UC Berkeley

Campus Sustainability Assessment

2005

UNIVERSITY OF CALIFORNIA, BERKELEY APRIL 2005

PREPARED BY THE CHANCELLOR'S ADVISORY COMMITTEE ON SUSTAINABILITY

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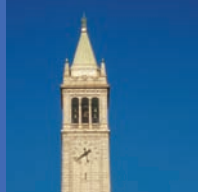


The challenge of sustainability – leadership, local action, global results

We stand at a unique point in history. For the first time on a global scale, we are experiencing limits to the Earth's resources, and recognizing a growing need to plot a more sustainable course into the future. Our apparent successes – growing economies and populations – threaten to undermine the basis of our survival in ways we have never before experienced. Climate change amidst calls for increased energy production, declining freshwater resources despite growing needs, loss of habitat and biodiversity while our reliance on ecosystem services is rising – these challenges are new and extreme. These are not simply "environmental" problems; they threaten our economy, our health, our way of life and our future.

Amidst this troubling news, however, we hear another refrain: the challenges present abundant opportunities. Tightening supplies of energy give us the chance to rethink the way we heat and cool our buildings, move goods and people, and create the built environment. Shortages of materials open the way for new thinking and innovative manufacturing to stretch resources farther than we thought possible. Degradation of natural ecosystems sets the stage for strategically rethinking and redesigning the way we live with and draw value from wetlands, farmland, forests, rivers and seas. Emerging models promise to make us healthier and more prosperous now, while preserving our natural capital for the future.

UC Berkeley is well positioned to take on the challenge of leading the way toward more sustainable practices. With a mission to deliver programs of instruction, research and public service of exceptional quality to the State of California, we now have the opportunity to develop these new ideas and practices in our labs and classrooms, and to utilize them amidst our operations. Where critical thinking, imagination, perspective and hard work are needed on behalf of the public good, we at Cal have a tradition of responding with vigor. As a respected member of our local community and a world-renowned research institution, we can both improve our local environment and be a role model for other institutions and communities.

The challenge of sustainability demands a global perspective, and we are a global institution, drawing students and researchers from around the world. The knowledge and wisdom that we develop here and disseminate worldwide are part of a global skill set used by organizations and individuals everywhere. Yet, we are also a local institution, a steward of local resources and a community member, and the path to sustainability requires adaptation to local constraints based on local assets. In a profound way, even the most severe global problems can only be solved with solutions that emanate from local actions.

Sustainability on campus, and beyond

To address these sustainability challenges, we must first define and measure them. This assessment is UC Berkeley's first-ever attempt to do so. Using nine systems (Energy; Water; Built Environment; Transportation; Purchasing & Waste; Land Use; Food; Health & Wellbeing; Academics & Culture) comprised of 32 indicators of sustainability, this report describes our performance, recognizes our recent accomplishments, and identifies potential opportunities.

We are not the first university to undertake a sustainability assessment, but are still clearly at the front end of an expected wave of similar studies. This report draws on lessons learned by the few preceding efforts of others, and incorporates new elements, contributing to a growing consciousness. We hope our effort will encourage still more colleges and universities to examine themselves with similar goals in mind.

We also expect our example to extend beyond the ivory tower. Already, *sustainability* is more than a buzzword among forward-thinking leaders in business and government – corporate and public-sector talk and action related to sustainability is growing quickly. Most importantly, as our graduates go on to become leaders in private and public organizations, our efforts to demonstrate more sustainable practices on campus will provide a model for our alumni to take initiative elsewhere.

Introduction

The story of this sustainability assessment

This assessment was conducted under the auspices of the Chancellor's Advisory Committee on Sustainability (CACS). Created by former Chancellor Robert M. Berdahl, CACS is comprised of a team of staff, faculty and students, charged with a mission of engaging the campus in an ongoing dialogue about working towards environmental sustainability, integrating environmental sustainability into existing campus programs, and instituting a culture at UC Berkeley of sustainable long range planning and design. This assessment is an important early project enabling CACS to serve as a more effective advisory body on institutional sustainability. Funding for the project was provided by former Chancellor Berdahl, and the assessment has enjoyed the continued support of current Chancellor Robert J. Birgeneau. Vice Chancellor for Facilities Services Ed Denton has provided ongoing staff support throughout.

The development of this assessment has itself been an extensive and highly collaborative process, involving students, faculty and over 70 staff members, many of whom exceeded their personal job responsibilities in a desire to help UC Berkeley better achieve its goals of resource conservation and environmental stewardship. Students in a Fall 2004 Energy and Resources course performed primary information gathering and initial writing. Three graduate students facilitated the course, coordinating information gathering while simultaneously creating a unique educational opportunity for the students. Staff in Capital Projects, the Office of Environment, Health and Safety, and Physical Plant-Campus Services supplied additional oversight, support and guidance, including the accompanying staff engagement process (described below). An outside consultant (coincidentally, also a Cal alum) provided additional assistance and expertise to both academic stakeholders and staff.

Action in parallel: a staff process underway

As this document goes to press, groups of professional staff – including campus units representing dozens of individuals who were contacted during the course of the assessment – are developing a short list of high-priority action items based on the opportunities identified in this assessment. This staff process will, we hope, bring about the first set of tangible actions resulting directly from the CACS assessment.

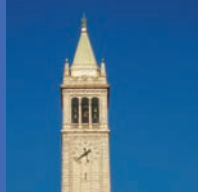
A note on scope and boundaries

A comprehensive sustainability assessment of any institution would require a list of indicators almost without end. However, it was the desire of CACS to complete this project within one year, providing conclusions on which to base further progress within a reasonable timeframe. Thus a necessary balancing act between breadth and depth set the scope of this report. In short, this document cannot and does not include everything that matters in the context of campus sustainability. The indicators chosen undoubtedly reflect the biases of CACS. The timeframe chosen has limited the number of indicators that could be examined and the number of contributors involved. In an ideal world, more time would have allowed this process to explore additional indicators and involve even more staff, faculty and student contributors.

Where do we go from here?

It is our charge to ensure that this report represents not the end but rather the beginning of UC Berkeley's efforts to document our performance, recognize our achievements, and identify opportunities for improvement. This assessment sets the stage for more effective action. It is designed to be a 'living document' on the internet – one that will be revised and expanded as new indicators are incorporated and existing indicators are updated. In the process of developing this report, CACS has already identified a handful of indicators worthy of addition to future versions. Hearteningly, this assessment also documents the efforts of many members of the Cal campus community presently working on sustainability-related issues. As this assessment is kept current, it will continually serve to raise awareness and guide our discussions and actions toward a more sustainable future.

Executive Summary



UC BERKELEY CAMPUS SUSTAINABILITY ASSESSMENT

As UC Berkeley's first campus sustainability assessment, this report documents our performance, highlights our achievements, and identifies opportunities as we strive to become a more sustainable University. Developed by the Chancellor's Advisory Committee on Sustainability (CACS), this assessment is the culmination of a year-long collaborative process involving many hours of staff, student and faculty effort. The need to lead our society toward more sustainable ways of living on the planet continues to grow ever more pressing. This report tells the story of a University making progress on numerous fronts, with plentiful opportunities for improvement still ahead of us.

Within each of the nine systems and 32 indicators examined here, examples of both positive progress and opportunities for improvement can be found. Each indicator presents a brief overview of our performance, accomplishments and opportunities for next steps. Below is a summary of the report's conclusions. Please see the full report for a more detailed and comprehensive perspective.

Energy

- In the last six years, total energy use has been slowly rising, as has energy use per square foot to a lesser extent.
- The vast majority of our energy is derived from fossil and nuclear sources, but use of renewable energy is growing through both onsite solar projects and changes to our direct access contract.
- The recently implemented UC Regents' Green Building Policy and Clean Energy Standard (GBCE) represents a significant step forward, requiring us to reduce energy consumption and shift to renewable energy sources.
- Physical Plant has implemented some energy tracking, but there has been little communication about energy use behavior with the campus community.

Water

- Over the last 25 years, we have achieved a significant decrease in total and per capita water use, despite a growing campus. However, both have increased during the last five years.
- The University has received awards for implementing programs which have improved the quality of our wastewater.
- Many opportunities exist on campus for upgrading to more water-efficient fixtures.
- We do not yet recycle or reuse graywater on campus, but we are working on a plan to install a pilot onsite recycled water treatment plant.
- The University has had little communication about water use behavior with campus users.

Built Environment

- The UC-wide GBCE is playing an important role, pushing us to construct greener buildings.
- Cal has made progress toward implementation of the GBCE through adjustments to our building decision-making process. These include the integration of increasingly effective mechanisms for ensuring that capital projects reflect campus policy and our mission.
- UC Berkeley makes little systematic use of life-cycle cost assessment tools.
- Our long range campus planning is increasingly incorporating principles of sustainability.

Executive Summary

Transportation

- UC Berkeley students continue to employ diverse multi-modal commute patterns, with a low rate of single-occupancy vehicle use.
- Faculty and staff continue to rely heavily on single-occupancy vehicles, though less so than 20 years ago.
- Use of public transportation has been growing amongst students, faculty and staff.
- Housing affordability near campus remains a challenge, especially for staff and faculty.

Purchasing & Waste

- Purchasing at UC Berkeley is highly decentralized, with little mandate for environmentally preferable purchasing.
- Our campus recycling rate has significantly improved since the mid-1990s, but has been largely stagnant over the last five years, as has our total waste generation.
- A need exists for increased recycling opportunities in classrooms, public spaces, and at special and seasonal events.
- Significant policy improvements have led to a decline in hazardous chemical waste generation over the last five years.
- We have made modest progress in recent years with recycled paper procurement and paper waste reduction and recycling, but still lack a comprehensive improvement strategy.

Land Use

- Long range campus planning calls for careful limitations on development to ensure continued preservation of green space.
- Cal has implemented a number of improved stormwater and creek management practices over recent decades, leading to measurable improvement in the health of Strawberry Creek.
- UC Berkeley's Structural Pest Management Program is a model integrated pest management (IPM) program, and has led to reduced structural pesticide use.

Food

- Cal Dining has taken important recent steps toward procurement of more sustainable food options, buying some foods from local and/or natural foods distributors and accommodating diverse dietary needs.
- We have reduced food-related waste through composting and recycling efforts, but substantial volumes of organic food waste are still landfilled.

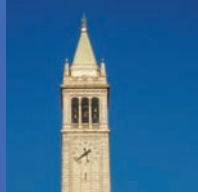
Health and Wellbeing

- Initial discussions are taking place on the procurement of greener cleaning chemicals, but no systematic campus-wide procurement strategy exists.
- Our long-standing Smoke-Free Policy represents a major step toward improving indoor air quality on campus.
- We are responsive to indoor air quality concerns and problems as they are reported.
- Multiple campus programs and funds proactively and reactively address ergonomics and workplace safety issues.

Academics and Culture

- Academic opportunities related to sustainability have grown sharply in the past decade.
- Sustainability-related organizations abound on campus, with CACS playing an important leading role.
- Town-gown relations remain a complex challenge, but new forums for stakeholder dialogue are growing and developing.

Acknowledgements



This assessment was developed by the Chancellor's Advisory Committee on Sustainability, and made possible by the contributions of staff, faculty and students from across the University

Financial Support
Robert M. Berdahl, former Chancellor

Continued Support
Robert J. Birgeneau, Chancellor

Continuing Staff Support and Administrative Oversight
Ed Denton, Vice Chancellor for Facilities Services

Project Coordinator
Garrett Fitzgerald

Associate Project Coordinator
Jubilee Daniels

Primary Staff Oversight
Lisa Bauer, Manager, Campus Recycling and Refuse Services
Judy Chess, Manager for Policy and Programs, Capital Projects
Karl Hans, Senior Environmental Scientist, Office of Environment, Health & Safety

CACS Leadership
Sasha Gennet, Co-Chair – Spring 2005
Paul Ludden, Co-Chair – Spring 2005
Lisa Bauer, Chair – Fall 2004, Co-Chair – 2003-04
Ryan Buckley, Co-Chair – 2003-04

CACS Assessment Subcommittee
Lisa Bauer, Jubilee Daniels, Garrett Fitzgerald, Sasha Gennet, Joel Guenther, Karl Hans, William Lit, Tera Nakata, Brooke Owyang

Vetting Coordinators
Lisa Bauer, Jubilee Daniels, Garrett Fitzgerald, Karl Hans, Kira Stoll, Sarah Szambelan

Editors
Garrett Fitzgerald, Joel Guenther, Brooke Owyang

Production Coordinator
Joen Madonna

Design
Missy Nery

Cover Design
Ellen Lam

Acknowledgements

Production
Sharon Skolnick-Bagnoli

Website Support
Carter Brooks

Research and Writing Coordinators
Carter Brooks, Jubilee Daniels, Garrett Fitzgerald

Original Research and Writing
Jared Baker, Dylan Cisney, Jubilee Daniels, Christian Eggleton, Patrick Ford, Walter Kotecki, Adrienne Levoy, Joen Madonna, Preeti Makwana, Holly Marley, Ian McGowan, Laura Meehan, Jodie Mendelson, Jessica Meskin, Tera Nakata, Brooke Owyang, Emma Palethorpe, Michael Picetti, Judi Quach, Kamya Ramachandran, Janine Rickard, David Slavich, Sarah Szambelan, Jeremy Weed

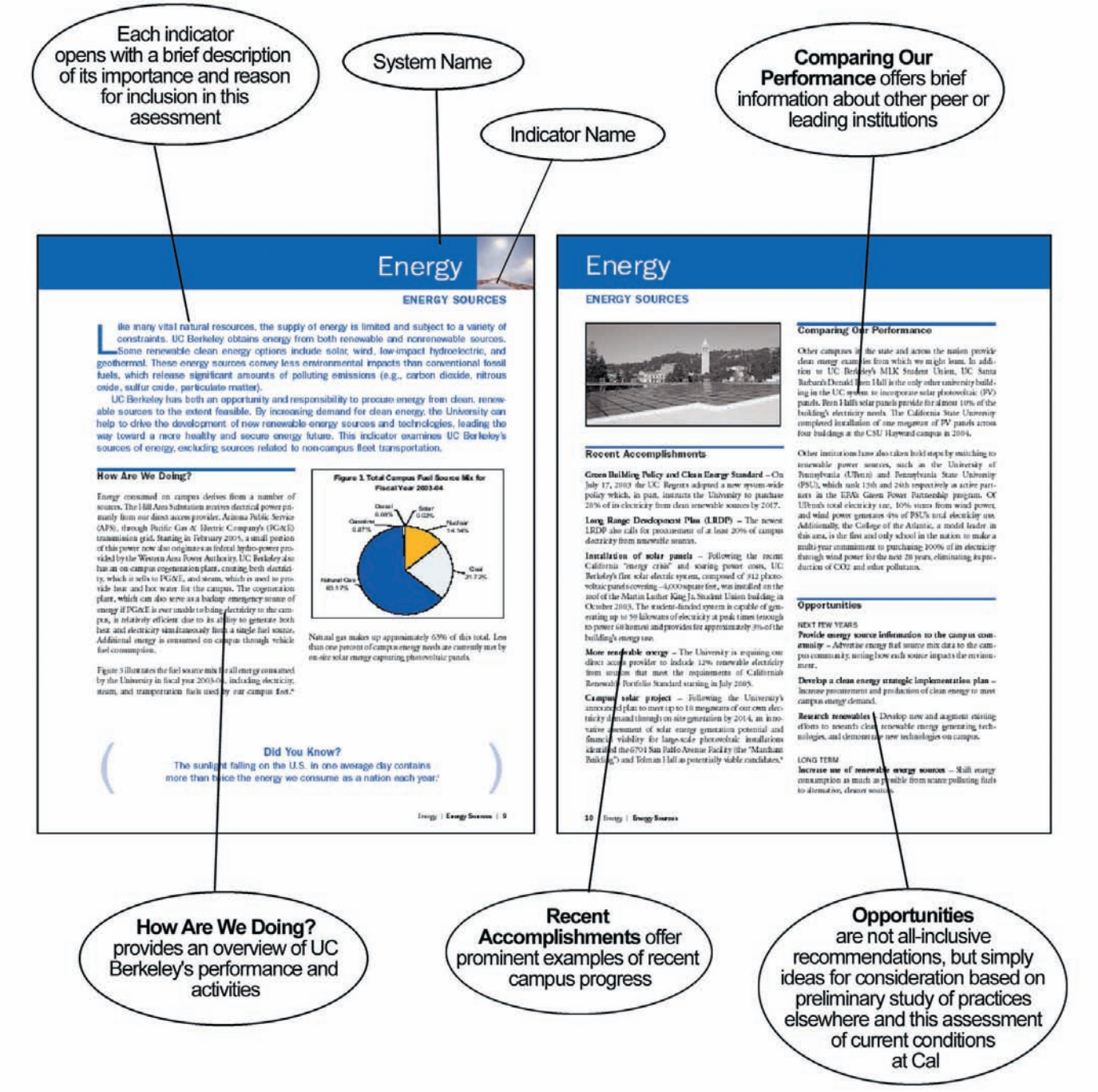
Staff, Faculty & Student Expert Contributors
Eric Anglim, Ed Arens, Janice Austin, Eddie Bankston, Lisa Bauer, Mara Baum, Steve Beissinger, Paul Black, Kate Bolton, Adam Borelli, Linda Brun, Susanna Castillo-Robson, Arrietta Chakos, Judy Chess, Phil Cody, Tom Cordi, Mike Courter, Janice Crowder, Chuck Davies, Brandon DeFrancisci, Jan De Vries, David Dowall, John Duncan, Gilbert Escobar, Elizabeth Gillis, Iris Grace, Vernice Haddix, Greg Haet, Karl Hans, Chris Harvey, Nate Hedberg, Irene Hegarty, Kristen Hopper, Arpad Horvath, Margaret Hurlbert, Gary Imazumi, David Jaber, David Kolsom, Kim LaPean, Shawn LaPean, Jennifer Lawrence, Kurt Libby, Jane Lin, Steve Lustig, Ali Mansour, Steve Maranzana, Lila Mauro, David McEligot, Sarah Minczeski, David Moers, Mike Morgan, Maric Munn, Bob Newell, Ben Palaima, Tim Pine, Barbara Pottgen, Heather Randol, Vincent Resh, Eric Robinson, Luna Salaver, Mike Salcido, Alix Schwartz, Christine Shaff, Daniel Sherwood, David Siddiqui, Linda Song, Matthew St. Clair, Judith Stilgenbauer, Kira Stoll, Susan Tonus, Mark Walstrom, Greg Watty, Becky White, Emery Wilson, Michael Wisherop, Geoffrey Won, Elizabeth Zacharias

Consulting Support
Joshua Skov of Good Company

How to Read This Document

UC BERKELEY CAMPUS SUSTAINABILITY ASSESSMENT

The full report provides detail on nine campus systems encompassing 32 separate indicators. Each indicator is comprised of several sections, as illustrated in the snapshot below:



UC Berkeley Campus
Sustainability Assessment

Energy

Electricity Consumption

Energy Sources

Greenhouse Gas Inventory

Tracking, Feedback & Education

ELECTRICITY CONSUMPTION

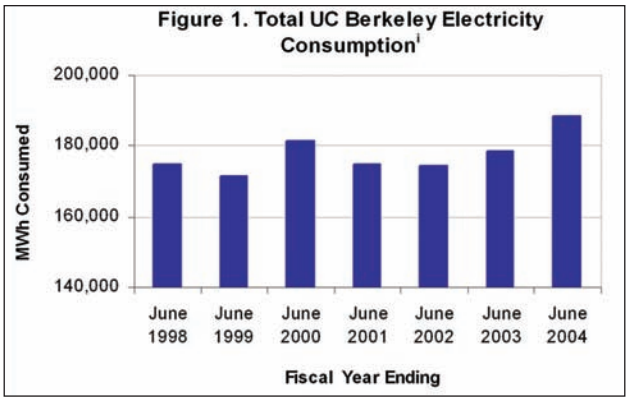
Electricity use is an integral part of our daily existence. It lights our cities, warms and cools our buildings, cooks our food and powers our machines. Unfortunately, our conventional modes of energy production involving the combustion of oil, coal and natural gas release polluting by-products into the air, contributing to air pollution, acid precipitation and climate change. Additional environmental impacts result throughout the energy supply chain as well.

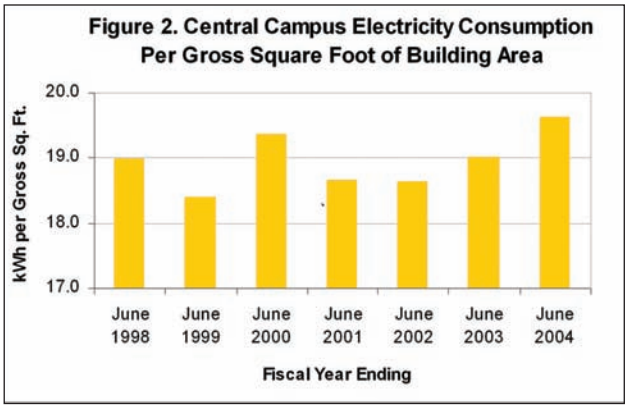
Reducing energy consumption can mitigate these negative environmental impacts and result in significant cost savings to the University. In the past four years, Cal has annually spent an average of almost $22 million on electricity, steam and natural gas. The University has a powerful opportunity and ongoing interest in becoming more energy-efficient, reducing energy consumption, saving money and exceeding its responsibilities for energy management. This indicator examines UC Berkeley's consumption of electricity on the central campus, excluding some facilities located off the main campus grid.

