campus always has been a defining element of its identity and experience. The Landscape Master Plan, a part of the 10-year Campus Plan, collaborates with the Sustainability Plan in envisioning a landscape that will continue to be experientially rich and simultaneously more sustainable, versatile and functional.

Goals, Strategies & Progress

Goal: Create a vibrant and sustainable landscape.

Strategy: Enhance green space with new plantings and local soils as needed and restore selected woodlands.

Progress:

- In the past year, more than five acres of woodlands were restored along Washington Road and the Boathouse Walk, and roughly four acres of green space were reconstructed along Shapiro Walk, the Sciences Green and the Ellipse. In total, 215 new trees and 197 new shrubs were planted.
- All University plantings are selected for their appropriateness in Princeton, N.J.'s, hardiness zone, as defined by the U.S. Department of Agriculture. Additionally, plantings are informed by soil and watering requirements and proven ability to flourish in this campus environment.

Strategy: Minimize the use of synthetic fertilizers and pesticides.

Progress:

- Synthetic fertilizer use decreased to approximately 2 tons this past year on the 635 acres of campus managed by the grounds and building maintenance department. This reflects a 20 percent reduction from the 2.5 tons used per year since 2008, and a 50 percent drop from the average of 4 tons used annually over the last decade.
- Pesticide use (herbicides, insecticides and fungicides) on campus has decreased from more than 5,000 gallons in 2007 to slightly more than 1,500 gallons in 2010. As part of the University's integrated pest management (IPM) program, a variety of beneficial insects and larvae were released this past year, including approximately 30,000 rove beetles, 228,000 convergent lady beetles, 6,400 green lace-wing larvae, 2,000 spider mites and 220,000 microscopic wasps.
- A pilot test using compost in place of fertilizer is being carried out in the south courtyard at Whitman College in an effort to increase the organic matter and, in turn, improve water retention and reduce the need for additional soil inputs.

Strategy: Create compost from campus leaves, landscape trimmings and construction site topsoil when available, and reuse for landscape projects in an effort to enhance and restore local soil quality.

Progress:

- Nearly 100 percent of the leaves and landscape trimmings collected on campus are composted. Since 2008, an average annual volume of more than 4,400 cubic yards of "green waste" was composted — enough leaves and trimmings to cover nearly three acres one foot thick.
- More than 1,500 cubic yards of soil excavated from campus construction sites in the past year was mixed with the University's compost, as well as on-site sand, and turned into a high-quality topsoil for reuse in ongoing landscape projects.

Strategy: Improve the campus network of bicycle paths and walkways and promote walking and biking as a means of transportation.

The new Boathouse Walk provides a pedestrian/bicycle link between Faculty Road and South Drive (near Icahn Laboratory). Three acres of adjacent woodlands were restored by removing invasive species, adding new topsoil and planting 34 trees.

Progress:

- To encourage walking and biking, nearly a mile of paths and walkways was added to the campus in the past year, contributing to a total of about 55 miles (see sidebar). The new walkways suitable for bikes include those constructed at the Sciences Green, from the Elm Drive Circle to the Boathouse on Lake Carnegie, and on a portion of Faculty Road.
- Future sidewalk extensions were also approved for Faculty Road, Washington Road, FitzRandolph Road, Western Way and Broadmead Street.

Strategy: Implement a wayfinding program to direct motorists and pedestrians to their destination by the most efficient means possible.

Progress:

- A bicycle circulation plan is being implemented to better connect the campus to the surrounding streets and roads. The plan includes marking bike routes shared with vehicles through the use of "sharrow" (share arrow) symbols on the pavement, and new dedicated bicycle lanes on a portion of Washington Road.
- Signs for building identification, pedestrian and vehicular wayfinding, and parking information were designed, and applications for regulatory approvals for the vehicular signs were subsequently filed. Signs are expected to be put in place during the 2012 fiscal year.

What's Next

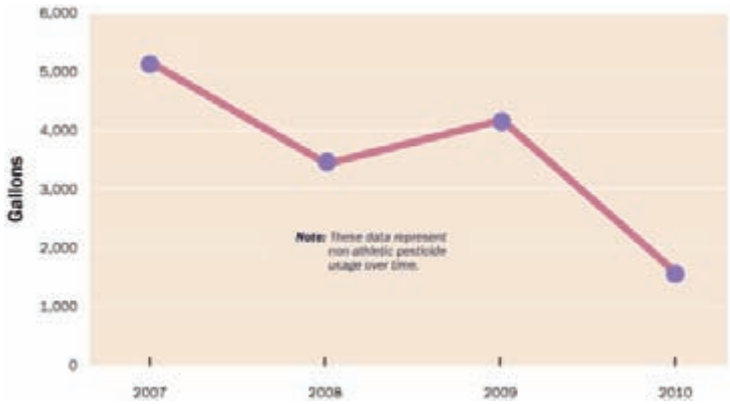
Short Term

- Complete restoration of four acres of woodland as part of the Washington Road stream project.
- Complete restoration of Blair Walk and sidewalk extensions for Faculty Road, Washington Road, FitzRandolph Road, Western Way and Broadmead Street.
- Carry out a pilot test of porous asphalt on a portion of the Frick Nature Trail.
- Secure regulatory approvals and execute the manufacture and installation of 38 vehicular signs as part of the wayfinding program.
- Continue to pursue the bicycle circulation plan and implement it as approved.
- Explore alternative fuels for maintenance equipment and continue to reduce the impact of maintenance operations.
- Track irrigation water usage.
- Track the use of fertilizers and pesticides by athletics and landscape subcontractors.

Long Term

- Continue pursuing projects as guided by the Landscape Master Plan within the Campus Plan, including implementing long-term walkway and open space enhancements and the campus wayfinding program, and formulating a new list of landscaping projects.
- Complete prototypes for the remaining sign types and file applications for regulatory approvals as needed as part of wayfinding program.
- Maximize the on-site top soil reuse program so that all soils stay on campus.
- Continue to track changes in green space and permeable surfaces.
- Implement projects recommended in Princeton's campus lighting guidelines (in development), which stresses that outdoor lighting should be consistent with U.S. Green Building Council LEED standards.
- Develop a Reunions protocol for site use (flooring systems, etc.) to include in the future Green Reunions Guide.