How Are We Doing?

UC Berkeley's electricity use has increased by approximately 7.7% over the past seven years (see Figure 1).[i] This increase in electricity use is largely due to campus expansion and construction. Per gross square foot of building area, electricity consumption has increased by 3.4% over the same span (see Figure 2).

In 2003-2004, the University paid Arizona Public Service and Pacific Gas & Electric (PG&E) approximately $19.2 million for 188,435 megawatt hours (MWh) of electricity. While much of this was used for essential academic program initiatives, some of this expense represents waste. Looking ahead, an increase of over 55,000 MWh in annual electricity demand is expected to support the development projected in the campus Long Range Development Plan. Reducing present and future energy use could provide huge financial savings.





Did You Know?

California consumes more energy than all but one other state in the nation, yet 47 states consume more energy per person.[ii]

Energy

ELECTRICITY CONSUMPTION

Recent Accomplishments

Energy audits & retrofits – In an effort to reduce energy use, UC Berkeley has completed three generations of large-scale energy audits and lighting retrofits in most of our state-funded buildings since 1986. The first of these retrofits resulted in a 25%-40% decrease in lighting energy use. Typical energy utilization for lighting has been cut from two to three Watts per square foot (W/sqft) to 1.5 W/sqft. The University continues to increase its energy efficiency through additional improvements, and as a result, more than 10 million kWh per year and about $1 million per year are currently saved due to facility energy upgrades.

Green Building Policy and Clean Energy Standard – Per this new system-wide policy adopted by the UC Regents in July 2003, UC Berkeley will integrate principles of energy efficiency and sustainability into our capital projects. As a result, all new buildings will surpass the California Energy Code "Title 24" efficiency standard by at least 20% and major renovations will surpass them by 10%.

Opportunities

NEXT FEW YEARS

Provide energy usage feedback and education – Publicize energy consumption data in readily available venues, advertise tips to promote energy conservation and provide incentives for efficiency to faculty, staff and students.

Conduct lighting audits and retrofits – Maximize energy efficiency by installing ENERGY STAR® efficient lighting in all existing buildings, renovations and new construction. Provide banked switching and automated dimming control to take advantage of daylight when it occurs in building perimeter zones.

Increase use of improved technology – Install additional occupancy sensors in rooms and hallways, integrate vending misers in campus vending machines and replace older appliances, electronics and equipment with more efficient models.

Initiate ENERGY STAR purchasing standards – Create a campus policy of purchasing only ENERGY STAR appliances and equipment as a number of other universities and government agencies have done.

LONG TERM

Increase monitor-based commissioning – Install real-time energy meters and submeters so that facilities personnel can track building energy use and effectively monitor and diagnose the performance of significant energy-using equipment (see Energy Tracking, Feedback & Education indicator).

Improve energy management system – Marry installation of better metering and more efficient heating, ventilating and air conditioning systems with improved building control systems, which are key instruments in the effective operation of building equipment.

Increase energy maintenance budget – Prevent deferred maintenance caused by inadequate funding by increasing investments in operations and maintenance. In the long run this will pay for itself by increasing equipment lifetimes and reducing energy consumption.

Establish a revolving energy efficiency loan fund – A revolving loan fund could provide ongoing funding for energy efficiency projects, where money saved by conserving energy goes back into the fund to provide capital for additional projects. Other universities have established similar funds and benefited from impressive savings. For example, Harvard achieves nearly $1 million in annual operating savings from projects funded in this way.

ENERGY SOURCES

Like many vital natural resources, energy supply is limited and subject to a variety of constraints. Burning conventional fossil fuels releases significant amounts of airborne pollution (e.g., carbon dioxide, carbon monoxide, nitrogen dioxide, sulfur oxides, lead and particulate matter). A properly operating nuclear power plant produces no airborne emissions, but does generate highly toxic radioactive waste, and a malfunction can be catastrophic. By contrast, renewable energy sources, such as solar, wind, low-impact hydroelectric, biofuels and geothermal, are much cleaner.

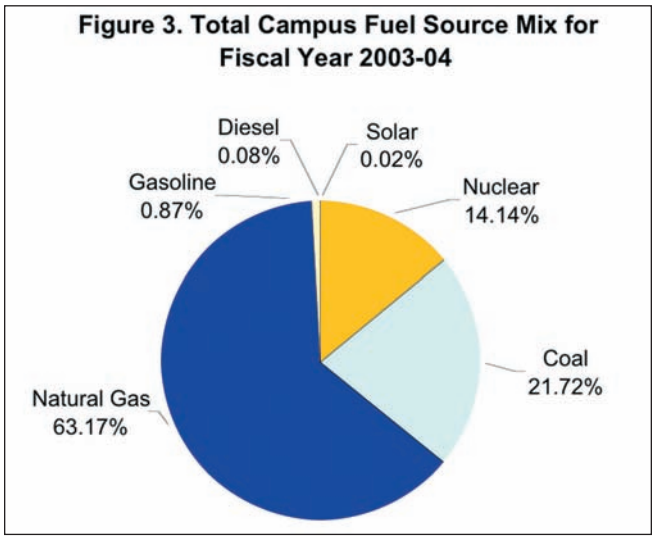
UC Berkeley has both an opportunity and responsibility to procure energy from clean, renewable sources to the extent feasible. By increasing demand for clean energy, the University can help to drive the development of new renewable energy sources and technologies, leading the way toward a more healthy and secure energy future. This indicator examines UC Berkeley's sources of energy, excluding sources related to non-campus fleet transportation and facilities separate from the main campus grid.

How Are We Doing?

The campus consumes energy derived from a number of sources. The Hill Area Substation receives electrical power primarily from our direct access provider, Arizona Public Service (APS), through Pacific Gas & Electric Company's (PG&E) transmission grid. Starting in February 2005, a small portion of this power now also originates as federal hydro-power provided by the Western Area Power Administration, and this portion is scheduled to rise to 12% in July 2005. UC Berkeley also has an on-campus natural gas fueled cogeneration plant that creates both electricity, which it sells to PG&E, and steam, which is used to provide heat and hot water for the campus. The cogeneration plant, which can also serve as a backup energy source if PG&E is ever unable to bring electricity to the campus, is relatively efficient because it generates both heat and electricity simultaneously from a single fuel source. Additional energy is consumed on campus through vehicle fuel consumption, mostly in the forms of gasoline and diesel.

Figure 3 illustrates the fuel source mix for all energy consumed by the University in fiscal year 2003-04, including electricity, steam and transportation fuels used by our campus fleet.[iii]

Figure 3. Total Campus Fuel Source Mix for Fiscal Year 2003-04



Natural gas makes up approximately 63% of this total. Less than one percent of campus energy needs are currently met by on-site solar energy capturing photovoltaic panels.

Recent Accomplishments

Green Building Policy and Clean Energy Standard – On July 17, 2003 the UC Regents adopted a system-wide policy

Did You Know?

The sunlight falling on the U.S. in one average day contains more than twice the energy we consume as a nation each year.[v]

Energy

ENERGY SOURCES

which, in part, instructs the University to purchase 20% of its electricity from clean renewable sources by 2017.

Long Range Development Plan (LRDP) – The newest LRDP also calls for procurement of at least 20% of campus electricity from renewable sources.

Installation of solar panels – Following the recent California "energy crisis" and soaring power costs, UC Berkeley's first solar-electric system, composed of 312 photovoltaic (PV) panels covering ~4,000 square feet, was installed on the roof of the Martin Luther King Jr. Student Union building in October 2003. The student-funded system is capable of generating up to 59 kilowatts of electricity at peak times (enough to power 60 homes) and provides for approximately 3% of the building's energy use.

More renewable energy – The University is requiring our direct access provider to include 12% renewable electricity from sources that meet the requirements of California's Renewable Portfolio Standard starting in July 2005.

Campus solar project – Following the University's announced plan to meet at least 10 megawatts of our own electricity demand through on-site generation by 2014, an innovative assessment of solar energy generation potential and financial viability for large-scale photovoltaic installations identified the 6701 San Pablo Avenue Facility (the "Marchant Building") and Tolman Hall as potentially viable candidates.[iv]

Comparing Our Performance

Other campuses in the state and across the nation provide clean energy examples from which we might learn. In addition to UC Berkeley's MLK Student Union, UC Santa Barbara's Donald Bren Hall is the only other building in the UC system to incorporate PV panels. Bren Hall's solar panels provide for almost 10% of the building's electricity needs.

The California State University completed installation of one megawatt of PV panels across four buildings at the CSU Hayward campus in 2004.

Other institutions have also taken bold steps by switching to renewable power sources, such as the University of Pennsylvania (UPenn) and Pennsylvania State University (PSU), which rank 13th and 24th respectively as active partners in the Environmental Protection Agency's Green Power Partnership program. Wind power generates 10% and 4% of electricity use at UPenn and PSU, respectively. Additionally, the College of the Atlantic, a role model in this area, is the first and only school in the nation to make a multi-year commitment to purchasing 100% of its electricity through wind power for the next 20 years, eliminating its production of CO_2 and other pollutants.

Opportunities

NEXT FEW YEARS

Provide energy source information to the campus community – Advertise energy fuel source data to the campus community, noting how each source impacts the environment.

Develop a clean energy strategic implementation plan – Increase procurement and production of clean energy to meet campus energy demand.

Research renewables – Develop new and augment existing efforts to research clean renewable energy generating technologies and demonstrate new technologies on campus. For example, the Berkeley Energy Alliance's Biodiesel Program, BEAR Biodiesel, has researched the feasibility of collecting waste vegetable oil from the campus dining commons and converting it to 100% biodiesel for use in the campus Refuse & Recycling fleet. This program could initially provide fuel for one truck, reducing diesel consumption by 2,500 gallons per year.

LONG TERM

Increase use of renewable energy sources – Shift energy consumption as much as possible from polluting fuels to cleaner, renewable alternatives.

GREENHOUSE GAS INVENTORY

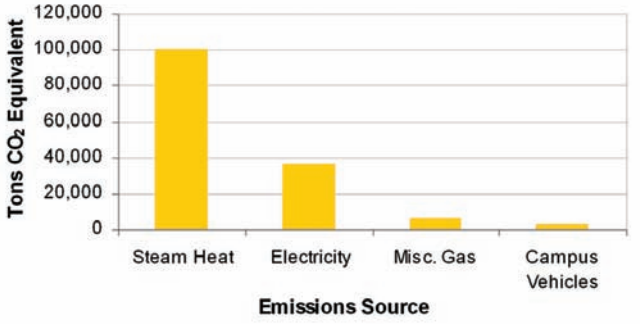
The overwhelming scientific consensus is that human-induced climate change is among the most pressing environmental problems facing this generation and those to come. Never in the past 1000 years has the planet warmed at a faster rate than during the 20th century, and the most recent decade has been the warmest ever on record.[vi] Allowing this trend to continue could result in decreased agricultural output, increased catastrophic weather events such as forest fires, drought and floods and displacement of entire populations due to rising sea levels.[vii] This indicator examines greenhouse gas (GHG) emissions from Cal's energy consumption: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), all expressed in CO_2 equivalent units (CO_2e). Energy use related to the University occurring in locations outside the main campus is not considered here.

How Are We Doing?

To date, Cal has not established explicit greenhouse gas emission targets. In 2003, the campus emitted a total of nearly 150,000 tons of CO_2e into the atmosphere – enough to fill over 11,500 Goodyear™ blimps![viii] Though full energy use data is not available for an accurate estimation of long term CO_2e emission trends, a constant fuel source mix would have yielded an increase in GHG emissions of over seven percent in the last seven years, in parallel with rising energy consumption (see Energy Consumption indicator). Campus greenhouse gas emissions are likely to increase further based on projections of 30% growth in annual electricity use as well as increased steam consumption predicted in the Long Range Development Plan.

Figure 4 illustrates campus CO_2e emissions by consumption type for the 2003-04 fiscal year. Steam heat is produced by burning natural gas. Of the electricity Cal purchases, 28% is produced by nuclear plants, which do not directly produce GHG emissions.[ix]

Figure 4. Campus CO_2 Equivalent Emissions by Consumption Type in 2003-04



Recent Accomplishments

New UC Clean Energy Standard – On June 26, 2004 the Office of the President (UCOP) formally issued the new UC Regents' Green Building Policy and Clean Energy Standard, which includes a goal of procuring 20% of electricity throughout the UC system from renewable sources by 2017. Beginning in 2005, UCOP plans to begin purchasing 10% of UC grid-supplied electricity from renewable resources.[x]

Energy audits & retrofits – The University saves more than 10 million kWh and about $1 million annually due to facility energy upgrades relative to our 1986 consumption rate (see Energy Consumption indicator).

Did You Know?

Although the United States accounts for a mere 4% of the world's population, it produces 25% of the world's greenhouse gases![xi]

Energy

GREENHOUSE GAS INVENTORY

Comparing Our Performance

Other institutions have developed additional "best practice" examples that we might draw from in the future. For example, Lewis & Clark College became the first campus in the nation to reduce its GHG emissions seven percent below its own 1990 levels, thereby achieving Kyoto Protocol compliance, partly through the purchase of CO_2e offset credits. Tufts University has also committed to achieving Kyoto Protocol compliance by the year 2012.[xii] Oberlin College has set an even loftier goal of becoming "climate neutral" by the year 2020, meaning it will produce no net GHG emissions.

More and more campuses are taking the first step toward reducing their contributions to global warming and climate change by conducting a GHG emissions inventory. So far, 30 colleges and universities across the nation have conducted GHG inventories, 20 of which used the Clean Air – Cool Planet GHG emissions inventory tool. Here in California, UC Santa Barbara graduate students are conducting a campus inventory and assessing emissions reduction and offset options, while UC San Diego has joined the California Climate Action Registry and plans to register its GHG emissions annually.

Opportunities

NEXT FEW YEARS

Conduct annual GHG emissions inventories – A frequently updated and detailed understanding of our greenhouse gas emissions will enable us to recognize trends and opportunities to improve most efficiently.

Report GHG emissions – By establishing baselines and registering them with organizations such as the California Climate Action Registry, Cal will be prepared for any future GHG emissions reduction requirements and will receive assistance with measuring, certifying and reporting GHG emissions. In addition, our GHG reduction efforts will enjoy increased credibility and recognition.

Purchase green tags – The purchase of green tags, which represent the renewable attributes of a quantity of energy produced, is another way to offset campus GHG emissions associated with electrical energy.

LONG TERM

Trade carbon emissions allowances – Reducing greenhouse gas emissions can involve a variety of efforts, including purchasing offsets that help avoid emissions through reforestation, methane collection, wind farms, or other forms of carbon sequestration projects. Trading can be a cost effective way to achieve Kyoto Protocol compliance, as is being demonstrated today in the European Union. Membership in the Chicago Climate Exchange has helped universities like Tufts to manage their emissions and achieve reductions through trading.

Commit to GHG emission reduction targets – By taking a portfolio approach to reducing GHG emissions, Cal has the opportunity to demonstrate leadership and excellence by pioneering a Climate Protection Plan for the entire UC system.

ENERGY TRACKING, FEEDBACK & EDUCATION

Tracking our energy use is the first step toward identifying priorities and developing improvement strategies. Adequate tracking can also enable the University to provide energy use feedback to campus users, along with other educational initiatives. Together, these efforts can help to raise awareness and motivate energy conservation. This indicator examines UC Berkeley's system of tracking our energy sources, consumption and resulting emissions and providing feedback and education to the campus community.

How Are We Doing?

The UC Berkeley campus does not have a comprehensive real-time energy metering system on par with some other campuses. UC Berkeley's Physical Plant–Campus Services (PP-CS) department does keep records of the amount of electricity consumed per building per month on the main campus, but little data is recorded for building steam use, and real-time energy tracking exists for only a few buildings. However, in the past year, six new steam meters have been installed to track building steam consumption, and about a dozen meters have been connected for real-time tracking. Additional real-time metering will be completed during 2005.

Likewise, the University has to date undertaken no large-scale efforts to provide feedback to the campus community regarding energy use or greenhouse gas and other emissions. However, a recent pilot effort to supply energy use feedback and education to users of three campus buildings has been a success (see below).

UC Berkeley participates in the Investor Owned Utility – University of California and California State University Partnership – which provides for energy efficiency improvements and training at UC and CSU campuses. Through this partnership, the campus will receive approximately $180,000 to finance lighting and HVAC retrofits and several hundred thousand dollars to invest in monitor-based commissioning and education/training for campus staff. With this new financial resource, staff will be educated on how to exceed the California Energy Code "Title 24" efficiency standard in new construction, and improved energy tracking systems will be installed, providing for better feedback.

Recent Accomplishments

Energy Awareness – In 2001, during the state's unprecedented electric shortages and high prices for natural gas, then-Chancellor Berdahl and Associate Vice Chancellor Ron Coley sent campus administrative memos via email to all UC Berkeley deans, directors, department chairs and administrative officers to distribute to employees in their units. These memos provided information on campus energy use and costs and requested that conservation measures be implemented to reduce energy use in daily operations. As a result, behavioral changes have helped reduce campus energy use by 2-6%, saving hundreds of thousands of dollars.

2020 Long Range Development Plan – In January 2005, the UC Board of Regents approved the 2020 Long Range Development Plan and Tien Center Environmental Impact Report. Data tracked primarily by PP-CS on the University's energy sources, consumption and resulting effects on outdoor air quality and greenhouse gas emissions were included in the LRDP.

Energy Education – Beginning early 2004, PP-CS took innovative measures to curtail energy consumption in three main campus buildings (California Hall, University Hall and Cory Hall) by monitoring their energy consumption and providing monthly charts on energy use to building managers and department heads. Meetings were also held with managers to provide education and suggestions for energy conservation plans. Although University Hall's energy use was already below its FY 2000 baseline by 6-8%, education efforts and resulting behavioral changes helped reduce energy consumption in that building by over 10%.

ENERGY TRACKING, FEEDBACK & EDUCATION

Comparing Our Performance

UC Berkeley is not yet a strong leader in this area. Our real-time energy metering system is not as comprehensive as those employed at some other campuses. California State University Long Beach, for example, has a comprehensive energy management program incorporating real-time metering and energy-saving technologies such as *EnergySaver*, which provides a more sophisticated alternative to turning off the lights by automatically varying the voltage to ballasted fixtures and reducing power consumption, while maintaining appropriate lighting levels. Several institutions, including The Woods Hole Research Center, the University of British Columbia, and Oberlin College, have even placed real-time energy meters on the Internet.[xiii]

Opportunities

NEXT FEW YEARS

Increase monitor-based commissioning – Install real-time energy meters, which can provide a significant amount of information necessary for facilities personnel to effectively monitor equipment performance and track and manage energy use.

Link environmental studies to campus practices – Encourage students to analyze renewable energy sources for UC Berkeley and to devise solutions to help conserve energy on campus through comprehensive group projects. Incorporate the findings of environmental and energy-related courses into campus energy policies.

LONG TERM

Provide energy usage feedback and education to campus users – Implement a more comprehensive effort to publicize campus energy sources, consumption data and tips to promote energy conservation to faculty, staff and students. Provide a centralized kiosk on campus or multiple kiosks within individual buildings to convey this information, and make it available via the Internet as well. This effort will likely require additional staff support within PP-CS.

Incorporate a more comprehensive energy metering system – Integrate metering, energy and demand response systems into the overall management of campus energy.

ENERGY NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Paul Black	Manager, Utilities & Energy Engineering, Physical Plant-Campus Services	Energy Consumption, Sources, Greenhouse Gas Inventory, Tracking & Education
Maric Munn	Associate Director, Energy and Utilities Planning, Office of the President	Energy Consumption, Sources, Greenhouse Gas Inventory, Tracking & Education
Matthew St. Clair	Sustainability Specialist, Energy and Utilities Planning,	Energy Consumption, Sources, Greenhouse Gas Inventory, Tracking & Education
John Duncan	Marketing Director, APS	Energy Consumption, Sources
David McEligot	Facility Manager, Delta Power Services, LLC	Energy Consumption, Sources, Greenhouse Gas Inventory
Daniel Sherwood	PowerLight Company	Energy Consumption, Sources, Tracking
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Energy Tracking & Education
Sarah Minczeski	Student, UCSB	Greenhouse Gas Inventory
Ben Palaima	Energy Analyst, Physical Plant-Campus Services, Utilities	Greenhouse Gas Inventory

CITATIONS

i Data provided in Figures 1 and 2 based on all electricity purchased by Physical Plant-Campus Services. This data excludes some Housing accounts, but represents the vast majority of total electricity consumed.

ii California Energy Commission. "Summary of California Energy." http://www.energy.ca.gov/html/calif_energy_facts.html

iii Excluding personal vehicles, transit fuel, air travel, energy consumed through food, embodied energy in materials, etc.

iv UCB Campus Solar Project, Matt St. Clair et al

v Kettlewell, Caroline. "It Takes a Solar Village." http://www.carolinekettlewell.com/articles/solar_village.html

vi http://www.newscientist.com/channel/earth/climate-change

vii IPCC Third Assessment Report - Climate Change 2001 http://www.ipcc.ch/pub/online.htm

viii Based on Goodyear's Spirit of America blimp, with volume calculated as an ideal gas at standard temperature and pressure. http://www.goodyearblimp.com/b_soa.html

ix Dautremont-Smith, Julian. "Guidelines for College-Level Greenhouse Gas Emissions Inventories"

x UC Policy on Green Building Design and Clean Energy Standards. http://www.ucop.edu/facil/greenbldgs/UC_green_clean.pdf

xi Natural Resources Defense Council http://www.nrdc.org/greengate/air/climatev.asp

xii http://www.tufts.edu/tie/tci/Commitment.html

xiii www.whrc.org/building/education/EngFlw2.asp
www.sustain.ubc.ca/
www.oberlin.edu/envs/ajlc/

UC Berkeley Campus
Sustainability Assessment

Water

Water Consumption

Wastewater

Water Tracking, Feedback & Education

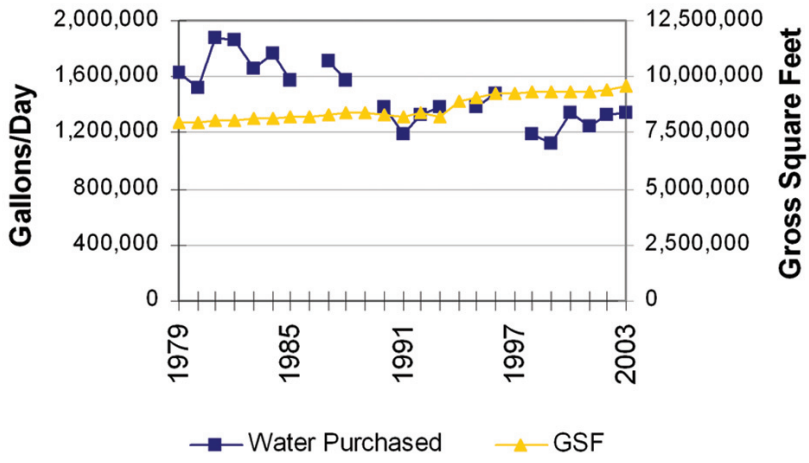
WATER CONSUMPTION

Water is an essential but limited renewable resource, and its efficient use and protection from pollution are required to meet the needs of an increasing population. The 1994 California Water Plan Update predicts water shortages in California of 2.4 million acre-feet by the year 2020.[i] The East Bay Municipal Utility District (EBMUD), Cal's water supplier, is anticipating shortages of 62.5 million gallons per day during drought conditions by the year 2020. In order to avoid anticipated water shortages, our State must either develop new water sources or more efficiently use our current water supply. UC Berkeley has an opportunity and responsibility to be a model for efficient and responsible water use, not only through exceptional research, but also by demonstrating how to incorporate sustainable water use and planning into all areas of our operations. This indicator examines UC Berkeley's main campus water consumption.

How Are We Doing?

UC Berkeley has officially recognized minimizing water consumption and maximizing onsite conservation and reuse as a priority in our 2020 Long Range Development Plan (LRDP). From 1979 to 2003, overall water consumption decreased by 17% while campus gross-square footage (gsf) increased by 19%, a very admirable trend. However, our recent trend has been the opposite. Water consumption for the main campus park increased by 20% and per capita water consumption rose 11.5% from 1999 to 2003, while Cal's building area increased by 14%.

Figure 1. UC Berkeley Water Use (1979-2003)



The LRDP anticipates further increases in water consumption. Planned development has the potential to increase water use by an additional 20% over 2002 water consumption levels by 2020. This would result in the use of an additional 269,000 gallons per day (gpd) and increased annual potable water costs of nearly $300,000.[ii]

The LRDP's Campus Park Guidelines provide recommendations and guidance for UC Berkeley to accomplish the goals and policies of the LRDP. Currently, other than encouraging the planting of plants with similar water requirements next to each other to minimize over-watering, the Campus Park Guidelines do not address UC Berkeley's water use.

Did You Know?

Waterless urinals save between one and five gallons of water per flush over the older urinals they typically replace.[xxii]

Water

WATER CONSUMPTION

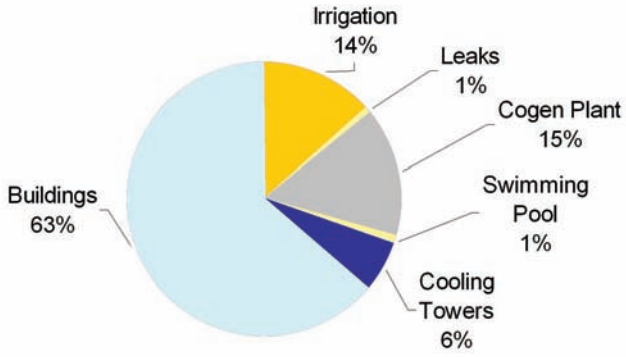
The UC Regents' Green Building Policy and Clean Energy Standard, passed in the summer of 2003, includes a requirement for LEED equivalency in new construction and major renovation of campus buildings (see the Built Environment system).[iii] This could provide the mechanism for reducing water consumption in all new development if we choose to target LEED credits offered for achieving a 30% water use reduction in new buildings. Under such an approach, water use is estimated to increase by only 14% instead of 20% by 2020, resulting in annual potable water savings of 80,000 gpd as well as approximately $86,000 in water costs and $19,000 in wastewater costs.[iv]

Campus water use decreased in the 1980's partly due to the upgrade of some high-use toilets to more water-efficient models.[v] UC Berkeley still has many toilets that were installed prior to 1992, when CA law imposed new maximum allowable flow rates for all toilets, sinks and showers.Toilets installed in CA prior to 1992 typically use 3.5 or 4.5 gallons per flush (gpf) vs. 1.6 gpf for toilets installed after 1992.[vi] UC Berkeley currently has no comprehensive plan or policy for upgrading all older non-conserving water use fixtures such as toilets and urinals. Instead, they are replaced on an as needed basis.[vii] EBMUD offers rebates for upgrading flushometer (industrial) toilets and urinals that often yield payback periods within two years.[viii] For tank toilets, EBMUD also provides $25 for upgrading to a 1.6 gpf toilet and $100 per dual-flush toilet. Moffitt Library and Zellerbach Hall are just two examples of buildings with 3.5 gpf flushometer toilets which would save water and monetary resources by upgrading to more water-efficient toilets.

Residence Hall Unit III bathrooms provide an example of the potential monetary savings the campus could reap from toilet upgrades. A joint water audit by Housing Services and EBMUD identified potential annual savings of over $16,000 and 3.6 million gallons of water if the Unit III building were to be upgraded from 4.5 gpf to 1.6 gpf toilets.[ix] Taking hardware and labor costs of $450 per new toilet into account, these toilet upgrades would offer a payback period of four years.[x] However, a $36,000 rebate offered by EBMUD for upgrading our toilets and achieving predicted water savings would lower the payback period to under two years.[xi]

UC Berkeley currently has no systemic toilet maintenance program.[xii] Problems are fixed when they occur. However,

Figure 2. Distribution of Water Use 2003



many toilets can leak and waste substantial amounts of water without the problem being visible to the user. Flush-valve kits, the part inside the toilet controlling flush volume, tend to wear out and remain open for longer than necessary, causing the toilet to use extra water with each flush. During Spring 2004, a restroom water audit of Dwinelle Hall identified that 68% of the toilets and 63% of the urinals had leaks.[xiii] An example of the potential monetary savings from annual toilet maintenance is illustrated in a separate recent Housing Services and EBMUD water audit of Residence Hall Unit II. This audit identified that 24% of the building's 1.6 gpf toilets leaked substantially and were using 3.5 gpf or more. When these toilet leaks are fixed, Unit II will save over $3,000 annually.[xiv]

UC Berkeley water consumption has also decreased due to major renovation and new construction of campus laboratories.[xv] Older labs are less water-efficient per gross square foot compared to newer laboratories, as many older labs still have inefficient once-through equipment cooling systems, as well as older and less efficient space heating and cooling systems.

Institutional water efficiency can save the University a substantial amount of money, but requires initial funds for technology upgrades and education. Some funding and technical expertise are available through partnerships with EBMUD and the California Urban Water Conservation Council (CUWCC). EBMUD offers rebates for upgrading older, less water-efficient technologies and for improving irrigation efficiency,[xvi] and there are many other grants available for water conservation and protection.

Automation of campus irrigation – The automation of campus irrigation controls has resulted in a 15% reduction in irrigation water use from the 2002-03 to 2003-04 academic years. Before adding irrigation controllers to the Supervisory Control and Data Acquisition system (SCADA), it took one or two days to manually turn irrigation values off when weather required a shut-down or restart of the irrigation system. SCADA currently serves approximately 75% of the irrigated area on the UC Berkeley campus, with plans for future expansion to 100%. Cal has also installed automated irrigation controllers with repetitive cycles and low-volume heads since the 1980s.[xvii]

Elimination of once-through cooling during major laboratory renovations and new construction – The UC Regents' Green Building Policy and Clean Energy Standard requires all new laboratories to meet the equivalent of Labs21 Environmental Performance Criteria standard certification. Labs21 requires that there be no once-through cooling units unless used as direct contact process water.[xviii] Once-through cooling has already been eliminated during the renovations of the Valley Life Sciences, Hearst Mining and Stanley Hall buildings.[xix]

Campus Food Service nozzle replacement – Virtually all food service providers on campus have replaced spray nozzles in their washing facilities This saves an estimated 10,500 gallons per day and $9,300 annually, not including savings from reduced energy and wastewater costs.[xx]

Housing and Dining low-flow faucet aerators – As a result of a residence hall water audit, Housing Services will be replacing Unit I, II and III residence halls' assortment of 1.5, 2.0 and 2.5 gallon per minute (gpm) faucet aerators with 0.5 gpm aerators provided free from EBMUD. The faucet aerators are anticipated to save over $15,000 and 3.4 million gallons of water each year.[xxi]

Comparing Our Performance

In similar fashion to UC Berkeley, the University of Vermont decreased water use by 15% from 1990 to 2000 as campus gross-square footage increased.[xxiii] Other institutions have also developed innovative management practices. For example, the University of Florida uses reclaimed water for 97% of its irrigation needs.[xxiv] The University of California, Santa Barbara (UCSB) also uses a reclaimed water system that provides roughly one-fourth of UCSB's total water, both for irrigation and for toilet flushing. UCSB also conserves water by mandating the use of waterless urinals in all new campus buildings. In 1999, UCSB's per capita consumption of potable water was roughly 20.9 gallons per day, compared to our rate of 33.8 gallons per day.[xxv] The University of North Carolina, Chapel Hill installed 300 waterless urinals for a projected water savings of 12 million gallons per year.

Opportunities

NEXT FEW YEARS

Expand SCADA to all irrigation – Expand SCADA, but continue to allow landscaping staff to make irrigation decisions which are relayed to the central control station.

Install water-efficient plumbing fixtures in existing buildings – Upgrade older toilets to 1.6 gpf models and switch to waterless urinals. The Americans with Disabilities Act compliant bathroom program, which begins next year, provides an ideal opportunity for upgrading to water-efficient fixtures. However, plumbing must be evaluated before upgrading restroom fixtures to make sure existing sewer systems can handle decreased water flows. EBMUD's Water Conservation Division provides free water audits to customers who implement water saving suggestions.

Establish a toilet maintenance program – A 1.6 gpf toilet should flush in about four seconds. Flush times of 7-20 seconds often indicate that the toilet is leaking and the flush valve kit needs to be replaced or the inside diaphragm part is incorrect. Many of the 1.6 gpf toilets on campus are likely using 3.5 gpf or more as a result of leaking. Periodic maintenance on a toilet that is typically flushed over 115 times a day could save over $300 per year.[xxvi] Given the number of such high use toilets on campus, Cal could enjoy a net savings of $44,000 after hardware and labor costs in the first year alone.[xxvii]

Plant drought-tolerant native species – Replace grass with drought-tolerant natives, especially in areas around buildings which are time-consuming to mow. This would reduce water use, provide "rain gardens" for the filtration of stormwater from building roofs, essential habitat for birds and reduce

WATER CONSUMPTION

irrigation and maintenance costs.

Achieve a 30% reduction in water use for new development – Water use reduction of 30% earns two LEED credits and can be achieved by incorporating water conserving products into the design of new buildings. A combination of the following four equipment upgrades may be sufficient to achieve this level of water use efficiency: (1) waterless urinals, (2) dual-flush toilets (0.8 or 1.6 gpf depending on which button you push), (3) ultra-low flow toilets (1.0 gpf) and (4) low-flow (0.5 gpf) and automatic push rod (short duration) faucets.

LONG TERM

Achieve a 15% reduction in water consumption relative to 2002 – Reducing campus water use by 15% from 2002 levels in currently existing buildings would result in water and wastewater savings of over $321,000 per year. This could be accomplished through a combination of ideas listed above and repairing and upgrading heating ventilation and air conditioning systems.

Eliminate once-through cooling water operations and use of water aspirators – Optimize and re-circulate water through cooling systems or capture this water for other non-potable uses.

Fix leaks in the Physical Plant condensate return system – These contribute significantly to campus water and energy loss, but finding and fixing them is a labor-intensive process.

Install drip irrigation systems with moisture sensors – Such systems are extremely efficient and are used by most modern vineyards. EBMUD provides rebates for the installation of moisture sensors.

WASTEWATER

Decreasing wastewater generation helps conserve water, energy, infrastructure and money. It extends the life of our wastewater treatment plants and plumbing, reduces the amount of energy necessary to treat and transport wastewater, lowers the amount of chemicals required in traditional wastewater treatment and reduces environmental impacts from the disposal of treated wastewater.

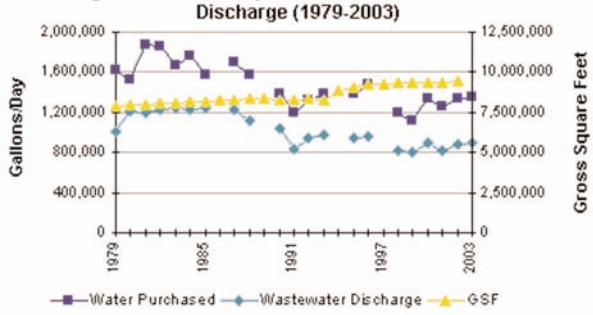
The sewage treatment process is costly, because we effectively pay for our water twice: first when it is delivered to us and second when we dispose of it through ongoing maintenance of the campus sanitary sewer system (higher flows require larger pipes and more maintenance). We pay the City of Berkeley a flat fee for the use of City sewer lines, and we pay the East Bay Municipal Utility District (EBMUD) for treating our wastewater based on the percentage of purchased water that is returned via the sanitary sewer.

Wastewater flow can be minimized by conserving water in general and partially treating and then reusing wastewater. This partially treated wastewater, called recycled, reclaimed or "graywater," is ideal for water uses such as toilet flushing, irrigation, heating and cooling that do not require pristine potable water. UC Berkeley has an opportunity to be a leader in not only researching but also practicing innovative methods of wastewater reduction and reuse, further strengthening our reputation for excellence and innovation.

How Are We Doing?

UC Berkeley recognizes the priority of minimizing wastewater production in our newest Long Range Development Plan (LRDP). Currently all of our wastewater is discharged into the sanitary sewer system and transported through the City of Berkeley's pipes to the EBMUD sewage treatment plant.[xxviii] From 1990 to 2003, UC Berkeley wastewater flow has fluctuated between 66-76% of water purchased.[xxix] A small portion of EBMUD wastewater is treated and used for irrigation and industrial cooling in EBMUD's service area, but most is released into the San Francisco Bay.

Figure 3. UC Berkeley Water Use and Wastewater Discharge (1979-2003)



Total UC Berkeley wastewater production has decreased by 11.3% from 1979 to 2003 (Figure 3).[xxx] However, in the last four years from 1999 to 2003, UC Berkeley's wastewater discharge has increased by 10% – roughly an 83,600 gallon/day (gpd) increase. The LRDP plans for an increase in wastewater production of up to 27% from 2002 levels by 2020 as a result of new development. This corresponds to an additional 237,600 gpd of wastewater and an additional annual cost of about $130,000.[xxxi]

Currently, UC Berkeley does not use any recycled or reclaimed water. However, EBMUD and UC Berkeley are working towards installation of an onsite EBMUD Satellite Recycled Water Treatment Plant.[xxxii] Cal has provided grants to faculty and is working with EBMUD on facility layout and footprint design for the plant to be installed below the Edwards Track bleachers. The facility would be small (1,000 square feet, which includes 300 ft^2 for faculty research) and

WASTEWATER

could treat 25,000 gpd. The recycled water would be used for irrigation of lawns and playing fields and would provide 14% of the water UC Berkeley used for irrigation in 2003. EBMUD estimates that the facility would save UC Berkeley $7,500 annually via reduced water and wastewater costs, as well as provide reliable water for irrigation during a severe drought. EBMUD will be responsible for the financial costs of installation and maintenance of the plant. This project is currently in the feasibility planning stage.

The University has taken measures to improve the quality of our wastewater. The campus has implemented Drain Disposal Guidelines and hazardous waste minimization programs, which advise laboratories and facility operators on safe and appropriate disposal of chemicals in wastewater to reduce corrosion of plumbing systems, prevent pollution of the Bay and avoid "harming the biological processes of sewage treatment at EBMUD."[xxxiii] These guidelines have fostered regulatory compliance, and the campus has been recognized by State and local agencies for effective implementation of these pollution prevention programs.

Six times each year, wastewater samples are taken from the sanitary sewer at the west entrance of campus and analyzed for compliance with EBMUD wastewater discharge requirements. UC Berkeley's main campus has not had a violation since 1999.[xxxiv]

Recent Accomplishments

Awards from EBMUD and CWEA – Due to campus wastewater and stormwater pollution prevention accomplishments, the quality of our wastewater has improved over recent years. EBMUD awarded UC Berkeley one of two prestigious industrial Pollution Prevention awards in 2002. In 2004, the California Water Environment Association (CWEA) awarded Cal a Certificate of Merit "for success in reducing the amount of chlorinated hydrocarbons entering the sanitary sewer, development of campus drain disposal guidelines, outreach and education programs, and more recently, implementation of a mercury reduction program."[xxxv]

Albany Village – Redevelopment of Albany Village has included plumbing that will allow use of recycled wastewater for irrigation once a supply is available from EBMUD.[xxxvi]

College of Chemistry elimination of water aspirators as vacuum sources – These aspirators were "once-through" devices using potable water that also carried evacuated solvent vapors directly into sink drains. With the help of the Office of Environment, Health & Safety, the College has switched to electronic vacuum sources.[xxxvii]

Waterless urinals in a remodeled student union restroom – UC Berkeley has just installed our first waterless urinals in the Associated Students of the University of California (ASUC) building.

Additional accomplishments – See the Water Consumption indicator.

Comparing Our Performance

The UC campuses of Santa Barbara, Los Angeles and Santa Cruz, along with CSU Hayward and CSU Northridge, all use waterless urinals in at least one building.

At Oberlin College, the Adam Joseph Lewis Center for Environmental Studies includes a Living Machine® to treat its wastewater to tertiary standards.[xxxviii] This solar-powered, microbe-based ecosystem uses a diverse assortment of bacteria, algae, snails, fish and flowers working together to break down contaminants and purify the building's wastewater. The system purifies 2,000 gallons of water each day and the result-

Did You Know?

Until 1951, when the EBMUD sewage treatment plant was built, all wastewater in the Berkeley area was discharged to local creeks and the Bay. Strawberry Creek was the campus sewer in the 1800s and first half of the 1900s.

ing water is used for toilet flushing and irrigation. The Living Machine not only purifies the building's wastewater but also educates students, faculty, staff and visitors about natural wastewater treatment processes and provides research opportunities for students.

The University of British Columbia's C.K. Choi Building (30,000 sq. ft) has composting toilets that reduce the volume of wastewater by 90%.[xxxix] The aerobic composting system is continually ventilated and produces an end product used as a humus-like soil amendment product. In addition, all irrigation derives from rainwater stored in 8,000-gallon subsurface cisterns.

Opportunities

NEXT FEW YEARS

Test waterless urinals – Not all waterless urinals perform equally well or cost the same to maintain. Differences exist in aesthetics, initial costs, maintenance costs and performance. Additionally, we should be mindful of minimum ventilation standards and ensure that ventilation is functioning properly where waterless urinals are installed.

Install the EBMUD onsite water recycling plant – Working with EBMUD, create opportunities for landscape architecture, engineering and business students to work together to create a packaged water treatment plant that both purifies wastewater and can serve as role model for other institutions. Consider using the purified water in a small wetland water feature prior to irrigation, allowing it to serve as an education opportunity for students and the community on the multiple benefits of using recycled water. The campus could apply for California Resources Agency Proposition 50 grant money for the installation of the system.

LONG TERM

Test composting toilets in one new building – If their performance, aesthetic qualities and cost-effectiveness are satisfactory, consider installation in all new development. This will allow Cal to grow while minimally increasing wastewater production.

Require waterless urinals in new buildings and major renovations – Most conventional urinals use a gallon of water per flush. As water scarcity becomes more severe in California, water and wastewater charges will continue to rise.

Build cisterns with new development – Modern cisterns are tanks that capture rainwater. Their use could help provide non-potable water for things like irrigation and toilets and also help the campus meet stormwater management goals.

Dual-plumbing – Plumb all new buildings for both potable and non-potable water.