Figure 10: Pesticide Use



The use of pesticides (herbicides, insecticides and fungicides) on campus has decreased from more than 5,000 gallons in 2007 to 1,500 gallons in 2010. (Usage represents diluted volume versus active ingredients; in 2009, usage increased significantly due to treating an outbreak of Dutch elm disease; figures do not include use for athletics facilities.) Click to enlarge.

Domestic Water Conservation

Introduction

New Jersey frequently suffers from both surface-water and groundwater drought conditions. Princeton University takes its responsibility to conserve domestic water very seriously at all times, even during non-drought conditions, and whenever possible integrates water conservation efforts with its overall landscape and stormwater management programs

Goals, Strategies & Progress

Goal: Reduce overall campus water usage.

Strategy: Ensure that water-saving measures for building and landscape design are considered for all new construction and renovations. Investigate and monitor new methods for water conservation.

Progress:

- Overall campus water usage was approximately 13 percent lower in fiscal year 2011 than in fiscal year 2006.*

**NOTE: The baseline year has been updated to fiscal year 2006 from 2001 to better track changes that took place following the adoption of the Sustainability Plan in fiscal year 2007, and to conform with the requirements of the Sustainability Tracking and Rating System, a self-reporting framework for colleges and universities to measure their sustainability performance developed by the Association for the Advancement of Sustainability in Higher Education. Residence hall water data also continues to be refined to reflect more accurate usage, resulting in updated totals from those reported last year. Little Hall water data is not accounted for due to a meter issue.*

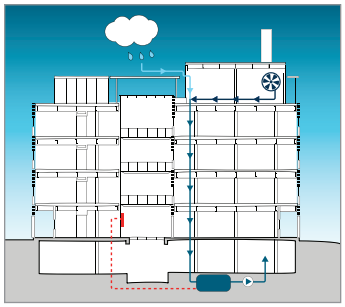
- When compared with 2010, water usage increased by about 21 percent, likely due to an increase at the central plant (cogeneration and chilled water), which uses water in direct proportion to the amount of energy provided for heating and cooling. Both campus heating and cooling demands were significantly greater in fiscal year 2011 than in fiscal year 2010, as a result of severe weather (more cold or hot weather for longer than average periods of time) and new buildings opening (see Figure 11).

Strategy: Reduce water usage in the residence halls by installing efficient fixtures and appliances and transitioning to tray-free dining.

Progress:

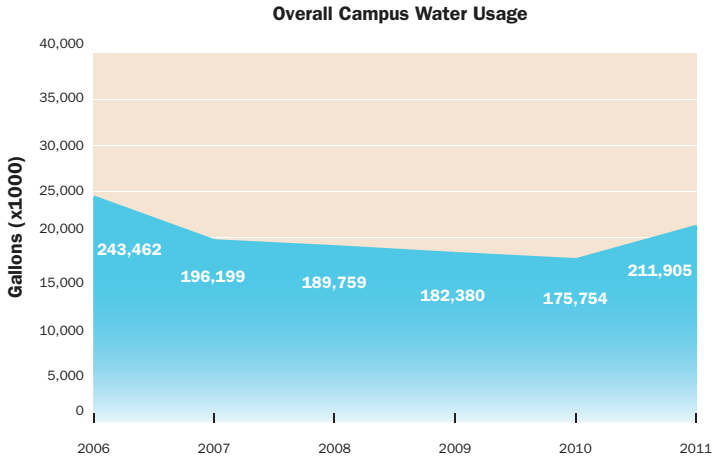
- Water usage in all residence halls continued to decline in fiscal year 2011.* Compared to 2010, usage was down by about 5 percent, or nearly 2 million gallons. In the past five years, residence hall water usage has dropped by more than 30 percent, or nearly 18 million gallons, due to the installation of low-flow fixtures and efficient clothes washing machines, among other water-saving measures (see Figure 12).
- In addition to having low-flow fixtures standard in all residence halls on campus, Princeton has continued to install low-flow aerators and low-flow shower heads in off-campus graduate housing units, such as the Lawrence Apartments.
- High-efficiency washing machines, which use 40 percent less water than standard machines, are now installed in all undergraduate dormitory laundry rooms — a four-year project that was completed in summer 2011. Associated water-savings is anticipated to be greater than 500,000 gallons each month, based on 35,000 washing machine cycles per month.

Figure 13: Water Collection at Frick Chemistry Laboratory



This drawing of the Frick Chemistry Laboratory shows how rainwater is collected on the roof of the building, and condensate is collected from mechanical systems in the "penthouse." The water is stored underground in a 12,000-gallon cistern, and is treated and reused for toilet flushing through high-efficiency, automatic flush valves. Data on stormwater and condensate collection and usage is then analyzed and fed to a video display in the atrium, along with data on photovoltaic panel production and fume hood energy consumption.

Figure 11: Overall Campus Water Usage



Campus water usage decreased by 13 percent between 2006 and 2011.

- Dining Services has successfully implemented "tray-free" dining in all dining halls. This measure has the potential to reduce water and energy costs by $4,000 per year.

Strategy: Reduce water usage in academic and administrative buildings by installing efficient fixtures and equipment as well as rainwater storage and reuse systems.

Progress:

- A microfiber cleaning cloth program that employs reusable cloths that clean more effectively with less water than conventional methods was introduced this past year at the Frick Chemistry Laboratory. A significant reduction in water usage is anticipated.
- A rainwater and condensate collection system at the Frick Chemistry Laboratory has provided enough water for all toilet flushing needs since the building opened in fall 2010, reducing building water usage.

Strategy: Reduce water usage associated with campus heating and cooling.

Progress:

- A new "PowerPure" water treatment system is being piloted at the Baker Rink cooling tower to cool the rink ice. This system uses an electronic process rather than chemicals to remove dissolved solids from evaporated water. The system annually will save more than an estimated 140,000 gallons of water. Because the discharge water is chemical-free, it may be clean enough to release to surface water instead of the sanitary sewer system, further reducing costs.

Strategy: Track and reduce potable water use for irrigation.

Progress:

- A pilot test using compost in place of fertilizer is being carried out in the south courtyard at Whitman College in an effort to increase the organic matter and, in turn, improve water retention and reduce the need for additional soil inputs.

What's Next

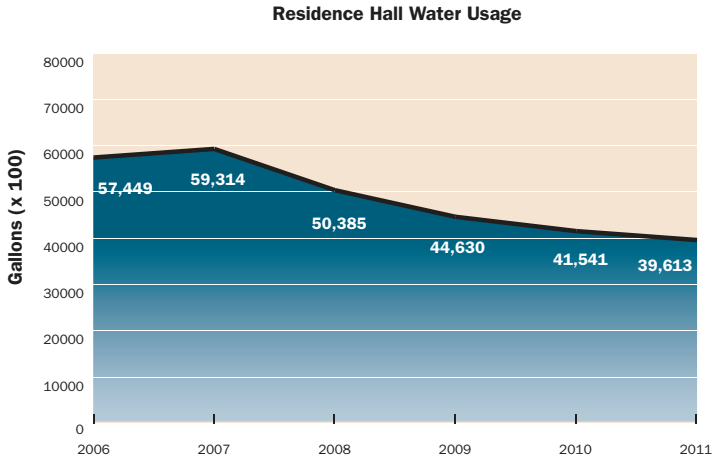
Short Term

- Expand the microfiber cleaning cloth program to Butler College, Jadwin Hall and Fine Hall.
- Implement the PowerPure system at the new High-Performance Computing Research Center.
- Track water usage reduction resulting from the rainwater collection system at the Frick Chemistry Laboratory.
- Compile and track installations or low-flow fixtures and aerators.
- Support behavior-changing water conservation initiatives through student organizations such as the EcoReps and Greening Princeton.
- Continue to assemble and track data indicating the acreage of areas planted with drought-resistant or native varieties.

Long Term

- Complete low-flow bathroom fixture replacements in athletic facilities, and academic and administrative buildings.
- Continue to evaluate drought-tolerant lawn species.

Figure 12: Residence Hall Water Usage



Residence hall water usage has dropped by more than 30 percent over the past five years.

Stormwater Management

Introduction

Consistent with the University Campus Plan, the Sustainability Plan proposes an ambitious program of integrated landscape and stormwater management that reduces demand for purchased water by capturing and using rainwater, and helps to preserve the regional watershed by reducing erosion and minimizing stormwater-related pollution.

Goals, Strategy & Progress

Goal: Manage stormwater events with an integrated campuswide ecosystem approach.

Strategy: As part of the University's Campus Plan, implement stormwater management practices, including rain gardens, rainwater harvesting tanks, porous paving, green roofs, and others to promote on-site stormwater retention and improvement of stormwater quality prior to entering streams and the lake.

Progress:

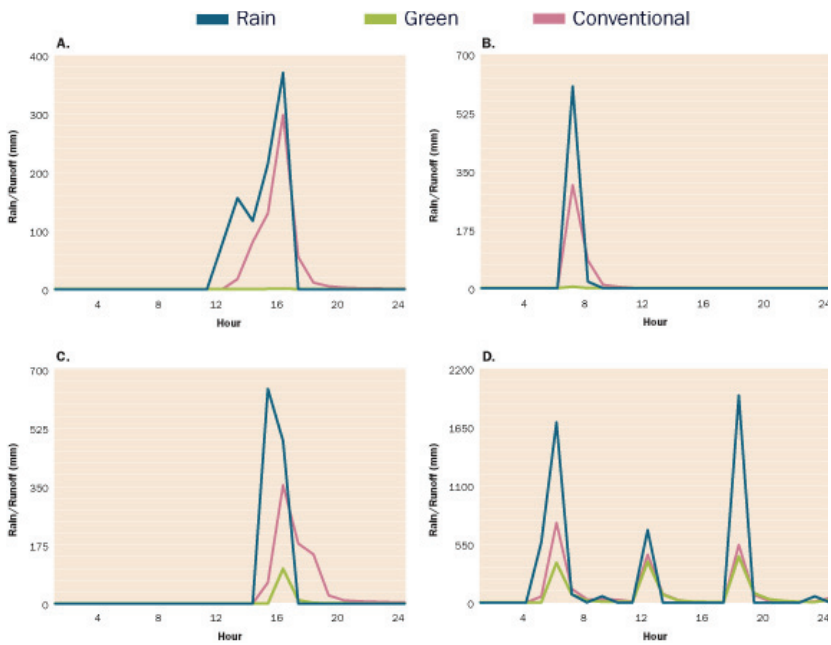
- The following stormwater management practices were integrated into the Frick Chemistry Laboratory and its surrounding landscape:
  - A former 124-space parking lot and adjacent area along the Washington Road stream corridor was restored to a green space by expanding and enhancing a woodland buffer along the stream, and removing a source of pollution discharging into the stream.
  - Three bioretention basins, or rain gardens, were constructed that treat about half of the stormwater that runs off of the building's rooftop and the project's impervious site areas.
  - The remaining rooftop runoff is directed to an underground 12,000-gallon rainwater harvesting tank, which supplements the building's toilet flushing demand.
  - On an annual basis, the Frick stormwater management project is estimated to reduce the volume of stormwater discharge by 583,270 gallons through the greening of the site, with an additional 582,860 gallons of stormwater estimated to be reused annually for toilet flushing, equating to more than 1.1 million gallons of stormwater retained on-site annually.
- Real-time performance data from the Butler College green roofs are continuing to be monitored by faculty and students (see graph below). Mathematical modeling of total stormwater mitigation of the green roof across various storm type events is under way. In most cases, the green roof is delaying, lowering the rate and reducing the volume of stormwater runoff, compared to the conventional roof.