Pilot a graywater/wastewater project in a new or substantially renovated building – The renovation of the Clark Kerr Campus or the new Boalt/Hass building could provide the perfect opportunity for graywater recycling, possibly using a Living Machine® like that at Oberlin College.[xl] This would provide a high-profile example of Cal's environmental leadership, and it may qualify for a Proposition 50 grant.

Design and install an onsite biological water treatment system for all campus wastewater – Such a system could purify enough water to meet all campus non-potable water needs. Onsite wastewater recycling would also prolong the life of the EBMUD treatment plant, help reduce demand on the City of Berkeley's aging sewage infrastructure, reduce the volume of effluent wastewater discharged to the Bay and provide a learning laboratory for UC Berkeley students.

WATER TRACKING, FEEDBACK & EDUCATION

At UC Berkeley, our mission is to "deliver programs of instruction, research and public service of exceptional quality to the State of California." Movement toward more sustainable water use offers us a number of leadership opportunities in line with this mission: teaching and research on sustainable water technologies, planning and development; demonstration of these techniques through operations; and education of the campus community on water use efficiency and wastewater reduction.

In order to measure our success, we need to track our water use. Furthermore, both technological improvement and behavioral change can play significant roles in minimizing water consumption and wastewater production. To inspire behavioral change in the campus community, we have the opportunity to inform campus users about their water use and steps they can take to conserve. As an educational institution and responsible member of our wider community, Cal should endeavor both to monitor and assess our water use and to educate and inspire the campus community regarding water issues and opportunities to increase water use efficiency.

How Are We Doing?

Almost all main campus buildings at UC Berkeley have individual water meters that are read monthly and added to a database. However, there is currently insufficient staff support for verifying and analyzing monthly water readings. Only annual readings are verified, as these are used to document water consumption for the wastewater discharge permit report submitted each year to the East Bay Municipal Utility District (EBMUD). Real-time building water meters are planned for the irrigation Supervisory Control and Data Acquisition system (SCADA). (For more on SCADA see the Water Consumption indicator.) With additional staff to monitor this real-time irrigation data, leaks could be detected rapidly based on abnormally high nighttime water use.

Currently, no feedback on building water use is provided to occupants, and individual departments and campus units are not responsible for the cost of their water consumption or wastewater disposal, so there is no direct financial incentive for departments to conserve water.

Documenting overall water use in individual buildings is only the first step in tracking water use. To determine sources of potential water and financial savings within each building, we need to know the breakdown of water usage among the different devices within each building. Comprehensive building water audits can provide detail on the consumption of water using fixtures, as well as the location of the water using devices that offer the greatest potential water and monetary savings. Currently, no lists of water fixtures, flow rates or usage frequency exist at Cal.

Recent Accomplishments

Water conserving stickers in the residence halls – In the Fall of 2005, the residence halls will have water conservation stickers placed on bathroom mirrors reminding students to turn off faucets when brushing their teeth.

Personal student water audits and Residence Hall Water Audit Coordinator – Students in one undergraduate course conducted self-audits of their residences in the 2003-04 academic year. An undergraduate student thesis analyzed this data, and resulting projected monetary savings convinced campus Housing Services to hire a water audit coordinator to conduct a complete water audit of the residence halls.

Residential Sustainability Education Coordinators (RSEC) – These student volunteers live in the residence halls and educate other students about the importance of preserving our environment and teaching positive habits that help to conserve our natural resources. The RSEC's help sponsor "Sustainability Week" each Fall, during which they focus on sustainability issues such as water conservation. Their work has included education, information distribution and special projects in the area of sustainability, such as a leak survey in

WATER TRACKING, FEEDBACK & EDUCATION

the residence halls and educating students on the environmental benefits of shorter showers.

Additional audit results – See the Water Consumption indicator.

Comparing Our Performance

Several universities have undertaken practices from which we might gain insight. For example, the University of North Carolina at Chapel Hill has achieved a 25% decrease in water use through changing institutional practices, infrastructure upgrades and an education campaign entitled "Every Drop Counts."[xli] A web page providing water saving suggestions was linked from the main campus web page, and stickers, posters and bus placards encouraged water reduction. The importance of water conservation, as well as specific tools for how campus water uses could be modified to reduce water use, were shared in employee and student newspapers and in a drought forum. UNC also sponsored "water wars" between residence halls and gave prizes for the residence hall that achieved the greatest reductions in water use. In addition, UNC created a specific position to oversee implementation of water sustainability measures, the UNC Water, Wastewater and Stormwater Manager. Meanwhile, California State University, Northridge, has placed water-conserving stickers in all restrooms and kitchenettes, reminding users to not let faucets run when not in use.[xlii] The University of British Columbia posts real-time water consumption and real-time water savings information, showing corresponding monetary savings, on its campus sustainability website.[xliii]

Opportunities

NEXT FEW YEARS

Post water conservation stickers – Post stickers explaining the importance of conserving water and whom to contact regarding leaking faucets, showers or toilets all in restrooms. Most importantly, post stickers in residence hall showers encouraging shorter shower times and relating water use to environmental protection.

Perform a campus water audit – Identify all water fixtures, flow rates and user frequencies to determine which water using devices offer the greatest potential water and monetary savings.

Achieve Labs21 credit 4.1 "Metering of Process Water" – UC Berkeley could require the installation of water meters to document annual process water use and process wastewater generation for all new laboratory spaces.

Provide building occupants with monthly water use data – Additionally, UC Berkeley could give monetary or other rewards for buildings achieving large decreases in water use.

Partner with EBMUD and the California Urban Water Conservation Council – Partnerships can provide technical and monetary assistance for improving institutional water use efficiency. EBMUD employs a water conservation specialist willing to help UC Berkeley qualify for toilet replacement programs and improved irrigation efficiency rebates.

LONG TERM

Implement the results of a campus water audit – Allocate funds for equipment upgrades and other improvements based on projected water and monetary savings revealed through a campus water audit, beginning with the most cost-effective opportunities.

Appoint/Hire a sustainable water specialist – This additional staff position could conduct and implement the results of a campus water audit.

Continue adding real-time water data to buildings – Enable real-time tracking of individual building water use data and provide dedicated employee time for analyzing the data to quickly detect leaks when they occur.

Increase access to building water use data – Allow access to building water use data from off-campus computers, enable campus search engines to locate and present relevant information and verify the accuracy of monthly readings.

Water website – Develop a site including real-time water use and savings data, within the context of http://Sustainability.Berkeley.edu.

WATER NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Wastewater
Karl Hans	Senior Environmental Scientist, EH&S	Wastewater
Gary Imazumi	Manager of Grounds Operations	Water Consumption
Tim Pine	Environmental Specialist, EH&S	Wastewater
Paul Black	Manager, Utilities & Energy Engineering, Physical Plant-Campus Services	Water Consumption

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[iv] Water and Wastewater costs are $2.40/Hundred Cubic feet (CCF) and $0.50/CCF per CCF. 748 gallons = 1 CCF

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Water

WATER NOTES

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[xxvii] (15/kit* 200 toilets) + (70/hour * 1/hour per toilet*200 toilets) = $17,000 $61,800-$17,000 = 44,800

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UC Berkeley Campus
Sustainability Assessment

Built Environment

Green Building Practices and Policies

Building Decision-Making Process

Long Range Campus Planning

GREEN BUILDING PRACTICES & POLICIES

Our buildings play a significant role in our lives on campus. We work, study, live and breathe in them every day. In the U.S., buildings account for 36% of total energy use, 65% of electricity consumption, 30% of greenhouse gas emissions, 30% of raw material use, 30% of waste output (136 million tons annually), and 12% of potable water consumption.[i] However, it is possible to construct buildings with significantly smaller environmental impacts. Examples of buildings that incorporate more sustainable practices are becoming increasingly common. When designed and built with the health and safety of their occupants as well as the environment in mind, buildings can produce their own energy, recycle and reuse their own water, provide healthy indoor air quality, increase worker productivity, and use sustainable and non-toxic renewable materials in their construction. At UC Berkeley, we have an opportunity to integrate green features and design strategies into both our new and existing buildings through consideration of the life-cycle costs of our energy, water, lighting, ventilation, material use, transit proximity, landscaping, and flexibility in the decisions we make about the development of our campus. This indicator examines the degree to which we are establishing green building practices in our campus policies.

How Are We Doing?

UC Berkeley, in concert with all of the campuses in the UC system, has recently made progress toward building greener buildings. The Green Building Policy and Clean Energy Standard (GBCE), passed by the UC Board of Regents in the summer of 2003, requires that all campus new construction and major renovation projects approved as of July 1, 2004, must meet a LEED™ equivalent certification standard, and strive to achieve a LEED Silver-equivalent rating whenever possible within the constraints of program needs and standard budget parameters. The LEED (Leadership in Energy and Environmental Design) building rating system was developed by the U.S. Green Building Council as a national standard for evaluating and certifying individual projects as green buildings.[ii]

The UC Office of the President (UCOP), responsible for overseeing the implementation of the GBCE, has not allocated additional funds to help the campuses meet GBCE requirements. UCOP has instead directed the campuses to develop and implement an internal LEED-equivalent certification process, as UC Berkeley has chosen to do, or to obtain outside funding to pay for official LEED certification of projects (roughly $2000-$10,000 per project for registration and certification).[iii] This internal certification system includes identifying to what extent current campus building and development practices already align with LEED for New Construction rating requirements (a UC Berkeley Green Building Baseline) and procedures for achieving and demonstrating LEED equivalency at the Certified (26 points and all prerequisites) level.

The UC Berkeley Green Building Baseline identified 22 points on the LEED for New Construction checklist that are obtainable using Cal's existing design and construction practices. Additional project-specific green building features will be integrated into each new project as appropriate to earn at least the equivalent of standard LEED certification (26 points). Each capital project that is new construction or a major renovation is required to prepare LEED checklists at key design phases. UC Berkeley is also developing a system for

Did You Know?

The Governor of California has called for all state buildings to be certified LEED Silver. The cities of Berkeley and San Francisco also require LEED Silver or higher certification for their new buildings.[iv]

GREEN BUILDING PRACTICES & POLICIES

evaluating projects per green criteria and demonstrating LEED equivalency, to assure that the process demonstrates credibility. University Capital Projects Managers and Planners are being trained in the use of the LEED checklist and green building requirements. The next step will be to formalize a plan to have each new project strive to achieve the equivalent of LEED Silver certification. Projects must provide appropriate documentation at specific milestones during the review and approval process if they are unable to achieve the University's green building goals.

Another important requirement of the GBCE states that all new campus building projects must also enroll in California's Savings by Design program, which provides design consultation services and financial incentives to better enable new buildings to exceed Title 24 energy efficiency requirements by 20% for new construction and 10% for major renovations. The Savings by Design process also includes a life-cycle cost analysis of all recommended energy efficiency features to demonstrate the relationships between first costs and lower future operating costs.

The absence of life-cycle cost analysis in the University's funding process remains one of the most significant barriers to greener building practices at UC Berkeley. While each project must be constructed to meet initial budget constraints and programming needs, other important costs incurred later in the life of each building, including operation and maintenance costs, receive limited consideration. Green building elements, typically complex building systems and technologies, are often excluded due to the focus on minimizing initial construction cost, despite the significant direct cost savings some of them would provide to the University when viewed over the 50-year or longer expected life of each building. These trade-offs would become more transparent if, in addition to reporting on our traditional cost-per-square foot criteria, a more detailed life-cycle cost analysis for each new building project would also be provided to decision makers in our design and construction and building approval processes.

The State of California's budgeting process for supporting campus building projects presents another powerful barrier to greener building practices at UC Berkeley. All State-funded buildings are supported through two separate State budgets – one for building design and construction, the other for operation and maintenance (O&M). While the State allows O&M funds to be used toward the capital cost of buildings if the O&M budget has funds to spare, this scenario seems increasingly unlikely given the O&M budget's long-running deficit. This formal budget separation strongly reinforces our tendency to focus on initial construction costs at the expense of future O&M costs in the design and construction of campus buildings.

Recent Accomplishments

UC Regents' Green Building Policy and Clean Energy Standard – The 2003 Regents' Green Building Policy and Clean Energy Standard, which took effect in July 2004, requires all new building and major renovation projects in the University of California system to be LEED certified or equivalent.

Residential housing certification – The new residence hall Units I and II infill projects, along with the Channing-Bowditch apartments and the Crossroads and Clark Kerr dining facilities, are examples of Cal building projects incorporating sustainable design and construction strategies. The Unit I and II Infill Housing projects are registered with the USGBC and are preparing a submittal for LEED certification. Preliminary analysis indicates that the projects may be able to obtain certification at the Silver level. The Crossroads Dining Commons became the first campus facility to be Green Certified by the Bay Area Green Business Association as a green business. The Residential and Student Services Program is considering certification of these other facilities under the LEED for Existing Buildings rating system.

Education of students and staff – The Facilities Services units of Physical Plant and Capital Projects have had numerous training opportunities in sustainable design, LEED, energy conservation measures through UCOP's Project Management Institute, and partnerships with the Alameda County Waste Management Authority. The departments have also supported staff attendance at the past three GreenBuild conferences convened by the USGBC. These conferences include trade shows, educational sessions and additional workshop training opportunities. Sustainable design principles are taught in courses offered at UC Berkeley, especially in the College of Environmental Design, and Civil and Environmental Engineering.

Comparing Our Performance

UC Berkeley has joined other colleges and universities across the country and within the UC system in making a commitment to constructing greener buildings. While our green building policy is noteworthy and ambitious, there are other UC campuses and universities who have presently surpassed us in demonstrating their commitment to green buildings. Within the UC System, UC Santa Barbara, UC Merced and UC Irvine have committed to certifying all new buildings LEED Silver or higher. The L.A. Community College District now requires LEED Silver or higher certification through USGBC for the large number of buildings it is constructing and funding through a bond issue. The University of Colorado at Boulder has mandated that all new buildings be certified LEED Gold or higher. The University of Florida's new School of Building Construction has also been certified LEED Gold. This building is not only a learning laboratory for its students, but is projected to use 30% less water and 47% less energy than a similar conventional building. The additional cost of this LEED Gold building will pay for itself within six years from the reduced energy bill alone.

Opportunities

NEXT FEW YEARS

Estimate lifecycle costs – Prior to approval, every building project should include life-cycle cost estimates as well as potential savings estimates for key building components. Include a written statement of measures taken to minimize long-term operational and maintenance costs.

Achieve LEED Silver equivalency – Perform a life-cycle analysis of potential additional LEED points that might allow us to proceed to a LEED Silver target for all new buildings.
Continued education – Continue current efforts to educate campus staff and others regarding green building features and design strategies.

Set acceptable payback period for green features – Work with UCOP to establish acceptable payback periods for building systems and components to give the campuses guidance and assurances of design and budget approval for their proposed new buildings.

Establish a Green Building Fund – Establish a revolving fund allowing additional green features to be incorporated into new campus buildings. A certain percentage of utility savings derived from green projects could be reinvested to maintain this fund.

Develop a Green Materials Guide for campus buildings – Develop a guide specifying green versions of materials commonly used in our buildings, complete with information on pricing and vendor contact information, and provide this guide to our contractors for their use.

Develop a system of accountability for LEED-equivalent certification – As one of the world's leading universities, UC Berkeley could fully develop a rigorous and transparent internal certification system that incorporates the same level of accountability as an external certification system.

LONG TERM

Life-cycle cost assessment tool – Develop a standardized life-cycle cost assessment tool that would take into account all components of each new building project.

Consider life-cycle costs – Incorporate life-cycle cost analysis into the budgeting, design, value engineering, and approval process of all new buildings and major renovations.

Continue to strive for higher sustainability performance – The LEED certification system is not intended to be static, but rather will continue to require more sustainable features as the design and construction industry gains more experience building greener buildings. The LEED Gold building of today might thus only qualify as a LEED Silver building tomorrow. UC Berkeley should also continue to strive to improve the sustainability of each new building.

Zero-waste buildings – Become one of the pioneering leaders in green building and stewardship of the Earth's resources by constructing campus buildings that create no net export of wastes. It is possible to design buildings capable of producing their own energy and purifying and reusing their own wastewater.

BUILDING DECISION-MAKING PROCESS

New buildings require a significant amount of time and coordination before they are occupied on the UC Berkeley campus. Many years typically pass from the point at which the need for a new building is identified until it is constructed and fully operational. To ensure that our buildings achieve high green building standards, consideration of sustainability issues must be addressed throughout the building decision-making process, from design through construction, and ultimately through retro-commissioning and de-commissioning. Involving stakeholders both in the formation of a project's sustainable design goals and at key stages in its design and construction is often critical to the successful delivery of a green building. Throughout the process, green design strategies should be considered in balance with each building's multiple needs. This indicator examines the inclusion of green policies and practices in our building decision-making process.

How Are We Doing?

Since the adoption of the Green Building Policy and Clean Energy Standard (GBCE) by the UC Regents in June of 2003, issues of sustainability have played an increased role throughout our building decision-making process. The GBCE stated the Regents' support for "... the principles of energy efficiency and sustainability in the planning, financing, design, construction, renewal, maintenance, operation, space management, facilities utilization, and decommissioning of facilities and infrastructure to the fullest extent possible, consistent with budgetary constraints and regulatory programmatic requirements." [v]

Several recent changes have been made to our campus building decision-making process as a result. For example, the project manager of each new building project must now develop and update a LEED™ equivalency checklist throughout the design and construction process. Formal mechanisms for the evaluation and accountability of these checklists have not been fully developed, but this represents a significant process improvement.

The current campus process for approving new building projects includes seven phases. At phases 1, 2, 3, 4 and 6, each project is submitted for evaluation to the Design Review Committee and the Executive Campus Planning Committee. UC Berkeley's extensive review process provides ideal opportunities to promote sustainable design meeting or even exceeding that required by the GBCE, especially if explicitly supported by these review committees. Facilities Services staff manage review at each stage.

As stated in the LRDP, "The principles of sustainable design are not separate and discrete. On the contrary, they are interdependent, and require a comprehensive approach to design… Sustainable design ultimately depends on the integrated efforts of a multidisciplinary project team." To ensure on-time and under-budget delivery of green buildings, planning, design, construction and engineering professionals should be working together to incorporate green strategies early in the design process, during the concept phase. In the last six years, UC Berkeley has increased the involvement of construction managers and general contractors early in the design process, and has used pre-qualification, early selection and team-building activities with designers, builders and clients.

Did You Know?

Stakeholders in the building decision-making process include Deans and department heads, faculty with specific teaching and research needs, staff who work in our buildings, Capital Projects staff who facilitate building delivery, Physical Plant staff who operate, clean and maintain each building, and students who are educated in our buildings.

Built Environment

BUILDING DECISION-MAKING PROCESS

Building greener buildings is easier and less expensive when planned for from the start. Ecocharrettes can be a powerful tool for fostering the integration of sustainable design goals early on. Ecocharrettes bring the client(s) and various stakeholders together to collectively identify green design goals and opportunities during the project concept phase, before the first schematic drawings have even begun. UC Berkeley has held similar charrettes for some past projects, but has not yet institutionalized the use of ecocharrettes.

Recent Accomplishments

UC Regents' Green Building Policy and Clean Energy Standard – The GBCE has caused the campus to significantly increase our attention to green building issues. UCOP now requires that each campus report on how individual building projects are achieving compliance with the GBCE.

LEED equivalency – Cal is documenting how our existing building practices compare to the requirements of the LEED for New Construction checklist. This measure will provide a basis for the most effective use of green building principles on the UC Berkeley campus. Staff resources from several units, including Physical Plant, Project Management and the Office of Environment, Health and Safety, have been invested in determining the practices that will best add value to every new project and reflect the true nature of our efforts to construct greener buildings.

Enforcement of policies – The Executive Campus Planning Committee, which reviews various aspects of new campus building projects, has already begun to serve as a reviewing body to ensure that green building requirements are met throughout the design and construction process. The Design Review Committee, which reviews campus projects in the Feasibility Analysis and Program Development phase, includes design professionals with extensive experience in green design.

Opportunities

NEXT FEW YEARS

Ecocharrettes – Hold at least one ecocharrette facilitated by a green building expert before the schematic phase of the building approval process. Ecocharrettes can not only help to produce a more integrated design, but can also help to make all stakeholders more aware of potential green design opportunities as well as their costs and benefits. In particular, include facilities personnel who will operate and maintain the building.

Peer-to-peer training – As primary clients, our faculty and staff are influential in determining the program priorities of many campus building projects. Establish peer-to-peer training of faculty and departmental representatives to individual building committees regarding green building principles and opportunities. This practice could yield improved initial designs and help to ensure that green features are properly valued throughout each project's development.

Green building documentation – Require documentation at all project review stages demonstrating how each new building project is meeting campus green building goals beyond the required documentation already submitted to the Office of the President. Include details on projected cost-savings expected to result from different design choices based on full life-cycle analyses.

Green design review – The campus Design Review Committee has an established role in reviewing building projects during the design phase. This committee might assign specialists to review and report on the green aspects of each project during the schematic design and design development phases when influential decisions are often made, as well as during subsequent value engineering procedures.

Commissioning, retro-commissioning, de-commissioning – Use these tools to ensure that our buildings are working as efficiently as possible throughout their life-cycles.

Post-Occupancy studies – Conduct post-occupancy studies of building occupants and operation and maintenance staff to improve building performance and lead to better design in new campus buildings.

Accessible database of campus-specific green products – Compile a database of green products and service providers, green building specifications, and construction waste management plans, to be used in the development of new building projects.

LONG TERM

Green building implementation review – A regular review committee or research center might be created to periodically assess the effectiveness of our efforts to comply with existing green building policies and to explore options for further improvement.

More integrated management teams – Revise the project approval process to involve a more integrated advisory or management team in the oversight of new campus projects, from concept through feasibility, design development, value engineering, and construction, in accordance with LEED recommended best practices.

Support research in component-specific life-cycle analysis – One of the barriers to using life-cycle cost analysis more heavily in our decision-making processes is a lack of available life-cycle information for many common building components.

Existing building improvement – Establish a more pro-active process for recognizing opportunities to improve efficiency and move toward green practices in existing campus buildings.

Allocation of funds – Often, constructing greener buildings requires additional up-front capital (e.g., 2-5%). Budget restrictions may need to be adjusted to allow for the integration of additional green features and design strategies expected to yield life-cycle cost savings.

Built Environment

LONG RANGE CAMPUS PLANNING

Long range campus planning is of vital importance for universities — long-lived institutions where development choices can last for centuries in built environment and educational legacies. We at Cal pay for the construction, operation and maintenance of our campus and are therefore positioned to benefit from an increased emphasis on life-cycle cost analysis and whole systems thinking. Successful long range planning can work to preserve and enhance the character of our campus through thoughtful design of public spaces, circulation patterns, natural amenities, and new and existing buildings. This indicator examines the incorporation of sustainable concepts and practices into our long range campus planning.

How Are We Doing?

The 2020 Long Range Development Plan (LRDP) is UC Berkeley's land use and physical development plan for supporting our academic and institutional objectives. It integrates the design framework of our New Century Plan and the academic principles articulated in the Strategic Academic Plan.

UC Berkeley has released several LRDP documents, in 1956, 1962, 1990, and most recently in 2005. Our current LRDP includes an array of visionary goals and recognizes that "every new capital investment decision at UC Berkeley has the potential to advance the state of the art in responsible, sustainable design, and thereby contribute to our mission of public service." This may be achieved through implementation of projects and programs that are designed and developed to conform to the LRDP's Campus Park Guidelines, the University's Construction Design Standards, and the UC Regents' Green Building Policy and Clean Energy Standard (GBCE), which requires all new buildings and major renovations to meet LEED™ or Labs21 equivalency.[vi]

The LRDP emphasizes that while some general guidelines can be applied universally to campus building decisions, the best integrated and most sustainable design decisions will come from multidisciplinary design teams working on individual projects. To that end, the Strategic Investment requirement in the LRDP requires that UC Berkeley evaluate a range of alternatives at the feasibility phase of the project approval process for each new building. Working with Planners from Facilities Services, the Executive Campus Planning Committee reviews all new capital projects for compliance with goals and policies laid out in the LRDP.

While the LRDP covers a wide range of campus planning issues, notably absent is a comprehensive plan for improving the sustainability and resource efficiency of the already built campus. Much of UC Berkeley's resource consumption (e.g. energy and water use) comes not from new development but rather our existing campus infrastructure. As of 2002, 85% of the planned campus infrastructure for 2020 had already been built. Cal was the first University of California campus and as a result has some old and resource-inefficient building systems and equipment. Although our architecture as seen upon a campus stroll is magnificent, the long-term viability of the campus depends at least as much on our inner "hidden" infrastructure – our steam, sewer, ventilation and cooling systems.

The lack of a comprehensive improvement plan for existing infrastructure is compounded by the lack of available funds for already known improvement needs (i.e. "deferred maintenance"). UC Berkeley has taken steps on a limited budget to improve the energy efficiency of our existing buildings through category efficiency improvements and equipment replacement, especially during renovations. A new monitoring-based commissioning program, to be implemented in

Did You Know?

On average, buildings on Cal's main campus are over 40 years old.

LONG RANGE CAMPUS PLANNING

2005, will review the performance of individual campus buildings by analyzing energy use profiles and building operation strategies. This program will help identify inefficiencies and propose methods for improvement. UC Berkeley is focused on achieving the 10% reduction in existing building energy use goal called for in the GBCE, but achieving this goal will require capital investment.

Recent Accomplishments

"Sustainable Campus" section of the LRDP – The 2020 LRDP is our first to include a section specifically devoted to goals for developing UC Berkeley into a more sustainable campus and policies aimed at helping us achieve those goals.

"Plan every new project as a model of resource conservation and environmental stewardship" – This pioneering goal is just one example of the LRDP's increased emphasis on more sustainable campus development. In addition, the LRDP's Campus Park Guidelines include some requirements and suggestions for concrete actions UC Berkeley can take to meet our goals of resource conservation and environmental stewardship.

Opportunities

NEXT FEW YEARS

Plan for infrastructure and equipment maintenance – Develop a long range comprehensive plan for performing deferred maintenance on campus infrastructure, including identifying, repairing and upgrading inefficient equipment that uses excess energy and/or water.

More detailed guidelines – Incorporate into the Campus Park Guidelines and other plans additional requirements regarding material selection to improve indoor air quality, facilitate the use of recycled and recyclable materials, and achieve UC Berkeley's goals of minimizing water use and wastewater production. In addition, incorporate new standards making it more difficult to "value engineer out" green building features during the design process.

LONG TERM

Funding for infrastructure and equipment maintenance – Bolster funding needed for delayed maintenance and other improvements to campus infrastructure with the potential to save energy, water and materials, as well as campus staff and financial resources.

BUILT ENVIRONMENT NOTES

Staff interviewed in the assessment of this system include (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Ed Arens	Professor of Architecture	Green Building Practices and Policies, Building Decision-Making Process, Long Range Campus Planning
Jennifer Lawrence	Principal Planner, Physical and Environmental Planning, Capital Projects	Green Building Practices and Policies, Building Decision-Making Process, Long Range Campus Planning
Judy Chess	Manager for Policy & Programs, Capital Projects	Green Building Practices and Policies, Building Decision-Making Process, Long Range Campus Planning
Jane Lin	Graduate Student in Architecture	Green Building Practices and Policies, Building Decision-Making Process, Long Range Campus Planning
Nate Hedberg	Unit I Construction Mitigation Coordinator	Green Building Practices and Policies
Matthew St. Clair	Sustainability Specialist, Energy and Utilities Planning, Office of the President	Green Building Practices and Policies
Bob Newell	Associate Director - Utilities Engineering and Operations	Green Building Practices and Policies, Building Decision-Making Process, Long Range Campus Planning

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UC Berkeley Campus
Sustainability Assessment

Transportation

Transportation Modal Split

Fuel Consumption

Presence of TDM Programs

Housing Availability & Affordability Near Campus

Transportation

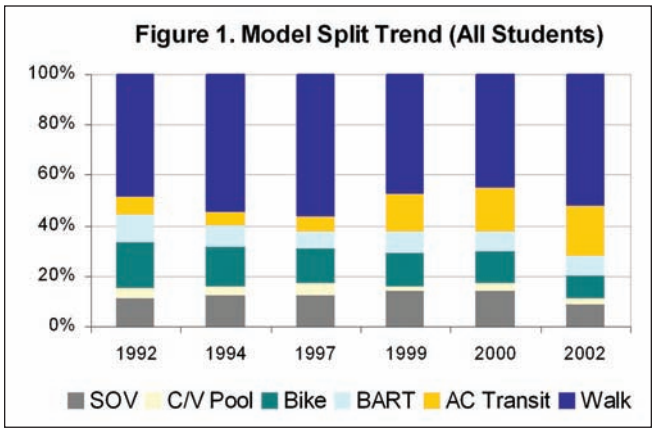
TRANSPORTATION MODAL SPLIT

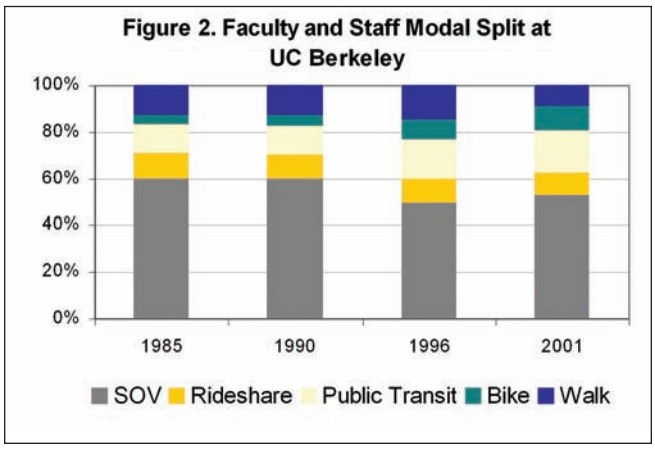
The modal split is the most fundamental measure for tracking the performance of a transportation system. Modal split here refers to the proportion of transportation modes used by commuters traveling to and from campus. Each mode of transportation carries different costs for the user, as well as for the surrounding community and environment. Single occupancy vehicle (SOV) trips can be thought of as particularly costly due to their proportionately higher per capita emissions, as well as the related infrastructure costs and traffic and parking demand they generate. Within the fixed amount of developed and undeveloped space near campus, these undesirable impacts can be acutely felt. As the largest member of the Berkeley community, Cal has a special responsibility to meet the transportation needs of our students, faculty and staff while maintaining both the integrity of the environment and positive relationships with the broader community (see the Town & Gown Relations indicator in the Academics system).

How Are We Doing?

Reflective of the importance we place on transportation planning, staff at UC Berkeley have been recording our modal split since 1960. During the past ten years, our student modal split has experienced a large increase in AC Transit bus ridership (Figure 1). Among many factors, this shift may correspond to the implementation of the Class Pass program in 1999, which grants unlimited rides on AC Transit for a nominal fee each semester (see Transportation Demand Management Programs indicator). Walking remains the mode of choice for Cal students, no doubt bolstered by housing availability close to campus.

In 1985, UC Berkeley set a goal to reduce the number of staff and faculty who drove alone to campus to 53%. This goal was exceeded in 1996 with a 49% drive alone rate. From 1987 to 1998 surface parking lots were used as building sites, and the Underhill Parking Structure was closed due to structural concerns, resulting in a net loss of 441 spaces.[i] Also in the early 1990's, a $36 fee to fund alternative transportation was added to parking permit costs. The loss of available parking combined with funding for alternative transportation paralleled a 10% reduction in SOV trips by staff and faculty reported during those years.





Did You Know?

Before 1952, motorists could park their cars in the center of campus where Dwinelle Hall stands today.

Transportation

TRANSPORTATION MODAL SPLIT

Consistent with parking policies articulated in the 2020 Long Range Development Plan (LRDP), UC Berkeley has taken a "balanced approach" to parking development and transportation programs. Surface parking continues to be relocated away from the central campus unless specifically targeted for commuters with disabilities or other special needs. This relocation has been coupled with new incentives and programs encouraging the use of alternative transportation. One goal of the LRDP is to maintain the current modal split in coming years while the campus population grows.

Recent Accomplishments

On the bus - Since the implementation of the student Class Pass, 55% of students report using AC Transit at least once per week, an increase from previous years. The recently adopted Bear Pass gives faculty and staff the same benefits as the Class Pass, but for a fee of $20 per month.[ii] If all goes well, it is anticipated that the Bear Pass could drop the SOV rate for faculty and staff to just below 49% from the current rate of 51%.

"Balanced approach" to parking in the planning process - The LRDP authorizes the completion of either 1800 or 2300 parking spaces by 2020, depending on the completion of the Bus Rapid Transit (BRT) Telegraph Route proposed by AC Transit. The additional 500 parking spaces may not be created if AC Transit meets its BRT development goals and that portion of campus transportation needs can be met through public transit. In the past, additional parking has been balanced with new transportation demand management programs such as the New Directions Program, the Class Pass, bicycle programs, and short term parking limitations (see the Transportation Demand Management Programs indicator).

Comparing Our Performance

The number of students housed within walking distance of campus and the amount of parking located near campus, as well as other factors, can significantly influence our transportation modal split. UC Berkeley often outperforms other universities in modal split measurement, though location-specific issues limit the degree to which most such comparisons can be meaningful.[iii]

Opportunities

(For more Opportunities to influence Modal Split, see TDM Programs)

NEXT FEW YEARS

Discount passes on BART – Students, staff, and faculty have expressed interest in joining forces with other Bay Area universities and community colleges to encourage the Bay Area Rapid Transit District (BART) to offer a higher education discount pass.

Continue the Class Pass and the Bear Pass – The Associated Students of the University of California (ASUC) will soon hold a referendum on the Class Pass. Passing this referendum would lead to a continuation of the Class Pass program and the increased student use of AC Transit that it facilitates. The Bear Pass pilot ends in June 2006. Decisions regarding its continuation will be based on the success of this pilot period.

LONG TERM

Continue to offer trip reduction opportunities and incentives to staff and faculty – Ample opportunity still exists for the non-student campus population to make more use of alternative transportation options. If programs are made more convenient and aggressively marketed to faculty and staff, the effectiveness of trip reduction programs could continue to grow.

Development of student housing and advocacy for all housing – The new LRDP promotes an aggressive student housing development program. Housing is to be built either within walking distance of campus or within a 20 minute direct transit ride. This land use pattern will support student uses of alternatives to motor vehicle commuting. Additional new housing in these locations could also appeal to campus faculty and staff and further improve our modal split. However, new housing development, especially higher density housing proximate to transit lines, is often subject to highly politicized local approval processes (see the Town & Gown Relations indicator in the Academics system). Students, staff and faculty have the opportunity to influence local zoning issues (e.g., density, unit type) and the approval of local housing development projects by participating in local politics.

Transportation

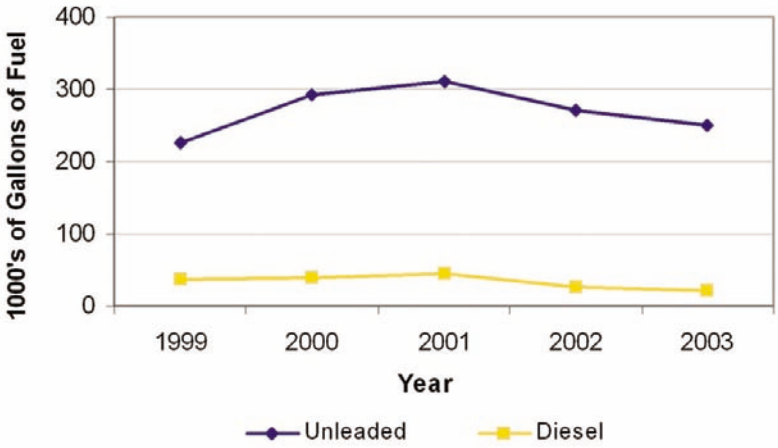
FUEL CONSUMPTION

This indicator provides a minimum estimate of campus fuel consumption, covering vehicle fuel use from most campus operations and fleet inventory of the Parking and Transportation (P&T) department. Fuel consumed in the commutes of students, faculty and staff outside of campus fleet vehicles and shuttles falls outside the scope of this report, but it should be acknowledged that fuel consumption from daily commuting likely dwarfs fuel consumption on campus. Fuel consumption uses up limited resources and impacts the quality of the air we breathe. We wish to minimize total fuel consumption while providing necessary services.

How Are We Doing?

Fuel consumption for UC Berkeley's fleet vehicles has decreased slightly in the last two years. Fuel usage at Cal is mostly restricted to gasoline and regularly available diesel fuels. Alternative fuel projects have been tried in the past, and thus far proven uneconomical. Figure 3 depicts fuel purchased using the Voyager fuel card system. All campus vehicles use this system, with the exception of Parking and Transportation's fleet of 16 buses and vans.[iv]

Figure 3. Fuel Purchased For Campus Vehicles



The University does not track average fleet fuel efficiency. In the past, P&T has operated two natural gas shuttle vehicles which were discontinued due to extremely high maintenance costs. An electric bus was also used but was recently discontinued because the area's hilly terrain created an operating problem for the vehicle's power supply.[v]

UC Berkeley's transit buses are leased from AC Transit. This has been the most financially successful means of operating the campus shuttle program, Bear Transit. Bear Transit offers Cal affiliates extensive services around campus. Because the buses are not owned internally, however, alternative fuel endeavors and compliance issues fall under AC Transit's jurisdiction. In the year 2004-5, an estimated 61,000 gallons of low-sulfur diesel and gasoline fuel will be consumed by the transit buses.[vi]

Recent Accomplishments

Electric-powered Transport and Electric Charge Stations - The University has stations for electric Rav-4s used by Cal staff and for commuting. Departmental use of Segway HTs is also expanding.

Campus Biodiesel Committee - Recently formed by staff members, this committee is currently researching the feasibility of implementing biodiesel conversion in some of Berkeley's heavier Physical Plant–Campus Services (PP-CS) fleet vehicles.

Did You Know?

Driving below 65 mph, not using the air conditioner, keeping tires properly inflated, and replacing dirty air filters can each increase your vehicle's fuel efficiency by up to 15%.[vii]

Transportation

FUEL CONSUMPTION

Comparing Our Performance

The University of British Columbia (UBC) is pioneering research and development of hydrogen fuel cell technology. Working with industry and government, UBC is creating a "Hydrogen Village" with a planned hydrogen fueling station and vehicle conversions expected to reduce annual CO_2 emissions by 15,000 tons.[viii]

At Michigan State University (MSU), fuel usage was estimated to have increased by roughly 23% between 1989 and 1998, and was projected to increase further as their motor pool increased. In response, MSU now has over 400 vehicles operating on alternative fuels and a reuse system for various fluids & components.[ix]

The University of Vermont (UVM) is currently collecting data on the number of trip miles made on alternative fuels and has a long term goal of a larger fleet of low- to zero-emission vehicles. The campus has also implemented a one-year experiment in biodiesel operations, initiated by an undergraduate student.[x]

UC BERKELEY'S FLEET INVENTORY

608 Total Operational Vehicles
127 Smog-exempt
516 Gasoline Vehicles
31 Diesel Vehicles (including transit buses)
12 Electric Vehicles (including motorcycles)
1 Compressed Natural Gas Vehicle
1 Solar Vehicle

P&T'S FLEET INVENTORY

16 total vehicles leased from AC Transit:
6 larger diesel buses of approximately 2.35 mpg
4 mid size diesel buses of approximately 2 mpg
6 small gasoline cutaway vans of approximately 5 mpg
Total fleet efficiency average: 3.14 mpg
It should be noted that some transit buses can service up to 50 people at once.

Opportunities

NEXT FEW YEARS

Explore new funding sources for transportation innovations – P&T has attempted to implement various alternative fuel technologies, but all have been discontinued mainly due to financial constraints and technological limitations ill-suited for campus use. UC Berkeley's transit program has been providing alternative transportation services in recent years, but revenues needed for these programs are limited. Additional revenue sources are needed to maintain and expand programs.[xi]

Incentives – Creative strategies to increase transit ridership or encourage cleaner fuel consumption should be considered by transportation officials. Reduced parking rates for high-efficiency vehicles or alternative fuel vehicles (AFVs) may provide one such opportunity.

Cleaner fuel contracts – Since the campus leases buses from AC Transit, discussions are underway regarding including these buses in any future AC Transit biodiesel pilot programs. Cleaner fuel consumption by AC Transit could be a good marketing angle to encourage more AC Transit use by campus commute.

LONG TERM

Biodiesel conversion – Conversion of campus vehicles to run on biodiesel may be a logical step toward cleaner fuel consumption. The City of Berkeley, with its own biodiesel-powered fleet, is a potential biodiesel procurement partner. Cal has a unique opportunity for progress in this area, though mechanical, long-term financial and logistical hurdles remain to be resolved.

Purchase AFVs – The University has some degree of freedom in how to comply with the The Energy Policy Act of 1992 (EPAct) mandate, requiring 75% of all new light-duty vehicles in applicable fleets to be AFVs. Rather than buying heavier or used vehicles (which other institutions have done), biodiesel conversion can also earn EPAct credits.

PRESENCE OF TRANSPORTATION DEMAND MANAGEMENT PROGRAMS

Conventional transportation modes are one of the largest contributors to both climate change and local air pollution. In response, many strategies have been developed to promote more efficient and effective use of transportation resources. These strategies, referred to in aggregate as Transportation Demand Management (TDM) initiatives, can include improved transport options, incentive programs for using alternative transportation, strategic placement and regulation of parking, careful land use management, and other policy and institutional reforms.

How Are We Doing?

The 1956 Long Range Development Plan (LRDP) for UC Berkeley was committed to "the private automobile as the means of circulation and access to the campus." However, as our campus continued to grow, this rather short-sighted approach was largely abandoned. The 1962 LRDP demonstrated a new focus on encouraging the use of public transit, bicycles, and other alternative modes of transit. Since these early plans, the University has implemented many TDM programs that have shifted our transportation modal split, and the urban setting of our campus continues to offer many opportunities and difficulties for transportation managers.

In 1987, Cal hired outside consultants who released a campus Transportation Plan stating, "because of the high cost of providing expanded parking in the vicinity of the campus, the development and enhancement of alternate transportation modes (ridesharing, public transit, bicycle and motorcycle/moped) should be actively pursued, and encouraged as an alternative to the single-occupant auto." As a result, the campus implemented the New Directions program to promote alternatives to automobile commuting through discounts and incentives.