What's Next

Short Term

- Develop a monitoring program in partnership with academic programs to test the Frick Chemistry Laboratory bioretention basins for actual performance in filtering and retaining stormwater.

Figure 16: Stormwater Mitigation

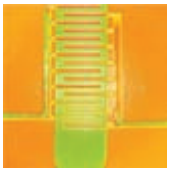


Stormwater Mitigation: These graphs show stormwater drainage from conventional (red line) and green (green line) roofs on the University's Butler College dormitories during a light rain event (360mm) in Graph A, medium rain events (600-650mm) in Graphs B and C, and a heavy rain event (1,900mm) in Graph D. In most cases, the green roof delayed, lowered the rate and reduced the volume of stormwater runoff, compared to the conventional roof. As demonstrated by Graph D, which shows three sequential rain events and varied levels of stormwater retention by the green roof, the success of the green roof in stormwater mitigation is directly related to soil moisture content before the rain event. "We continue to collect data for rain and stormwater runoff as well as soil moisture and thermal parameters, and are currently working on mathematical modeling of total stormwater mitigation of the green roof across various storm type events in collaboration with Nitsch Engineering Associates," said Eileen Zerba, senior lecturer in ecology and evolutionary biology, who provided the data for these graphs.

- Enhance the campus stormwater plan with guidelines for managing stormwater on small and infill sites.
- Complete the Washington Road stream restoration.
- Study impact of Washington Road stream restoration on local water quality, and during peak runoff events.
- Install real-time green roof performance data at the electronic building performance dashboard in Butler College.
- Assemble and analyze data on Frick Chemistry Laboratory rainwater and condensate collection.

Long Term

- The Neuroscience and Psychology complex will feature reduction of impervious surface by more than 10 percent, a stormwater reclamation system for nonpotable use, as well as permeable pavement and rain gardens.
- Consider implementing the following proposed stormwater strategies:
  - Hibben-Magie: reduction in impervious area; use of amended planting soil that will increase porosity of the topsoil and reduce surface runoff; rain gardens and bioswales.
  - Andlinger Laboatory: green roofs; use of amended planting soils that will increase porosity of the topsoil and reduce surface runoff; biofiltration; rainwater harvesting; and permeable paving materials.

Research, Education & Civic Engagement

Overview

Princeton is uniquely positioned to advance research and public discourse on environmental, ecological, social and economic sustainability on campus, in the local community and across the nation. Faculty research and teaching — including initiatives that engage the campus as a laboratory for new ideas — will reap exponential environmental benefits. Investments in research and education are arguably the most effective way that Princeton can use its resources to make a global impact. By engaging students in sustainability research and other environmental initiatives, the University aims to prepare them for lives of leadership and active civic engagement in a time when such commitment is critical to achieving a sustainable future. Princeton also aims to promote sustainable practices among all University and community members through education and communication and by example.

The strategies employed to reach the goals are included in the following four priority areas:

- **Research & Education:** Broaden and increase interdisciplinary academic and research opportunities in sustainability in graduate and undergraduate education; instill awareness in students regarding their responsibilities as global citizens through international study, research and service; support research endeavors that use the campus as a laboratory, linking operational and academic departments.
- **Student Initiatives:** Facilitate peer-to-peer collaboration among environment- and sustainability-focused student clubs and through the Princeton Environmental Network (PEN); foster student-run residential college initiatives in sustainability; encourage diverse student-generated sustainability services, outreach and events, and maintain a dedicated calendar for those activities.
- **Campus Programs:** Raise sustainability awareness through outreach, events and campus tours; develop and facilitate a Universitywide "Drink Local" initiative to encourage tap water consumption across campus; coordinate the awarding of sustainability grants from the High Meadows Foundation; develop and facilitate a staff Sustainability Ambassador Program; establish research apprenticeships and employment opportunities for students and postgraduates in the Office of Sustainability; build environmental consciousness among incoming students through the Outdoor Action and Community Action programs.
- **Communication:** Publicize campus sustainability news and events through the offices of Sustainability and Communications; create opportunities for members of the campus and broader community to share knowledge and engage with Princeton sustainability initiatives; participate in core higher education leadership groups to share knowledge on successful sustainability strategies; facilitate the Student Environmental Communication Network.

Craig Arnold (center), an associate professor of mechanical and aerospace engineering, leads a freshman seminar, "Science and Technology for a Sustainable Future," in which students learn about opportunities and challenges related to the development of sustainable technologies.

Research & Education

Introduction

Through courses, independent study, internships and discussion forums, Princeton aspires to connect the academic experience to sustainability research and the inner-workings of the campus.

Goals, Strategies & Progress

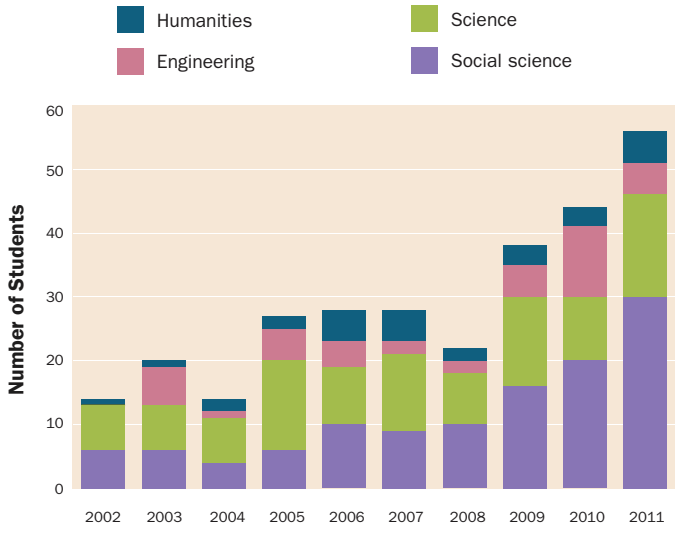
Goal: Develop leaders among students to advance global sustainability.