In 1999, Cal forged a partnership with AC Transit to alleviate parking shortages and increase transit use. The introduction of the Class Pass offered the student body unlimited usage of local buses at a cost of $18 per student per semester.[xii] This program went through a pilot period from 1999 until Spring 2002, when it was renewed for four more years by voter approval. The Class Pass currently costs students $37.50 each semester. The New Directions program continues to evolve based on TDM studies, some of which have been done in collaboration with the City of Berkeley. UC Berkeley's drive-alone rate is significantly lower than the Bay Area's average drive-alone rate of about 75% (see Transportation Modal Split indicator).[xiii]

Although TDM programs have created incentives for alternative transportation, challenges linger. An April 2000 TDM study found that public transit continues to be the "least preferred" means of travel for Berkeley residents, with the perception being that public transit is only for the less economically fortunate. A 2001 survey of staff and faculty at Cal showed that convenience and travel time were the primary reasons for not using public transit. These perceptions may still be hindering its use by UC Berkeley commuters.

Recent Accomplishments

Class Pass & Bear Pass - The Class Pass allows registered students to ride free of charge on AC Transit (including Transbay lines to and from San Francisco) and Bear Transit campus shuttle buses (except the Richmond Field Station shuttle line) all semester long. This value, estimated at over $400, is paid for out of individual student registration fees ($37.50 per semester). The Bear Pass is the AC Transit unlimited-ride bus pass for UC Berkeley employees. This two-year pilot program offers unlimited AC Transit rides for just $20 per month.[xiv]

Did You Know?

The various direct and indirect costs of owning and maintaining a car typically total roughly $7,000 a year.

Transportation

PRESENCE OF TRANSPORTATION DEMAND MANAGEMENT PROGRAMS

Carpooling – Over the last two years the number of faculty and staff commuting by carpool has increased dramatically, largely due to reduced pricing of carpool parking permits. This program has quickly grown from 200 to over 750 participants.

New Directions Program: *The Alternative Commute Program for UC Berkeley Faculty & Staff* – Administered by the Parking & Transportation Department, this program offers a host of benefits to all faculty and staff (career, most temporary appointments, post-doctorate researchers and visiting scholars) who do not hold a daytime campus parking permit.[xv] These benefits include the Bear Pass, Free BearTransit rides, emergency rides home, discounted carpool parking, City CarShare, and more.

Comparing Our Performance

Our shift from an emphasis on the personal automobile to alternative transportation is seen in programs such as the Class Pass, Bear Pass, New Directions program and bicycle paths through campus. As a large institution, UC Berkeley is among a handful of leaders in this area, and Cal may benefit from example TDM programs developed by other institutions.

Opportunities

NEXT FEW YEARS

Discount passes on BART – Students, staff, and faculty have expressed interest in joining forces with other Bay Area universities and community colleges to encourage the Bay Area Rapid Transit District (BART) to offer a higher education discount pass.

Improve the image of public transit – An improved image through advertising could result in greater usage of existing programs and may also help set a positive tone beyond the University.

Advocacy for AC Transit's Bus Rapid Transit (BRT) – As proposed by AC Transit, BRT would appeal to new ridership and address convenience and travel time concerns of those who drive. Congestion that impacts transit travel time would be addressed by dedicated transit lanes. However, dedicated lanes for BRT face considerable opposition in local communities. As community residents, students, staff and faculty have the opportunity to influence the approval process for BRT.

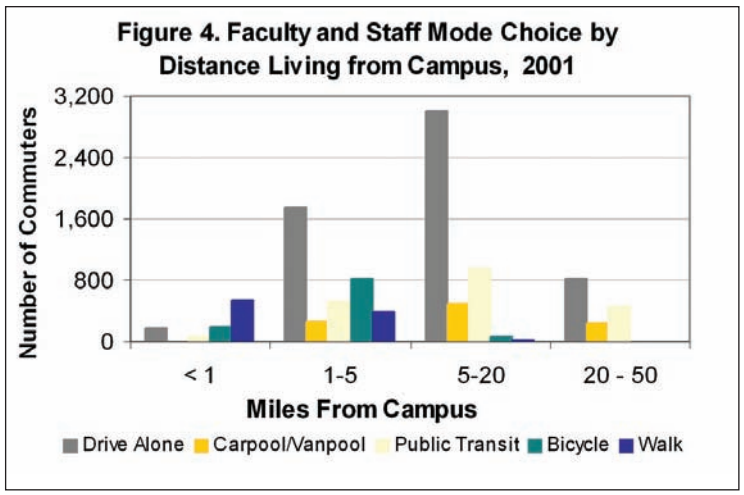
LONG TERM

Continue Cal's first comprehensive Bike Plan – Planning that will better connect bike riders to off-campus routes and on-campus amenities, facilities and paths is underway and should be continued.

Implementation of Translink Technology in the Bay Area – Existing technology is available that makes paying for public transit like using a prepaid phone card. If this were available and valid on all systems in the bay area, public transportation would be much more user friendly.

HOUSING AVAILABILITY AND AFFORDABILITY NEAR CAMPUS

This indicator examines the combined challenge of finding housing near campus, commuting to and from campus, and maintaining a professional or academic life at UC Berkeley. A long commute can be a strain on the commuter, the University, the community, and the environment. UC Berkeley demonstrates its understanding of this tension in the New Century Plan: "Our best student and faculty candidates increasingly cite the scarcity of good, reasonably priced housing as the primary factor in the decision of whether they come or not to UC Berkeley."[xvi] This indicator also touches briefly on the supply and cost of housing near campus, and programs the University provides to deal effectively with housing market dynamics.[xvii]



How Are We Doing?

As Figure 4 depicts, the majority of faculty and staff who drive alone live between 5 and 20 miles from campus. The Long Range Development Plan states that a reasonable transit commute takes no more than twenty minutes, yet finding housing within this geographic range can be difficult and costly. Given high cost, low availability, and the tendency for market fluctuation over time, what can the University do to help ensure affordable housing for students, faculty and staff close to campus?

Four current programs provide housing-related assistance to Cal faculty, the most significant being the Mortgage Origination Program (MOP). One-quarter of all faculty members have enrolled in this program, demonstrating its popularity, but no similar program is offered for staff.

Should students want to live within walking distance of campus, one obvious option is residence hall housing. For the next school year, room and board in residence hall units will cost around $1,200 per month. This cost is often met with financial aid money – two-thirds of students receive aid at UC Berkeley.[xviii] The University residence halls accommodated 95% of all entering freshmen and 28% of all transfers this year, all of whom thus live within a mile of campus.[xix]

In estimations by Cal's 2001 staff and faculty transportation survey and the City of Berkeley's 2000 Southside/Downtown Transportation Demand Management Study, about one-third of UC Berkeley employees live in the City of Berkeley.[xx] It is often stated by staff and faculty that there are more affordable housing options and better public schools elsewhere. As depicted in Figure 5, the ratio of median home prices to average first-year Assistant Professor salaries has been making it increasingly difficult for faculty to afford housing in the City of Berkeley in recent decades.[xxi]

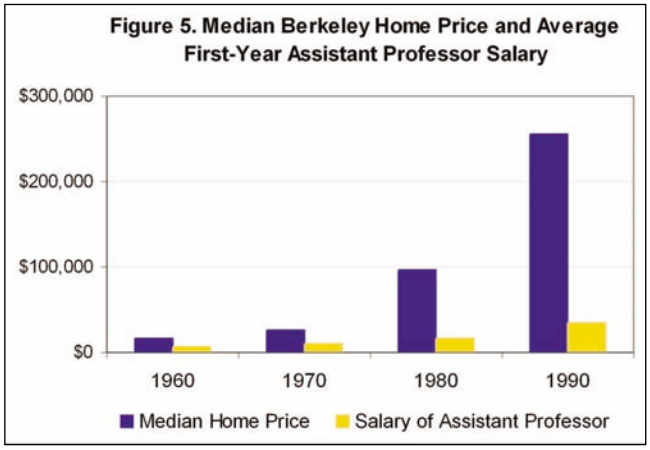
Recent Accomplishments

University Terrace and Clark Kerr Apartments – Consistent with the New Century Plan initiative that seeks to provide at least three years of housing for newly recruited untenured faculty who desire it, University Terrace opened in the early 1990's with 75 condominium units for sale to faculty and staff. Also, the Clark Kerr Faculty Apartments opened in 1987 with 29 rental units for new faculty (who must be tenured or on a tenured track) for a maximum stay of two years. Both apartment groups are within walking distance of campus.

Albany Village – Housing for faculty and staff may be added during the next phase of construction at Albany Village, in line with objectives stated in the LRDP to provide a larger stock of more reasonably priced housing within five miles of campus.

Transportation

HOUSING AVAILABILITY AND AFFORDABILITY NEAR CAMPUS

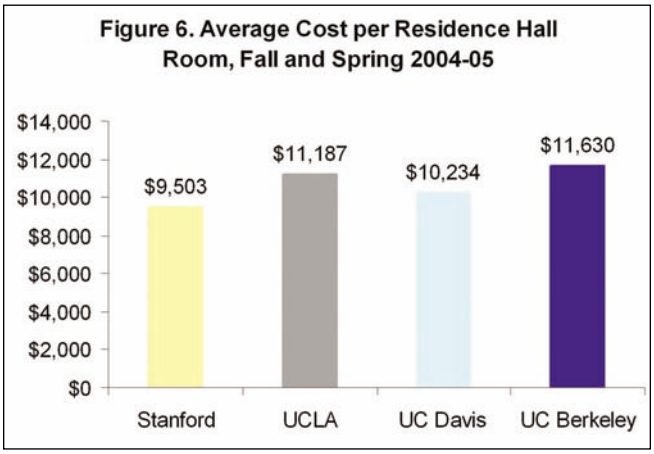


Most students live within walking distance of campus – About 7000 (~22%) Cal undergraduate students live in campus residence halls. Among all students living within one mile of campus, about 85% choose to walk as their primary mode of transportation (see the Transportation Modal Split indicator).[xxii]

Comparing Our Performance

STUDENT HOUSING

Construction of new housing for students has raised the cost of campus residence halls, but we remain competitive with our peers (see Figure 6). UC Berkeley houses 58% of its students on campus, while UCLA houses only 46%.[xxiii] Stanford has historically housed 92% of its 6,700 undergraduate students, and charges residence hall rates below other universities.[xxiv]



FACULTY & STAFF HOUSING

UC Berkeley provides 104 units of faculty/staff housing, comprised of 75 condos and 29 rental units. These figures do not include new units that may be added in phase III construction at Albany Village, yet Cal already provides more housing units than most UC campuses. However, due to home loan program offers from other universities, some of last year's potential faculty members decided to accept contracts elsewhere.

Opportunities

NEXT FEW YEARS

Housing study - The campus might benefit from a more thorough study of the housing market in areas defined by the LRDP as reasonable commute distances via public transit. Such information could help align housing and transportation objectives at UC Berkeley.

LONG TERM

Expand housing assistance programs for staff – Two model programs are the Mortgage Origination Program for Cal faculty and a program available to state employees in which retirement funds can be borrowed to purchase a home. Expanded finance options could also improve the living situation of staff members.

Build housing along AC Transit corridors – In line with goals stated in the LRDP, Cal might attract new undergraduates, graduates, and untenured faculty by providing more housing along AC Transit corridors to make commutes easier.

TRANSPORTATION NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Eddie Bankston	Executive Director, Housing and Dining, Residential and Student Services	Housing Availability Near Campus
Judy Chess	Manager for Policy and Programs, Capital Projects	Housing Availability Near Campus
Jan De Vries	Vice Provost—Academic Affairs and Faculty Welfare	Housing Availability Near Campus
David Dowall	Professor & Director—Institute for Urban and Regional Development	Housing Availability Near Campus
Iris Grace	Faculty Home Emergency Loan Coordinator, Loans and Receivables	Housing Availability Near Campus
Jennifer Lawrence	Principal Planner, Physical and Environmental Planning, Capital Projects	Housing Availability Near Campus, Fuel Consumption
David Moers	Assistant Vice Chancellor—Human Resources	Housing Availability Near Campus
Becky White	Assitant Director—Cal Rentals & Faculty Housing Services	Housing Availability Near Campus
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Modal Split
Kira Stoll	Transportation Planner for Parking and Transportation	Modal Split, Presence of TDM Programs
Eric Robinson	Fleet Services	Fuel Consumption
Janice Austin	Public Safety & Transportation Purchasing, Accounts Payable Supervisor	Fuel Consumption
Eric Anglim	Material Management Property Manager	Fuel Consumption
Linda Brun	PPCS Fleet Manager	Fuel Consumption
Vernice Haddix	Parking & Transportation Transit & Charter Assistant Manager	Fuel Consumption
Tim Pine	Environmental Specialist, Office of EH&S	Fuel Consumption
Greg Watty	Public Safety & Transportation Manager of Budget & Planning	Fuel Consumption

CITATIONS

i 1998 UC Berkeley Campus Parking Study by Wilbur Smith Associates

ii http://public-safety.berkeley.edu/p&t/transportation_alternatives/bear_pass/#ProgramOverview

iii 1998 UC Berkeley Campus Parking Study by Wilbur Smith Associates

iv It should be noted that some transit buses can service up to 50 people at once.

v Fleet Services, Oct 2004

vi Parking & Transportation, Oct 2004 gave info that .33 of lease costs is fuel. Currently, gasoline & diesel cost an average of $2.30 per gallon (California Energy Commission) of $424,340.00 of total lease costs, an estimated $140,032 were fuel costs. 140,032/2.3 = 60,883.5

vii California Energy Commission, 2004

viii http://www.ubyssey.bc.ca/20041005/article.shtml?%3C!--1--%3Enews/coolvancouver.html

ix http://webmail.hoster909.com/download_attachment.php?msg=35&partbody=2&partprop=2&fname=Univ+of+Florida+report.pdf&folder=ER%20190

x http://webmail.hoster909.com/download_attachment.php?msg=35&partbody=2&partprop=2&fname=Univ+of+Florida+report.pdf&folder=ER%20190

xi http://public-safety.berkeley.edu/p&t/classpass/referendum.html

xii http://public-safety.berkeley.edu/p&t/classpass/

xiii Bay Area Census pdf file found at: http://www.mtc.ca.gov/maps_and_data/datamart/forecast/

xiv http://public-safety.berkeley.edu/p&t/transportation_alternatives/bear_pass/#ProgramOverview

xv http://public-safety.berkeley.edu/p&t/transportation_alternatives/#AlternateTransportationServices

Transportation

TRANSPORTATION NOTES

[xvi] New Century Plan. on line: http://www.cp.berkeley.edu/ncp/goals/housinginitiatives.html

[xvii] Data from Staff and Faculty 2001 Housing and Transportation Survey

[xviii] Student budget website. http://students.berkeley.edu/admissions/general.asp?id=26

[xix] Walking percentage from 2001 Student Housing and Transportation Survey. Residence hall figures from interviews with Housing and Student Services.

[xx] In the P&T department's 2001 faculty and staff transportation survey results, 27% of UC Berkeley faculty and staff live in Berkeley. The 2000 Southside/Downtown TDM study done by the City of Berkeley reported that 31% of UC Berkeley employees live in Berkeley. http://www.ci.berkeley.ca.us/transportation/TDM/existingconditions/existingconditions.html

[xxi] City of Berkeley Planning and Development Department. "Rent Control in the City of Berkeley, 1978 to 1994: A Background Report." Berkeley, CA. May 27, 1998.

[xxii] Figure based on estimates in the LRDP for added student beds, an 85% walking rate is assumed.

[xxiii] UCLA Long Range Development Plan.

[xxiv] Wilbur Smith Associates. 1998 UC Berkeley Campus Parking Study.

UC Berkeley Campus
Sustainability Assessment

Purchasing & Waste

Procurement Policies & Options

Solid Waste Recycling & Disposal

Hazardous Chemical Waste

Reuse and Recycling Infrastructure

Paper Purchasing, Use & Disposal

Purchasing & Waste

PROCUREMENT POLICIES & OPTIONS

As individual entities and as an aggregate industry, universities purchase large amounts of products such as paper, computers, printers, copiers, office supplies, research supplies, cleaning supplies, building materials, furniture, paint, carpet, food and more. As an institution with large purchasing requirements, Cal can influence and drive the type, availability and price of products offered in the market. We can use purchasing practices to educate our students, improve human health conditions on campus, and lead the way as stewards of the Earth's resources by making environmentally preferable purchasing (EPP) choices. This involves consideration of the environmental and human health consequences resulting from the manufacturing, packaging, transportation, use and disposal of products. This indicator examines UC Berkeley's environmentally and socially conscious purchasing policies (see also the Green Custodial Chemical Use indicator in the Health & Wellbeing system).

How Are We Doing?

While UC Berkeley has made and continues to make some EPP choices, we currently have no overarching policy mandating EPP choices for products and services. The reorganization of campus purchasing currently underway provides an ideal opportunity to incorporate EPP criteria into our overall purchasing strategy.

Purchasing on the UC Berkeley campus is a highly decentralized process. Hundreds of people are involved in low-value purchasing (up to $2,500 per item) throughout the campus. High-value purchasing is handled by campus buyers, whether they are physically located in Procurement Services or dedicated to an individual department.

Currently the BluCard allows departmental buyers to purchase goods under $2500 independently of a campus buyer. A "green" portal has been developed to highlight EPP alternatives for commonly purchased items on the Blu website, but this portal has not yet been added to the website.[i]

The University of California Office of the President has developed a Strategic Sourcing Initiative, bringing personnel from all of the UC campuses together to form teams and use their increased purchasing power to negotiate UC system-wide contracts. These purchasing teams usually negotiate very low prices for a handful of specific products, as well as a standard discount for other products offered by a vendor company. No policy currently exists mandating that environmentally preferable products be emphasized in these price negotiations or that contracts be developed with companies specializing in environmentally or socially conscious products, but consideration of these issues is now encouraged. UC Berkeley purchasers on each negotiating team have an opportunity to emphasize EPP issues in the consideration of each contract.

Recent Accomplishments

Fair labor practices – All products that carry the Cal logo must be manufactured using fair labor practices as specified in the UC Code of Conduct for Trademark Licensees.[ii]

Sustainably harvested wood – The Residential and Student Services Program specifically sought out and purchased wood furniture made from non-rainforest, sustainably harvested wood.

Did You Know?

It takes 10 times more energy to make a piece of white paper than it does for an ENERGY STAR copier to print an image on it.[iii]

Purchasing & Waste

PROCUREMENT POLICIES AND OPTIONS

UC system-wide furniture contract has a sustainable product line – Steelcase, a major office furniture supplier, has offered a "sustainability line" of products ranging from chair coverings made out of 100% recycled content to chairs that can be dissembled for recycling in a matter of minutes.

Custodial paper products – These products (e.g., tissue, towels, toilet paper) are purchased through a campus-wide agreement that requires at least 30% post-consumer recycled content (or as high as is available on the market).

Comparing Our Performance

Indiana University implemented a selective purchasing policy that prohibits buying products derived from old-growth forests. The University of Colorado at Boulder, while not having a comprehensive green purchasing policy, is moving towards sustainable purchasing practices by producing a green products guide for commonly purchased items (analysis includes waste reduction and recycling provisions in vendor contracts), using re-tread tires for large campus vehicles, offering recycled paper and paper products to campus departments and stocking recycled paper in all copy centers.

Opportunities

NEXT FEW YEARS

EPP policy – Develop a purchasing policy that addresses environmental and fair labor practices for all UC Berkeley purchases on a per product basis.

Green BluCard portal – Add the already under-development portal of environmentally preferable options for commonly purchased products to the Blu purchasing website.

Educate purchasers – Train all campus purchasers in environmentally preferable purchasing, including sourcing options for the products they buy.

Use established resources – Utilize the EPA's list of environmentally preferred products when evaluating product choices.

LONG TERM

Fair labor contracts – Follow the Cal logo fair labor criteria for all products purchased by UC Berkeley.

Purchase fewer total products and more reusable and recyclable products – The best way to decrease solid waste production is to purchase fewer products. In addition, a higher proportion of reusable and recyclable products can also have a significant impact.

Database of reusable products – Develop an online database where members of the campus community can list and find items for reuse as an alternative to disposing of or purchasing new products.

Develop a supply management program – Develop a program including periodic check-ins with campus suppliers regarding their environmental performance and a reporting system for innovations and product upgrades that vendors may have achieved during duration of contract.

Purchasing & Waste

SOLID WASTE RECYCLING & DISPOSAL

While recycling rates have been increasing, we at UC Berkeley, along with American society as a whole, continue to generate a tremendous amount of solid waste. Much of this ends up in landfills, and its collection, handling and disposal cost the University significant amounts of financial and human resources. While recycling offers the University many advantages, it is also costly. Consequently, our goal should be to simultaneously minimize waste generation while working to divert the remaining waste from landfills into reuse or recycling streams. This is a very real challenge in our consumption-driven society, but it also presents an opportunity for the University to demonstrate leadership in sustainability. This indicator examines our solid waste stream. (For more information see the Reuse & Recycling Infrastructure indicator.)

How Are We Doing?