Strategy: Broaden and increase interdisciplinary academic and research opportunities in sustainability in graduate and undergraduate education.

Progress:

- A total of 192 registered undergraduates representing 19 academic disciplines participated in the Program in Environmental Studies in 2011, up from 162 undergraduates in 2010. Fifty-seven undergraduates received environmental studies certificates in 2011, up from 45 in 2010 and quadruple the number in 2002 (see Figure 16).
- Princeton currently offers 60 unique undergraduate and graduate courses among four academic areas that address sustainability by exploring some aspect of the intersection between the environment, economics and society (see Figure 17).
- During the 2010-11 academic year, eight Ph.D. candidates participated in the Princeton Environmental Institute (PEI) Program in Science, Technology and Environmental Policy. This program provides fellowship support for students to develop the environmental policy dimension of their graduate theses. A total of 49 students have enrolled since the program's advent in 2000.
- A new accelerated environmental certificate track is being developed for undergraduate students pursuing science, policy and engineering disciplines. The new curriculum will launch in 2012.
- In 2011, the University's Council on Science and Technology committed funds to support the development of two laboratory modules involving "real-world" applications for two "Fundamentals of Environmental Studies" courses, ENV 201 and ENV 202.
- Students, leading scholars and guest speakers participated in 11 dinner discussions in the past year held under the auspices of the Environmental Affairs Forum. Twenty-seven such discussions have taken place since the forum was initiated in 2009.
- The Princeton Energy and Climate Scholars Program, made up of eight prominent faculty members and 12 nominated Ph.D. candidates, met twice per month for conversation on energy and climate issues in 2010-11. Since the program's inception in 2008, 14 faculty and 28 Ph.D. candidates have participated.
- Students met weekly for dinner during the 2010-11 academic year to discuss current issues in sustainable energy at an "Energy Table" at Mathey College, a forum initiated in 2009.
- A new professorship in environmental studies and the humanities has been established with appointment targeted for 2016.
- About 20 percent of graduating seniors in 2011 participated in PEI's undergraduate program during their four years at Princeton, including combined experiences pursuing certificates, coursework, internships and independent research.

Figure 16: Home Departments of Environmental Studies Certificate Students



The number of students who have received the environmental studies certificate and their majors from 2002 to 2011.

Strategy: Instill awareness in students regarding their responsibilities as global citizens through international study, research and service.

Progress:

- During the 2011 summer PEI/Grand Challenges season, 111 Princeton undergraduate students from 22 majors interned in 21 countries around the globe, researching and working to address a variety of environmental- and sustainability-related topics. In total, the Grand Challenges program has sponsored 402 undergraduates on internships since the program's inception in 2007.
- The Summer of Learning (SOL) colloquia, in which students share from their summer internship experiences, was established in 2008 in order to provide forums for information exchange about global environmental challenges.

Strategy: Support research endeavors that use the campus as a laboratory, linking operational and academic departments.

Progress:

- Since 2008, assisted by the High Meadows Foundation Sustainability Fund, the Princeton Sustainability Committee, together with the Office of Sustainability, has awarded support for 11 often multiyear faculty research projects, and 37 grants to students and staff, to investigate sustainability solutions using the campus as a laboratory. Each faculty research project has engaged undergraduate and graduate student research teams.
- A new listing of more than 60 research opportunities has been compiled for potential junior paper, senior thesis and graduate research studies to assist students who wish to explore and advance sustainability using the campus as a laboratory. The information has been posted on the Office of Sustainability website and will be the focus of an event sponsored by the Princeton Sustainability Committee for faculty in fall 2011.
- In fall 2011, Elie Bou-Zeid, an assistant professor of civil and environmental engineering who conducts research on how local environments affect and are affected by the global climate, was named academic co-chair of the Princeton Sustainability Committee.

What's Next

Short Term:

- Work with faculty to more specifically define what a sustainability-focused or -related course is.
- Enhance "Fundamentals of Environmental Studies" courses, ENV 201 and ENV 202, and expand community research dimension.
- Continue to develop ongoing financial support for research fellowships, course-related fieldwork, internships and undergraduate research.

Long Term:

- Continue to define the role of sustainability in the existing University curriculum, both graduate and undergraduate, and explore how to develop a more cohesive curriculum around the environment and sustainability.
- Continue to investigate metrics to track the broad influence of Princeton faculty research on societal-scale sustainability progress.
- Develop courses at the intersection of the environment and humanities; appoint a new faculty chair in environmental studies and the humanities with appointment targeted for 2016.
- Establish an annual call for proposals to encourage faculty to redirect research to target areas and develop courses and opportunities for mentoring undergraduate and graduate students; recruit faculty scholars in target areas.

What's Next

- Work with faculty to define specifically what a sustainability-focused or -related course is.
- Investigate metrics to track the broad influence of Princeton faculty research on societal-scale sustainability progress.
- Define the role of sustainability in existing University curriculum, both graduate and undergraduate, and explore how to develop a more cohesive curriculum around environment and sustainability.

Elie Bou-Zeid, an assistant professor of civil and environmental engineering, is using the Princeton campus as a base to study how local environments affect and are affected by the global climate. He is standing here in front of a meteorological station that is part of the wireless sensor network deployed across campus to monitor the microclimate of Princeton. Bou-Zeid was named academic co-chair of the Princeton Sustainability Committee in fall 2011. Read a story and view a video about his work.

Student Initiatives

Introduction

The number and reach of environmental student groups inspired the formation of the Princeton Environmental Network (PEN) in 2006. Organized by the Office of Sustainability, PEN strives to coordinate across the broad span of environmental initiatives addressed by Princeton's student leaders and groups to effect lasting change on the Princeton campus.

Goals, Strategies & Progress

Goal: Encourage campuswide student initiatives in sustainability.

Strategy: Facilitate peer-to-peer collaboration among environment- and sustainability-focused student clubs and through PEN.

Progress:

Since 2006, the Office of Sustainability has coordinated biweekly PEN meetings for all leaders of environmental- and sustainability-focused student clubs and organizations. Representing more than 1,000 Princeton students, groups currently active in PEN include:

- BEE Team
- Ecology Representatives (EcoReps)
- Energy Service Corps
- Engineers Without Borders (EWB)
- Environmental Discourses on the Ingestion of Bugs League (EDIBL)
- FoodTASK
- Garden Project
- Graduate Student Government (GSG) sustainability representatives
- Greening Dining
- Greening Princeton
- Greening Princeton Farmers Market
- Greening the Street
- Outdoor Action (OA)
- Princeton Sustainability Committee (PSC) undergraduate and graduate student representatives
- Slow Food Princeton
- Student Environmental Communications Network (SECN)
- Students in Free Enterprise (SIFE)
- Students United for a Responsible Global Environment (SURGE)
- Students Working for Free Trade (SWIFT)
- U-Bikes and CycLab bike co-op
- Undergraduate Student Government (USG) Sustainability Working Group

Cross-club collaborations fostered by PEN include:

- USG sustainability survey and pledge
- 350 Day (International Day of Climate Action)
- Earth Day Extravaganza

Strategy: Foster student-run residential college initiatives in sustainability.

Progress:

- The recruitment and engagement of undergraduate student ambassadors for recycling and resource conservation in the residential colleges — the EcoReps — has continued. Under the sponsorship of the Office of Sustainability in partnership with Building Services and the student-based PEN during the past three years, there have been consistently more than a dozen active EcoReps.
- Student-run residential hall-focused sustainability initiatives have included a water filter carafe sale, end-of-the-year move-out collection sites and subsequent redistribution of unused school supplies, plastic bag collection bins, the Pull the Plug Campaign, and RecycleMania.

Strategy: Encourage diverse student-generated sustainability services, outreach and events, and maintain a dedicated calendar for those activities.

Progress:

- Building on past efforts to "green" Reunions, in 2011 the EcoReps, in collaboration with the Alumni Association and Building Services, expanded their efforts to promote recycling from two to 11 Reunions sites and developed a pilot program to educate Reunions cleanup crews to further increase recycling rates. The number of recycling receptacles along the P-rade route has also doubled since 2009.
- During spring 2010, the EcoReps launched a pilot residential education program in Rockefeller College on sustainability with the support of college administrators to educate freshmen. This program continued in 2011. The sustainability residential education program is now offered on the list of optional programs for all residential colleges in both fall and spring semesters.
- Students collaborating through the PEN group launched the fourth annual Earth Week Fest in 2011 and organized campus events around 350 Day (International Day of Climate Action).

Student environmental clubs and organizations are essential partners in the University's ongoing Sustainability Plan. Watch a video about the students involved in Princeton's sustainability efforts.

- Since 2009 the U-Bikes and CycLab co-op programs have organized and/or participated in numerous events, including the Greening Princeton Farmers Market, Sunday CycLab Workshops, the annual campus bicycle safety event and the FNA 2K11, a mini-bike race to raise awareness of bicycling as a green form of transportation.
- Greening Princeton hosted its third annual 5k fundraising run for the local Stonybrook-Millstone Watershed Association. The 2010 race raised more than $600 for the watershed association.
- The Energy Service Corps student group, in partnership with New Jersey Public Interest Research Group (NJPIRG), conducted a number of in-home energy audits for local community members.
- The Princeton Garden Project continues to provide fresh herbs and produce to Dining Services from three gardens on campus: one near Frist Campus Center and two near Forbes College.
- The Food Justice Foundation, a new nonprofit started by Princeton students to address problems of food access in the inner city, led a panel on "Food Access and Health in the Urban Context" in partnership with the Pace Center for Civic Engagement.
- The Office of Sustainability hosts the University's only centralized public calendar for all sustainability-related meetings and events, including student organization meeting times.
- In spring 2011, SURGE led its second student delegation to Power Shift, a clean energy conference in Washington, D.C. About 50 student leaders participated in both the 2009 and 2011 trips.
- The Environmental Discourses on the Ingestion of Bugs League (EDIBL) held two dinners in the 2010-11 academic year. The initiative, founded in April 2010, strives to create awareness about alternative sustainable food systems through intimate dinner events that challenge culturally accepted notions of taboo foods, and by educating people about the critical role that insects play in food systems globally.

What's Next

- Publicize PEN meetings and sustainability events through the sustainability kiosk to be installed in Frist Campus Center in 2011-12.
- Conduct the University's first LED bulb exchange program for students.
- Encourage the reduction of food waste on campus through student-led pledges and events.
- Increase student involvement in global/national climate change and sustainability campaigns.
- Explore new common student advertising/promotional spaces as an alternative to postering on campus to reduce waste.
- Update the Guide to Living Green at Princeton.
- Develop a venue for students to present their initiatives and research using the campus as a laboratory for sustainability problem-solving.
- Expand community outreach activities, such as student involvement in the biennial campuswide Sustainability Open House.
- Offer student-led Campus Green Tours.

Campus Programs

Introduction

A number of nonacademic campus programs promote and provide support for sustainability, including the Office of Sustainability, Outdoor Action and the Pace Center for Civic Engagement. A unifying goal for these programs is to introduce campus community members to the principles of sustainability and opportunities for action and engagement.

Goals, Strategies & Progress

Goal: Promote sustainable practices among University community members through education and by example.

Strategy: Raise sustainability awareness through outreach, events and campus tours.

Progress:

- In fall 2010, the Office of Sustainability partnered with several other offices to produce its second biennial Sustainability Open House for the campus and local community. More than 40 campus and community groups staffed interactive displays and demonstrations to showcase their sustainability efforts to an audience of more than 500 participants.
- As part of the Open House, more than 30 teams from the community and University created art pieces from discarded materials for a Trash Sculpture Contest. The top works provided a visual centerpiece for the occasion and drew many local families to the event.

"Princeton University has instituted many green initiatives, and Reunions provides a great opportunity to connect with alumni about the positive impact they can have on the environment. Our team of EcoReps has facilitated Reunions recycling through education as well as providing more receptacles and clearer labeling at an increasing number of sites over the past few years."