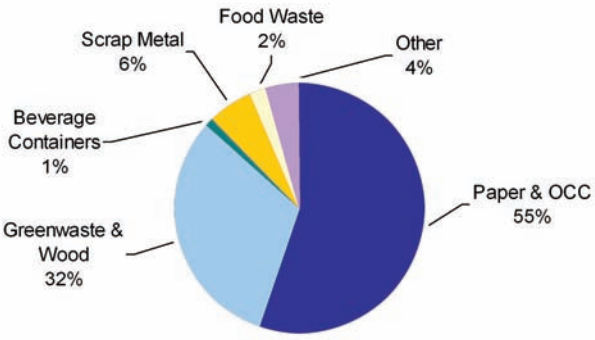
As shown in Table 1, our annual campus recycling rate increased from 1996 to 2000 and has remained relatively stable since. This increased recycling has reduced solid waste expenses. The cost to remove garbage is $120 per ton – a "loaded" cost covering $80 to collect and transport the waste and $40 to dump it at the landfill. By contrast, Campus Recycling & Refuse Services (CRRS) receives $30-50 per ton for the paper it sells to local vendors. Consequently, Cal saves $70-90 per ton when recycling rather than landfilling paper. Recycling of other commodities saves dumping costs, at a minimum, and may return some revenue to the campus.

Table 1. Campus Diversion Rates

FISCAL YEAR	DIVERSION RATE
1996-1997	17.53%
1997-1998	15.50%
1998-1999	21.43%
1999-2000	34.62%
2000-2001	33.09%
2001-2002	34.57%
2002-2003	37.11%
2003-2004	32.89%

Figure 1 illustrates relative amounts of recycled materials in 2003-04. Paper and cardboard are the largest contributor, making up over half of all recycled material, while beverage containers account for only one percent, despite their high profile receptacles. Figure 2 depicts the amounts of material we have recycled and landfilled in recent years.

Figure 1. Recycled Material in 2003-04 By Weight



Recent Accomplishments

Increased recycling rate – Since the late 1990s, the University has both increased solid waste recycling and decreased the tonnage going to landfills. In short, the overall recycling rate has jumped from below 20% in the mid-1990s to over 30% in each of the past several years. This represents a significant change in campus recycling and waste practices. However, progress appears to have reached a plateau, so policy changes may be necessary to achieve additional improvements.

Did You Know?

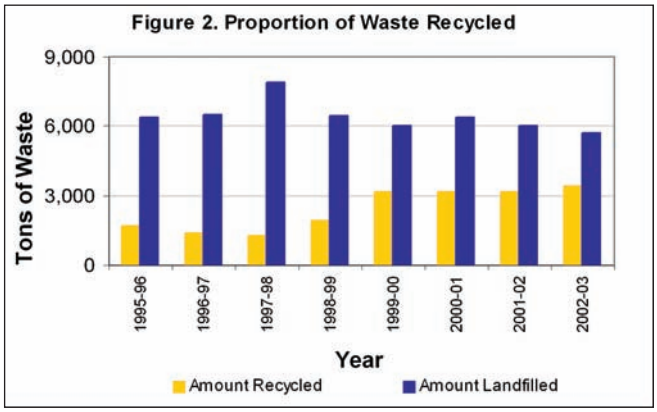
In 2003-2004, the campus generated almost 30 tons of garbage daily. This equates to a daily waste generation of 1.6 lbs per person.

Purchasing & Waste

SOLID WASTE RECYCLING & DISPOSAL

Comparing Our Performance

Although Cal's recycling performance has improved, our recycling rate is not among those of top performing major research universities. The University of Oregon consistently diverts over 40% of its waste stream, while the University of Massachusetts, Amherst exceeds 50%.



Opportunities

NEXT FEW YEARS

Improve frequency and accessibility of recycling receptacles – By systematically placing more multi-material bins throughout campus – especially in areas where they are not currently located, such as classrooms – we can provide the infrastructure necessary for achieving a higher recycling rate.

Increase the campus diversion rate above 50% – By making waste and consumption data more available, we can raise the "waste awareness" of campus users.

Explore waste-reducing technologies – For example, new high-performance air dryers can greatly reduce the use of bathroom hand towels, saving both purchasing and disposal costs and reducing material flow to the landfill.

LONG TERM

Employ and promote closed-cycle materials practices – Purchase reusable and recyclable materials, with an emphasis on reuse to save costs and close the materials loop.

Establish targeted materials use practices – For example, promote returnable packaging policies and collect shipping containers for reuse as part of all procurement contracts (see Procurement Policies & Options indicator).

Set a goal for campus diversion rate – Relevant campus stakeholders should settle on a high, but achievable, recycling rate, possibly in conjunction with the City of Berkeley. Current legislation requires the City to reach a 75% diversion rate by the year 2010.

HAZARDOUS CHEMICAL WASTE

Hazardous chemical waste is a small portion by weight of the total solid waste generated on campus, but it poses a large risk to the environment and those who handle it. As a leading research institution, UC Berkeley's laboratory and operational activities require the use of many hazardous chemicals that must be carefully managed in accordance with federal, state and local laws and regulations. In recent years, programs implemented on campus have complied with regulations and campus policies, saved money, and reduced the amount of hazardous chemical waste generated.

How Are We Doing?

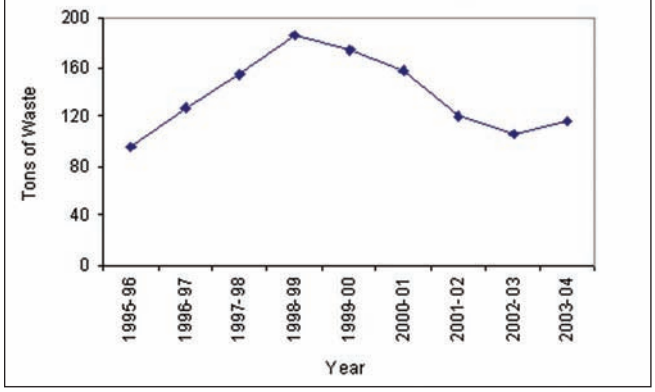
UC Berkeley generates approximately 100 tons of hazardous chemical waste each year as laboratory, building maintenance, landscaping, construction, and studio art wastes (Figure 3). Our largest producer is the College of Chemistry, which generates about half of this waste. UC Printing Services is the second leading contributor at 10%, mainly due to solvents and inks.

The early waste increase shown in Figure 3 is deceptive; it actually reflects improved education on proper hazardous chemical waste disposal and more accurate waste reporting. The more recent decline reflects improving waste reduction practices.

The four most common hazardous chemical wastes are (Figure 4): Bulk Solids (laboratory debris such as pipettes and used gloves), "Lab Packs" (used or unwanted laboratory chemicals), Bulk Liquids (various liquid chemicals used in laboratories), and Bulk Solvents. Together they account for 76% of this waste.

Hazardous chemical waste is collected by the Office of Environment Health and Safety (EH&S) upon departmental request. Chemicals that are unopened, unused, unexpired, and in relatively good condition enter the EH&S chemical exchange program (CHEX) and are made available to other departments at no cost. Non-reusable chemicals go to permitted treatment, storage and disposal facilities.

Figure 3. Hazardous Chemical Waste Produced at UC Berkeley



EH&S understands the importance of reducing the amount of chemicals used on campus and offers training in minimizing chemical use as well as safe chemical handling.

Recent Accomplishments

EH&S Chemical Exchange Program – CHEX facilitates recycling of chemicals between campus departments. EH&S personnel screen the chemicals they pick up, and those that meet minimum criteria are added to an online database. Researchers and departments can obtain chemicals free of charge through this system. Unfortunately, recent budget cuts have affected CHEX because EH&S pays for the disposal of

Did You Know?

The adjusted average disposal fee listed by EH&S for items classified within the four most common types of hazardous chemical waste is roughly $2.50 per pound.[iv] *At this rate, disposing of Cal's 100 annual tons of chemical waste would cost $500,000.*

HAZARDOUS CHEMICAL WASTE

unused chemicals submitted to the program, and dedicated staff are needed to process chemical requests. The Departments of Chemistry and Chemical Engineering maintain a similar program internal to the College of Chemistry.

Charging for waste disposal – In 1991 the Chancellor, working with EH&S, announced that researchers and departments would be charged for the cost of disposing of their non-radioactive hazardous wastes. This has led to some smaller experiments and less waste generated on average. This strategy also encourages more careful and efficient use of the most toxic chemicals since they often carry the highest disposal and handling costs.

Mercury grant – UC Berkeley has recently received a grant from the Environmental Protection Agency (EPA) to conduct a Mercury Reduction program. Three thousand mercury thermometers have been replaced and Mercury spills are now down to an average of two per year. Previously, EH&S handled two or three spills per month. Though this was a small change in hazardous waste policy, it has created a large positive effect.

Microscale Undergraduate Experiments – The College of Chemistry now uses microscale experiments in laboratory classes to reduce waste and save on purchasing and disposal costs.

Opportunities

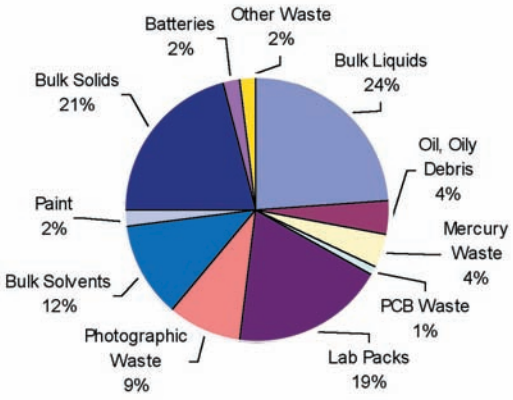
NEXT FEW YEARS

Expand the EH&S Chemical Exchange Program – Provide more funding for the CHEX program, and consider opportunities to coordinate with other campuses. If more widely used, fewer chemicals will need to be purchased and the chemical waste stream will decrease.

Restore grants for hazardous waste reduction programs – Grants for departments wishing to start their own hazardous waste reduction programs were cut, despite their many successes (e.g., College of Chemistry microscale teaching laboratories).

More outreach to non-traditional and smaller-scale generators – Many pockets of campus generate small flows of hazardous materials that in aggregate comprise a significant waste stream. To help reduce these wastes, future waste minimization programs, including grants, educational outreach, etc., could target smaller-scale generators across campus.

Figure 4. UC Berkeley Hazardous Chemical Waste 2003-04



LONG TERM

More comprehensive reuse and recycling – Focus on recycling/reuse methods so that a higher proportion of chemical waste generated on campus is recycled and used for other purposes instead of being sent to landfills and incinerators (see Reuse & Recycling indicator).

More funding for waste prevention – Continue increasing funding for projects and outreach to minimize hazardous chemical waste production.

REUSE & RECYCLING INFRASTRUCTURE

Reuse and recycling of our materials is critical to preserving our natural resources. A comprehensive, efficient, and user-friendly reuse and recycling infrastructure can enable our campus community to landfill less solid waste and increase our diversion rate. This indicator examines Cal's organizational strategy for on-campus recycling and the range of materials that we recycle.

How Are We Doing?

Campus Recycling and Refuse Services (CRRS) manages the recycling program at Cal and tracks recycling performance data. Since 1998-1999, the campus recycling rate has increased dramatically, reaching 33% in 2003-2004 (see Solid Waste Recycling & Disposal indicator). The campus recycled nearly 3000 tons of material in the 2003-2004 fiscal year, more than twice the tonnage recycled in 1996-1997. CRRS recycles materials from four broad categories: mixed paper, beverage containers, green waste (e.g. leaves, twigs, grass and pallets), and metal. One of the main goals of the UC Berkeley Recycling Summit in 2003 was to increase access to indoor/outdoor recycling containers and to make recycling more convenient for everyone.

The mixed paper program recycles 5-7 tons per day, including computer printouts, white paper, mixed paper, newspaper, glossy paper/magazines, soft-bound books and cardboard boxes. CRRS has distributed approximately 12,000 blue plastic 8-gallon paper recycling bins to campus offices for employees' desk sides. The distribution of these bins is focused around offices and areas of heavy paper generation such as printer and copier rooms. This program is intended to be a "user-friendly, no sorting or transporting" program. The bins are collected by custodians within the buildings and condensed outside into specified containers where they are picked up by trucks at least once a week and brought to a recycling center for sorting. In addition, special cleanout "toters" or 96-gallon clean-out bins are available for mixed paper disposal at no extra charge to the generator. Our huge increase in recycling rates between 1998 and 2000 can be attributed to the implementation of this highly successful mixed paper program.

The beverage container recycling program recycles more than two tons of glass, plastic and aluminum each week. This system is based on voluntary participation with customer-initiated bin placement. Collection is regularly provided in some instances, while low-volume generating customers are serviced on an "on-call" basis. However, bins may only be placed in locations that are accessible without keys and during normal working hours, where at least 35 gallons of beverage container waste is generated per month. The bins are collected on campus by the East Bay Conservation Corps, officially, and scores of local recycling entrepreneurs, unofficially. Beverage containers are also recycled at public locations on campus in silver "Eco Pop" bins and in recently purchased multi-partition concrete containers. These containers are very durable and make recycling more convenient because they have multiple compartments. However, they cost $1,000 each.

Green waste recycling has been highly effective, collecting an estimated 18 tons per week. Leaves, brush and tree trimmings as well as other compostable materials are collected in conjunction with other grounds-keeping activities, and mobile green waste bins are available to campus gardeners. Shipping pallets are also collected.

Scrap metal is also recycled at a modest 1.5 tons per week. Metal gallon containers are collected from high volume-generating buildings on campus and hauled away at no charge to Cal. The collected items are then deposited into a 20 cubic yard bin located at the Physical Plant Corporation Yard.

Fluorescent tubes, toner cartridges, plastic film and packaging peanuts are also recycled, and while their diverted tonnage is not large, the amount of these hazardous or problematic materials removed from the waste stream provides further benefits to the University.

Recent Accomplishments

Re-USE Center – This facility is open to all students, faculty and staff and is located beneath Eshleman Hall in the northeast corner of the MLK Garage. The main goal of the Re-USE Center is to divert 20-30 tons of reusable materials from landfills annually. There is no cost for either dropping

REUSE & RECYCLING INFRASTRUCTURE

off or taking Re-USE materials, which include binders, hole punchers, clothes, books, computer accessories and extension cords, among other items.

Reusable Mugs – The Chancellor's Recycling Summit in 2001 supported a reusable mug project, and campus Dining Services began selling reusable mugs for $1.00 with a free refill in 2003. The mugs are made of 40% post-consumer recycled content and encourage reuse in addition to reducing waste generated from disposable containers.

Comparing Our Performance

During football games at the University of Virginia, stadium parking lots hold 40 recycling containers, and students make recycling even more convenient by passing out bags for recyclables to be left near owners' cars and collected.

Opportunities

NEXT FEW YEARS

Place a greater number of recycling bins in key high-traffic locations – Despite the fact that eating and drinking is prohibited in campus lecture halls, it happens often, and a lack of recycling bins in these facilities encourages a large amount of recyclable containers to end up in landfills. However, placing bins inside of lecture halls could invite other distractions which should be weighed carefully.

Establish an organized and convenient recycling system for athletic events – All sporting events, especially those with larger crowds like football and basketball games, could incorporate a more conspicuous and user-friendly arrangement of recycling bins and garbage cans.

Create a more inclusive and diverse recycling program – A more diverse and comprehensive program might involve increased opportunities for recycling electronic wastes and composting of paper towels from bathrooms and animal waste from labs.

Implement a progressive rate structure for garbage collection – Further incentivize recycling by developing and implementing a progressive rate structure for garbage collection. Departments might further prioritize recycling if each extra ton of garbage generated entailed a higher incremental collection cost.

Purchasing & Waste

PAPER PURCHASING, USE & DISPOSAL

Paper consumption is a significant yet little-monitored activity on the UC Berkeley campus. According to the Environmental Protection Agency, paper constitutes 38 percent of municipal solid waste in the country. Here at Cal, we do not stray far from this national trend. Paper is everywhere on our campus. Courses generate textbooks, readers and notebooks; students distribute flyers and handouts on Sproul Plaza; and a large office population churns through volumes of paper every day. Because paper is a major component of our waste stream, it is necessary to consider ways in which the negative impacts of its use can be minimized. This indicator examines issues of paper purchasing, use and disposal at UC Berkeley.[v]

How Are We Doing?

In the last four years, paper has made up nearly 50% by weight of the recycled waste on our campus. However, a campus-wide dumpster audit of waste from 20 major campus buildings conducted in 1998 revealed that recyclable paper still comprised over 42% over Cal's landfilled waste.[vi] Less than half of recyclable paper is currently being recycled. These figures demonstrate the potential impact that faculty, staff and students can have in diverting paper from the landfill to the recycling stream.

There are approximately 70 public recycling bins along the walkways of campus for paper recycling – a small number for a campus nearing 10 million gross square feet in building area. Still, funding remains an issue, as each new recycling bin (typically accommodating multiple categories of waste in addition to paper) costs upwards of $1000. As well, roughly 10,000 deskside bins are in use throughout campus offices, copy rooms, and near printers.

The paper purchasing system at UC Berkeley is highly decentralized and lacks a single set of criteria and goals. Until 2002, much of the campus bought paper from Campus Supply, a centralized purchasing hub. However, after Campus Supply was closed and departments were left to purchase paper independently, most began purchasing from Office Depot.[vii] Efforts have been made to encourage purchasing of recycled content paper, but without a centralized paper purchasing system, it is difficult to track what departments are purchasing. In addition, the University allows anything under $2,500 to be purchased with little scrutiny. Generally, no department purchases more than this amount of paper (about 100 cases) at a time, and thus the University has no meaningful way of tracking the amount of paper purchased nor its recycled content. The UC Office of the President issued a report in 2003 estimating Cal's paper purchasing at just 9% recycled content, likely far below any goal the campus might set.[viii] (For more information on purchasing in general, see the Procurement Policies & Options indicator.)

Recent Accomplishments

Default double-sided printing – All campus computing centers now use doubled-sided printing as the default standard.

Desk side recycling bins – In 1998, over 10,000 desk-side paper recycling bins were placed in offices throughout the University. This encourages staff to recycle paper with little effort needed.

Double-sided copying – All new campus copiers have the capability to print double-sided.

Recycled paper procurement – Several departments purchase high post-consumer content recycled paper, including Facilities Services, Haas Business School, and the Associated Students of the University of California (ASUC) Auxiliary.

Did You Know?

Using recycled paper is not just good for the trees. For every 20 cases of recycled paper substituted for virgin paper, we save 17 trees, 390 gallons of oil, 7,000 gallons of water and 4,100 kWh of energy.[ix]

Purchasing & Waste

PAPER PURCHASING, USE & DISPOSAL

Comparing Our Performance

The University of California at Santa Barbara (UCSB) has adopted a recycling program and policy which includes the purchasing of recycled paper. UCSB's policy requires that the University purchase paper products of the highest recycled content available within five percent of the price of non-recycled paper. The University of Oregon has also mandated a policy of buying recycled paper and other paper conservation strategies from which we might draw ideas.[x]

Opportunities

NEXT FEW YEARS

Establish a recycled paper quota for purchasing – Establish a post-consumer recycled paper content mandate for all departments to follow when purchasing paper.

Track paper purchasing – Tracking our paper purchasing would allow us to better target future programs in support of recycled paper purchasing and reuse and recycling.

Streamlining e-mail approval – Sending out campus-wide e-mails requires the approval of a Vice Chancellor. Clarifying this rule for particular purposes could make wide-audience e-mails a more effective tool for decreasing the amount of paper used for campus communication.

Margin adjustment – Set default page margins in all word processing software installed on campus computers to 0.75 inches on each side.

LONG TERM

100% recycled content – Require that all paper purchased by campus departments have 100% post-consumer recycled content and be free of chlorine.

More mixed paper recycling bins and improved signage – Place paper recycling bins with effective signage alongside all indoor garbage bins and in many other strategic locations.

PURCHASING & WASTE NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Procurement Policies & Options, Solid Waste Disposal, Chemical & Hazardous Waste, Reuse and Recycling Infrastructure, Paper Purchasing, Use & Disposal
Heather Randol	Hazardous Materials Specialist, EH&S	Chemical & Hazardous Waste
Emery Wilson	Reuse Facility and Chemical Disposal for the College of Chemistry	Chemical & Hazardous Waste
David Kolsom	Strategic Sourcing Manager	Procurement Policies & Options
Kurt Libby	Purchasing Manager, Housing and Dining Services	Procurement Policies & Options
Lila Mauro	Associate Director, Procurement Services	Procurement Policies & Options

CITATIONS

i https://blu.berkeley.edu/psp/pspprod/EMPLOYEE/EMPL/h/?tab=PAPP_GUEST

ii Office of Marketing and Management of Trademarks. http://ommt.berkeley.edu/codeofcond.html

iii http://www.epa.gov/smallbiz/archive/homebiz.html

iv http://www.epa.gov/opptintr/epp/documents/copiers/copiers.htm

v Good Company. www.goodcompany.com

vi Figure based on white, colored, glossy, computer paper, newspaper, and cardboard.

vii http://www.berkeley.edu/news/berkeleyan/1996/0904/briefs.html

viii University of California Office of the President. "Report on Recycled Paper Products Utilization at the University of California: July 2002 - June 2003." December 2003.

ix http://www.losgatosca.gov/downloads/whybuy.pdf

x University of Oregon. http://darkwing.uoregon.edu/~recycle/Pol_Recpaper.htm

UC Berkeley Campus
Sustainability Assessment

Land Use

Stormwater & Strawberry Creek

Landscape & Habitat

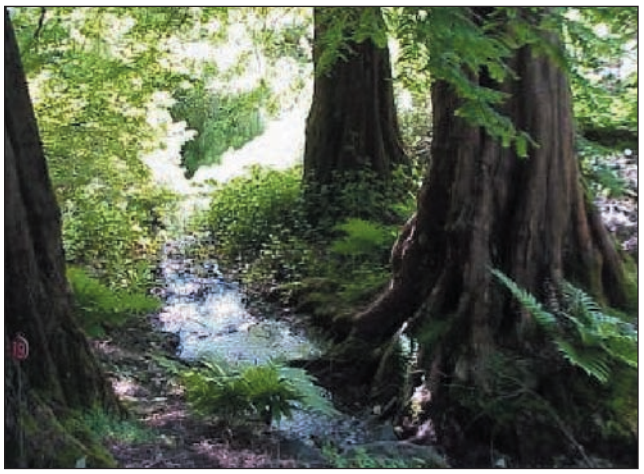
Pest Management

STORMWATER & STRAWBERRY CREEK

UC Berkeley's Central Campus and field stations are all located in watersheds with associated creeks or other water bodies that can be impacted by polluted stormwater from campus development and operations. Prominent water bodies include Strawberry Creek, the central landscape feature on our main campus, Codornices Creek at Albany Village, Stege Marsh at the Richmond Field Station and numerous other creeks at remote field stations. Campus property in the East Bay all drains to San Francisco Bay, which is an impaired water body due to numerous pollutants, such as mercury, pesticides and polychlorinated biphenyls.