—Jennifer Yeh, Class of 2012, EcoReps co-president

- The Office of Sustainability built upon its guided Green Tour launched in 2010 by developing a self-guided tour on the iPrinceton app. During 2011, six guided tours were offered upon request, including during the Ivy Plus Sustainability Committee and "She Roars" conferences. The online tour is currently available on the iPhone, and will soon be accessible on Android and Blackberry platforms.

Strategy: Develop and facilitate a Universitywide "Drink Local" initiative to encourage tap water consumption across campus.

Progress:

- Since 2009, the Office of Sustainability has distributed reusable water bottles free of bisphenol-A (BPA) to incoming freshmen with a "Drink Local" logo and campus map printed on the bottle indicating locations of campus bottle filling stations.
- More than 60 existing fountains and common room sinks across campus were retrofitted with water bottle filling spouts during the summer of 2011, bringing the campus total to more than 140 stations.
- The EcoReps held a successful "Drink Local" event in spring 2011 at Frist Campus Center in which they sold filters and pitchers to Princeton students for $1.

Strategy: Coordinate the awarding of sustainability grants from the High Meadows Foundation.

Progress:

- Since 2008, the Princeton Sustainability Committee, together with the Office of Sustainability, awarded grants to faculty, staff and students for research, education and civic engagement projects from the High Meadows Foundation sustainability fund.
- Moving forward, the fund will focus primarily on student projects that link campus-based initiatives with academic work including junior paper and senior thesis projects.

Strategy: Develop and facilitate a staff Sustainability Ambassador Program.

Progress:

- A pilot Sustainability Ambassador Program was carried out by the Office of Sustainability in partnership with the Facilities Organization to facilitate sustainability awareness and initiatives in the home offices of more than a dozen staff members in 2011. Based on feedback from the pilot year, the Office of Sustainability has established guidelines for campuswide implementation in 2012.

Strategy: Establish research apprenticeships and employment opportunities for students and postgraduates in the Office of Sustainability.

Progress:

- The Office of Sustainability has had more than 50 undergraduate coordinators over the past four years involved in projects including: Ecology Representatives (EcoReps); Garden Project; U-Bikes; CycLab bicycle cooperative; Student Environmental Communication Network (SECN); 2011 Sustainability Report; 2010 Sustainability Open House; Sustainability Plan working groups; Sustainability website; and YouTube, Facebook and Twitter pages.
- A one-year, full-time postgraduate fellowship funded by the High Meadows Foundation sustainability fund was filled in 2010-11 by a recent Princeton graduate interested in developing professional skills in the sustainability field.
- A new postgraduate fellowship in Energy Master Planning was created for 2011-12, funded by alumni support.

Strategy: Build environmental consciousness among incoming students through the Outdoor Action and Community Action programs.

Progress:

- Outdoor Action, the largest outdoor orientation program in the United States, enrolled 796 freshmen (60 percent of the class of 2014) from 40 countries in the pre-orientation program in fall 2010; 229 student trip leaders were trained in sustainability awareness. Trips included biking on back roads along the Chesapeake & Ohio Canal and the Great Allegheny Passage, canoeing on the Delaware River, backpacking and rock climbing on the Appalachian Trail, sustainable farming on local farms and more.
- A dozen incoming students participated in sustainability-related volunteer projects in fall 2010 through Community Action, a student-led pre-orientation program for freshmen. Environment-related volunteer sites included the D&R Canal, Honey Brook Organic Farm, Strawberry Hill Farm, Lawrence Nature Center, and the Stony Brook-Millstone Watershed Association. Community Action is sponsored by the Pace Center for Civic Engagement.

"The Sustainability Open House gave me a great overview of the huge variety of sustainability projects that are taking place all over campus. It was awesome to see that so many students and faculty are focused on sustainability, and I can't wait to see what's new at the next one!"

—Alexander Creely, Class of 2014

What's Next

- Expand campus Green Tour options for visitors and the campus community.
- Expand the staff Sustainability Ambassador Program into a campuswide endeavor by appointing sustainability leaders in additional administrative departments.
- Develop programs with the Office of Human Resources to begin to explore sustainability competencies as a component in performance evaluations and the learning and development curriculum.
- Continue the "Drink Local" educational campaign across campus by distributing reusable water bottles to incoming freshmen as part of a new "Sustainability Survival Kit" initiative.
- Create a venue coordinated by the Office of Sustainability and the Princeton Environmental Institute for High Meadows Foundation sustainability fund grant recipients to share their results.

Communication

Introduction

Communication is an essential tool for engaging the community, encouraging leadership and inspiring creative action. There is an increasing recognition that much of the educational value of sustainability initiatives is lost if the story is not told. Motivating engagement in sustainability depends on communicating both the challenges the University faces and the opportunities that are available to help address them.

Goals, Strategies & Progress

Goal: Expand the discourse about sustainability on campus, in the local community and across the nation.

Strategy: Publicize campus sustainability news and events through the offices of Sustainability and Communications.

Progress:

- The 2011 Sustainability Report is the third annual compilation of data available online for key audiences. Each report also is distilled in a four-page handout of highlights, and brought to the attention of media through a news release distributed by the Office of Communications.
- The University has signed on to the Sustainability Tracking, Assessment and Rating System (STARS), a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. The tool was developed by the Association for the Advancement of Sustainability in Higher Education with broad participation from the higher education community. Princeton will begin reporting its sustainability progress using STARS in 2011.
- The Office of Sustainability and the Office of Communications have begun the discovery phase of a process to build a new sustainability website that enhances and streamlines the management of information across multiple communications platforms; serves as a repository for data, events, reports, projects, funding proposal submissions and more; presents information in a well-organized, professional and enticing manner; and accelerates changes in personal and institutional habits, behaviors and perceptions by showcasing campus community initiatives, enhancing social networking, and improving access to timely, engaging, practical, and relevant sustainability information and resources.
- The Office of Communications has created a Sustainability Priority Project Team, designating key resources to devise and implement a communications strategy for University sustainability efforts.
- The Office of Sustainability began publishing a monthly e-newsletter, titled Sustainability News. The e-newsletter is distributed to students, faculty and staff and provides updates on all things related to campus sustainability.
- Lucid Design building performance touch-screen dashboards were installed in Frick Chemistry Laboratory and Butler College, providing access to performance data on green features such as green roofs, energy-efficient fume hoods and more.
- The Office of Sustainability created and maintains a public online calendar for campus-related sustainability meetings, events, lectures and other activities.

For the fourth summer in a row, the Office of Sustainability offered students a chance to learn audio and video production through the exploration of environmental issues in 2011. Two interns, Princeton senior John Votta and Ithaca College student Jessica Santos, filmed and edited multimedia projects with Student Environmental Communications Network (SECN) instructor David Benin (center), a media producer and Ph.D. candidate in the Department of Communication at the University of California-San Diego.

- The Office of Communications produced nearly 20 postings (stories, photos and videos) focusing on sustainability for the University home page that also were provided to media and used on the Princeton University Facebook page, Twitter feed, YouTube channel, and in the Princeton University Bulletin (faculty/staff newspaper), other University publications, and newsletters of academic programs. These pieces ranged from publicizing sustainability events sponsored by University departments that were open to the general public (including the second Sustainability Open House on Nov. 16, 2010, that drew more than 500 members of the campus and local communities); to profiling faculty members who are conducting research in sustainability; to highlighting the sustainability features in stories and media tours for new buildings opening or in design.

Strategy: Create opportunities for members of the campus and broader community to share knowledge and engage with Princeton sustainability initiatives.

Progress:

- In November 2010, the Office of Sustainability partnered with several other offices to produce its second biennial Sustainability Open House for the campus and local community. More than 40 campus and community groups staffed interactive displays and demonstrations to showcase their sustainability efforts to an audience of more than 500 participants.
- The Offices of Sustainability and the University Architect have partnered with a design firm and graphics firm to design a new interactive sustainability kiosk to be installed in the Frist Campus Center by 2012. Inspired largely by student interest, the kiosk will feature an exhibitor space, a Lucid Design building performance dashboard, a calendar of events, green tour information, video, demo space, unusual recycling opportunities and more.
- The Office of Sustainability built upon its guided Green Tour launched in 2010, by developing a self-guided tour on the iPrinceton app. During 2011, six guided tours were offered upon request, including during the Ivy Plus Sustainability and She Roars conferences. The online tour is currently available on the iPhone, and will be accessible on Android and Blackberry platforms soon

Strategy: Participate in core higher education leadership groups to share knowledge on successful sustainability strategies.

Progress:

- The Office of Sustainability hosted the Ivy Plus Sustainability Committee meeting in spring 2011. Thirteen schools in the consortium attended sessions focused on strategic planning and communications, sustainability as an important fundraising platform, and sustainability initiatives at Princeton.
- As a member of core higher education leadership groups, Princeton consulted and collaborated with peer institutions on developing and implementing successful sustainability strategies, especially through the Ivy Plus Sustainability Committee, the Northeast Campus Sustainability Consortium and the New Jersey Higher Education Program in Sustainability; best practices from these collaborations are informing the development of the sustainability field.

Strategy: Facilitate the Student Environmental Communication Network.

Progress:

- Since 2006, the Office of Sustainability has trained 39 students and interns through its Student Environmental Communication Network (SECN). Students have investigated the nuances of what is "green" and learned the research and technical skills needed to communicate them through podcast and video media.
- The SECN videos from the 2010 production season were featured at the Princeton Public Library's environmental film festival in spring 2011. Films produced during the 2011 production season will be featured in 2012.

What's Next

- Continue to document educationally valuable initiatives and community actions in sustainability to share with broader audiences.
- Continue to use SECN to increase the engagement of the undergraduate population with sustainability issues, and seek ways to integrate the program with academic objectives.
- Encourage various communications offices across campus to further develop stories for their audiences and to leverage their use for wider audiences.
- Collect campus-based stories from students, faculty and staff to capture efforts under way at both the personal and departmental levels that have not yet been documented.
- Continue to develop a dynamic new sustainability Web presence that will incorporate tools such as databases, metric-gathering instruments and social media.

In the News

In 2010-11, the Office of Communications worked with the Office of Sustainability and other campus partners to produce articles and videos for the University home page that also were provided to media and used in the Princeton University Bulletin (faculty/staff newspaper), Facebook page and newsletters of academic programs. Here is a collection of those postings:

November 2011

- Princeton continues progress on sustainability goals, enters new phase of plan
- Tackling tough questions about global environmental change

September 2011

- Campus sustainability efforts progress over summer and into fall
- Interns in Asia cultivate dialogue, address societal issues

August 2011

- PEI internships provide insights into environmental issues, students' futures

July 2011

- Video feature: Global lessons from Princeton's microclimate

June 2011

- Princeton Plasma Physics Laboratory wins environmental gold for green building

May 2011

- Class snapshot: 'Communicating Climate Change'

April 2011

- Facebook video: Earth Day Festival
- Facebook photo album on Princeton Environmental Institute intern KC Wade

February 2011

- Princeton to install powerful solar collector field

January 2011

- 'Air laser' may sniff bombs, pollutants from a distance
- State-of-the-art Frick Chemistry Lab, now open, advances new frontier of research

December 2010

- Celebrate Princeton Invention: Lynn Loo

November 2010

- Open house sustains green momentum
- Video: Sustainable sculpture contest winner
- Video: Sustainability at Princeton
- Carbon Mitigation Initiative receives $11 million through extended partnership with BP
- Princeton continues significant progress toward sustainability goals
- Making sustainable energy technologies come alive

Seven Princeton undergraduates spent this summer working with local organizations focused on sustainability as part of an internship program run by the Princeton Environmental Institute. Peter Smith (right), a rising sophomore at Princeton, worked this summer as an intern with D&R Greenway.

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Report on Sustainability 2011

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