Stormwater includes all water that flows into our storm drains and ultimately into local and regional waterways. Stormwater predominately refers to rainwater but can also include operational discharges, such as surface washdowns and irrigation water. As rainwater runs off streets and other impervious surfaces, it becomes contaminated by contact with trash, chemicals from cars (e.g., oil, grease) and atmospheric deposited chemicals (e.g., soot, mercury). The contaminated water then runs into the creek and from there to the bay. Stormwater runoff is the most common contributor to water pollution from urban areas.

Stormwater quality is especially important at UC Berkeley because Strawberry Creek is a central feature of our campus. It is important to keep our creek water clean to protect the bay, the creek and the campus community. This indicator examines Cal's stormwater management practices with an emphasis on Strawberry Creek.



How Are We Doing?

The water available for domestic supply from Strawberry Creek was one of the deciding factors in locating a campus in Berkeley. However, development of the City of Berkeley since the 1860s has gradually altered the creek's water quality, habitat and hydrology. By the 1980s, the creek was considered a public health risk due to chronic sewage pollution.

In 1987, UC Berkeley implemented the Strawberry Creek Management Plan to repair old plumbing affecting the creek and implement other pollution prevention practices. By 1989, water quality had improved sufficiently to allow reintroduction of fish, and today the creek supports several native species. Strawberry Creek's water quality is now good at most times, although it is still impacted by occasional spills, water main breaks and pollutants in urban runoff.

Did You Know?

Strawberry Creek was one of the main reasons the founders chose this land for the University of California. "All the other striking advantages of this location could not make it a place fit to be chosen as the College Home without this water. With it every excellence is of double value." (Willey, 1887)

Land Use

STORMWATER & STRAWBERRY CREEK

Cal's current Storm Water Management Plan, created in 2003, includes placarding of storm drains and regular monitoring of creek water quality by the Office of Environment, Health & Safety (EH&S). A Dedicated Spill Response Team deals with all chemical spills, and Physical Plant plumbers repair water main breaks on campus. Cal has also begun to address stormwater in new construction to decrease surface runoff and treat pollutants at their source. New projects are required to install treatment systems (such as green roofs, planter boxes and permeable pavement) to filter and degrade pollutants. Projects are also required to reduce impermeable surfaces (pavement and rooftops) to prevent further flow increases, a cause of watershed degradation over the last century.

Recent Accomplishments

Water Protection Policy - Completed in October 2004, this policy prohibits dispensing pollutants into the creeks and provides the materials and labor necessary for implementing pollution prevention.

Storm Water Management Plan – Cal's Storm Water Management Plan includes measures for improving pollution prevention in operations and during and after construction.

Construction Stormwater Specifications - Implemented in 2002, these specifications require all construction projects, regardless of size, to complete a Storm Water Pollution Prevention Plan and implement best management practices to reduce pollution during construction.

Strawberry Creek Management Plan (SCMP) - The SCMP addresses point and non-point source pollution control, aquatic and riparian habitat stabilization and restoration, and watershed management. Since 1987, implementation of the SCMP has led to substantially improved water quality, enhanced habitat quality and biodiversity, increased environmental education for students and the campus public, and stabilized the most critical erosion sites.

Drain labels - Placards have been placed on 95% of the storm drain catch basins on our main campus. These placards indicate that the storm drains flow to the bay and should only be used for clean rainwater.

University Village, Albany new development - Innovative stormwater measures, such as Continuous Deflective Systems and grassy swales, which minimize flow and treat pollutants in run-off, are designed into the Step II development currently being completed. This project has received national attention and will help preserve habitat in the newly restored lower Codornices Creek, home to the endangered steelhead salmon.

LRDP: No increase in impervious surfaces – The 2020 Long Range Development Plan calls for no net increase in impervious surfaces on campus above our current 60% impervious surface level.

Permeable pavement - In 2004, Cal replaced asphalt in Upper Sproul Plaza with semi-permeable pavers to decrease surface runoff in that area.

Comparing Our Performance

UC Berkeley has taken a leadership role in the UC system for stormwater management, but can learn from leading universities in implementing campus-wide controls. The University of Vermont has built five stormwater treatment ponds to reduce peak stormwater flows, allow sediment to settle and reduce the risk of erosion. The University of North Carolina (UNC), Chapel Hill now requires a site-specific plan for erosion control for all construction. This requirement is comparable to the minimum standards for construction pollution described in Cal's Storm Water Pollution Plan. UNC-Chapel Hill has also built a 70,000-gallon underground cistern for retaining stormwater and irrigating the recreation field above it, purchased a vacuum truck for reducing the pollutant load in stormwater runoff, and replaced pavement in two parking lots with permeable concrete and asphalt, decreasing associated surface run-off.

Opportunities

NEXT FEW YEARS

On-site stormwater treatment design standards – Redo design standards to require on-site treatment of stormwater when upgrading streets and landscape for all new and renovated buildings. Techniques include, but are not limited to, curb cuts, planter boxes under rooftop drains, rain gardens in small drainage areas such as parking lot islands, and even vegetated roofs.

STORMWATER & STRAWBERRY CREEK

Creek monitor - Set up a real-time monitor of Strawberry Creek to regulate water quality and flow rate. With live data of the creek's water quality, the response team could address unusual levels of chemicals or solids before significant damage occurs.

Purchase a hydrovac truck and other equipment for sanitary sewer maintenance – Sanitary sewer overflows from root intrusion and other blockage could be prevented with increased maintenance capabilities.

LONG TERM

Bioengineered crib walls – Incorporate crib walls instead of concrete walls to prevent erosion into the creek. "A crib wall is a biotechnical bank stabilization technique that combines vegetation with indigenous materials such as wood or stone" allowing filtration and stabilization to occur in a complementary manner.[i]

Wetland filtration – Plant highly concentrated wetlands at all of the major drainage outfalls along Strawberry Creek and other campus properties to remove as many harmful pollutants from the water as possible before it enters local waterways.

Swales – Create swales in all parking lots that will filter and prevent water mixed with accumulated pollutants from entering the creek.

Oil filters – Place oil filters on all parking lot storm drains as UC Santa Barbara does to prevent non-point source pollution from affecting the health of the creek.[ii]

Flood plain and flood bank vegetation – Vegetation in creeks and along banks can help filter organic chemical and bacterial pollutants from stormwater. Increasing planting of native vegetation can improve water quality and create additional habitat for flora and fauna.

Improve fire roads – Redesign the fire roads with rolling dips, water bars and improved culverts to keep loose dirt and other solids from washing into the creek with runoff rainwater.

Daylight Strawberry Creek – The creek is currently culverted under Memorial Stadium and Centennial Drive. Consider daylighting the creek during Memorial Stadium seismic renovation to provide more Strawberry Canyon wildlife habitat and more creekside open space on campus. An educational interpretive feature could also be added that describes the history of the old waterfalls.

Permeable pavement - Replace campus paths and roads with permeable pavement or unit pavers.

Green roofs – Install more green roofs on campus facilities, like the ones over the Northwest Animal Facility and the adjacent parking garage, to absorb rainfall and decrease associated surges of stormwater into the creek.

Open spaces – Utilize open spaces on campus such as lawns by converting them to swales and effective filters for storm and runoff water.

LANDSCAPE & HABITAT

The campus landscape is an integral piece of our campus community. At Cal, we strive to maintain a healthy, aesthetically pleasing and ecologically sustainable landscape. This indicator examines our landscaping practices and the presence of natural habitat areas on campus.

How Are We Doing?

UC Berkeley property is characterized by a wide variety of land uses, including educational, research and teaching facilities; support facilities (restaurants, shops, parking lots, athletic fields and physical plant corporation yards); residential areas (dorms and the Albany Village); and open park-like areas. The campus includes a large amount of undeveloped natural open space that serves as habitat for plants and animals, including some rare or endangered species, and provides opportunities for environmental studies and aesthetic enrichment.[iii]

Cal's main campus consists of approximately 178 acres of developed central institutional property (the Central Campus) within a total of 1232 acres, the rest of which is largely undeveloped land in the Berkeley hills (the Hill Campus) contiguous with undeveloped parkland owned by the East Bay Regional Park District.[iv] The Central Campus landscape is defined by large, historic native coast live oaks and other plants, particularly along the Strawberry Creek corridor, as well as unique and dramatic stands of exotic trees, such as the Eucalyptus Grove and redwood trees along the creek corridor. The campus also has an unusual collection of trees from around the world, many planted for educational study.

The UC Berkeley Central Campus is currently being renovated based on goals detailed in the New Century Plan and associated Landscape Master Plan. This latter document "is intended to inspire and guide investment in the campus landscape, and provide a foundation for renewal of this special place we call Berkeley; it provides a broad vision for the development of the campus open space, rather than specific design direction."[v] Many of the design initiatives include plans for removal of select non-natives, diseased and dying plants, and filling gaps with native vegetation.

Figure 1 Wheeler Glade in the Landscape Master Plan
The picture shows a constructed wetland designed to serve as a "stormwater detention area."

The Long Range Development Plan (LRDP), a guideline for campus development through 2020, declares a number of natural areas off-limits to construction and describes a number of design plans for increasing green space on campus in specific areas.

Many aspects of the campus landscape deserve further study. We explore two examples here as sample illustrations of current practices and conditions.

Central Campus lawns: Our lawns are an essential part of the landscape. They serve as an ideal place for social gatherings, sporting events, lounging and studying. To maintain these lawns, we apply synthetic fertilizer four or five times each year – the minimum amount deemed necessary to keep our lawns healthy. Between applications, tree cuttings are mulched and placed around trees to both reduce the occurrence of weeds and fertilize the soil.[vi]

Did You Know?

The Eucalyptus Grove, a prominent landscape feature at the west entrance of the UC Berkeley campus, is the tallest stand of hardwood trees in North America.

Land Use

LANDSCAPE & HABITAT

Non-native invasive plants: Currently Algerian Ivy, a non-native invasive plant, borders a significant portion Strawberry Creek. Ivy effectively prevents bank erosion along the creek but provides poor habitat for native animals while offering habitat for undesirable pests, such as rats. Ivy also retains an excessive amount of moisture in the soil, making conditions unfavorable for native plants such as live oak.[vii]

Recent Accomplishments

Landscape Master Plan – The creation of a Landscape Master Plan that gives strong consideration to both ecological significance and urban landscape is a major accomplishment.

Mulch application – To help control weeds and improve soil conditions, the campus has increased distribution of tree mulch in non-turf areas, which will improve soil organic matter and lessen compaction, reducing watering and herbicide use.

Irrigation Supervisory Control and Data Acquisition system – SCADA currently controls 85% of our sprinkler systems. This program can electronically shut down sprinklers, precluding the need to manually shut off these water valves. Plans have been made to convert 100% of our sprinkler systems to SCADA. (For more information on SCADA see the Water Consumption indicator in the Water system.)

Richmond Field Station Stege Marsh restoration – Following cleanup of pollution from industrial operations prior to UC ownership, approximately nine acres of tidal marsh are being restored. This restoration will increase habitat for the California clapper rail, a federally protected endangered bird occupying the site, as well as other rare plants and animals.

Opportunities

NEXT FEW YEARS

Inventory of natural spaces – Compile an inventory of the number and attributes of natural spaces on campus.

Plan for natural habitats – As the LRDP is implemented, seek opportunities to develop larger, more natural green spaces, specifically designed for re-introducing native plants and animals to the campus.

Native vegetation – Introduce more riparian habitat along the creek to replace the invasive ivy. Trees and shrubs could include White Alder, Arroyo willow, California Bay, Western Azalea, Western Creek Dogwood, and Twinberry. Understory species could include Osoberry, Pinkflower Currant, Miner's lettuce, and Giant Chain Fern, among others. Plant more native vegetation throughout the Cal Campus that will both attract and benefit the wildlife of the area.

Sustainable grounds management – Increase planting of low water use plants to minimize irrigation water needs. Use nitrogen rich compost, either made on campus or bought from a local vendor, instead of synthetic fertilizers to reduce costs and improve soil health. Establish goals for instituting the National Organic Program and other integrative pest management methods as alternatives to the use of synthetic fertilizers and pesticides.

Richmond Field Station (RFS) - The "Habitat Goals" report of the San Francisco Bay Area Ecosystems Goal Project identified restoration of eelgrass beds and moist grasslands/seasonal wetlands at the Richmond Field Station as a unique restoration opportunity. Development on the RFS should be planned to incorporate restoration of grasslands and wetlands, with new construction occurring only on existing paved or degraded areas, and not on the historic grassland resource.

LONG TERM

International demonstration forest – Many important timber and ornamental tree specimens have been planted on the Central Campus since construction began in 1872. In the 1970s over 300 species were present for study, but many have been lost due to age, disease, construction, or replacement with standard horticultural varieties. When trees are replaced, the campus should consider continuing the old tradition of maintaining an international demonstration forest for education and appreciation, while at the same time balancing our desire to plant native trees and those that minimize the need for future watering and chemical applications.

PEST MANAGEMENT

Synthetic pesticides (including herbicides, fungicides, insecticides, rodenticides and other pest control chemicals) provide opportunities but also pose challenges. As a society, we are still learning to balance the convenience and short-term effectiveness of these chemicals with the long-term costs and impacts of their use. This indicator assesses the University's efforts to prevent pest-transmitted disease and property damage while maintaining healthy, aesthetically pleasing landscapes and minimizing associated negative impacts on the campus community and environment.

How Are We Doing?

The need to manage plant and animal pests to protect public health and valuable campus trees and habitats has existed since the University was founded. Currently, the campus is moving toward reduced toxic pesticide and herbicide use. Examples of past and present pest control needs and pesticide applications include:

- **Control of mosquitoes** to protect public health from diseases such as encephalitis and West Nile Virus (currently using low toxicity larvicides, *Bacillus thuringiensis*, to replace historically used arsenicals, oils, DDT);
- **Control of insects such as silverfish and cockroaches** to protect housing and dining facilities, museum and library collections, and research facilities (currently using biocontrol and boric acid to replace pesticides such as chlordane and volatile sprays);
- **Wildlife management** (such as raccoons, skunks, mice, rats, pigeons) to protect public health from diseases such as raccoon roundworm, rabies, plague, and hanta virus (currently managed through habitat modification, exclusion, trapping and rodenticides);
- **Control of biting and stinging insects** (yellow jackets, fleas, etc.) to protect the public from diseases and individuals allergic to stings (currently managed with non-toxic traps, and least-toxic pesticides that have replaced volatile sprays);
- **Fungicides** to control diseases on campus trees and shrubs; and,
- **Herbicides** to control broadleaf weeds on campus lawns and playing fields, and non-native invasive species in restoration areas, such as in the Hill Campus after tree cutting for fire fuel management.

Historically, campus operations included widespread use of chemicals and other practices no longer considered safe or environmentally appropriate. Examples include spraying of arsenic-containing compounds and some synthetic organic pesticides, such as DDT, for control of mosquitoes and plant diseases. In the late 1940s, the hill area was sprayed with 2,4,5-T (agent orange) to eradicate poison oak.[viii] In the 1950s, burrows at the Richmond Field Station were gassed to exterminate ground squirrels, which have since returned. In the 1980s, a wide variety of herbicides and pesticides were used in the campus grounds including: Buctril, Brush-B-Gone, Roundup, Turflon, Fusilade, Surflan, Sevin, Malathion, Orthene, Mecomec, Diazinon, Banvil, Mantain CF 125, and Pre-Em.[ix] A methyl bromide fumigator was present at Gill Tract (next to Albany Village) and used until the late 1980s.

In recent years, pesticide use has not been eliminated but it has been reduced, with more attention being directed to prevention of exposure to people and sensitive ecological receptors, and prevention of water pollution. As an example, treatment of oak trees on campus in 2003 to prevent spread

Did You Know?

Cal's pest management efforts also encompass wildlife rescue services, sending injured animals for rehabilitation.

PEST MANAGEMENT

of the organism that causes Sudden Oak Death was accomplished using copper sulfate, an approved National Organic Program treatment. Some pesticide use has been eliminated due to chemicals, such as diazinon, being banned by federal, state and local agencies. The campus has also used building design to successfully exclude pests.

Currently, pesticides are applied by a number of entities at University properties. (For more information on campus units see the Green Custodial Chemical Use indicator in the Health & Wellbeing system.) The following represent the majority of current applications:

- Alameda County Mosquito Abatement District and Contra Costa County Mosquito Abatement District: larvicides and light oils;
- Physical Plant–Grounds Management: Roundup, Turflon and other chemicals applied by contractor Chem-Lawn;
- Physical Plant–Structural Pest Management: An Integrative Pest Management program that empha sizes prevention and non-chemical methods.
- Intercollegiate Athletics: lawn treatment chemicals on numerous playing fields;
- Offsite facilities grounds management at University Village, Albany, Richmond Field Station and other field stations: Roundup, lawn treatment chemicals;
- UC Botanical Gardens: Roundup and greenhouse applications;
- Oxford Tract: greenhouse applications; and,
- Hill Campus Fire Fuel Reduction Program: invasive weed control chemicals.

STRUCTURAL PEST MANAGEMENT PROGRAM

One way in which we have excelled at pesticide use reduction is by providing Integrated Pest Management (IPM) for pests in and around structures. IPM is a decision-making process that emphasizes prevention and non-chemical methods as long-term solutions. Prior to 1973, indoor pest control on campus was done in the traditional fashion, using volatile spray compounds such as diazinon and vapona. However, these methods did not meet the needs of research and the campus, as volatile compounds had the potential to affect research results and harm people. Increased awareness of the hazards of pesticides in the campus community led to the modernization of the program. Techniques were developed to meet clients' needs without affecting people, research, or the environment, and present day use of sprays is only 5% of pre-1973 levels.

One of our most successful IPM strategies has been the use of boric acid powder for cockroach control. Because it has an extremely low volatility, this powder does not affect research, yet it works well as an antidote for cockroaches when placed in hidden locations and wall voids. The use of boric acid powder, baits, and insect growth regulators in married student housing has reduced the number of cockroach complaints by 98%.

When the brown-banded cockroach became a problem in campus research buildings, Cal implemented a biological cockroach control program, using a tiny wasp, *Comperia merceti*, which parasitizes cockroach egg cases. Use of these parasitoids, along with baits, has successfully eliminated this cockroach species from all campus research facilities for over ten years. This was the first use of this parasite in a pest management program.

Recent Accomplishments

UC Berkeley has won several awards for its work with IPM:

1996 - California Environmental Protection Agency Innovative Pest Management Award given to the Structural Pest Management program;

2001 - Recognized by the National Wildlife Federation in their national report card for exemplary lands and grounds management; and

2005 - Weed control and re-vegetation at the Richmond Field Station is being accomplished primarily through sustainable, non-pesticide methods such as hand-pulling and covering with plastic. Work is coordinated by The Watershed Project using volunteers and school groups, and the project was recently recognized by the Chancellor as a noteworthy Community Partnership.

Comparing Our Performance

The UC Berkeley Structural Pest Management program is the first program of its kind in the country, and has been a model for other universities, including Harvard, the University of New Mexico, and the University of Colorado, along with many municipalities. It has pioneered sustainable and effective pest management, with the added benefit of low net cost. The University of Oregon has also placed an emphasis on alternative pesticides, employing a corncob-based pesticide and others that are non-toxic to humans.

Opportunities

NEXT FEW YEARS

Form a network – Form a network with coordinators of pest management programs at other UC campuses to share information about pest problems and best practices.

Building and Grounds Design Standards – Create design standards that hinder entry and breeding of pests. For example, consider adding concrete at a 45 degree angle to the tops of pillars to prevent pigeons from roosting, and excluding rodents by eliminating access points such as spaces under doors. Foster habitat for natural predators of pests, such as owls and raptors. (For more information on design standards see the Built Environment system.)

Policy and guidelines – Unlike many municipalities, UC Berkeley currently has no overarching policies or guidelines providing direction on the purchase and use of pesticides, so departments are allowed to make decisions on pesticide use independently. Such policies are needed to ensure protection of public health and the environment.

Expand use of biological control – Use parasitic wasps to control American cockroaches in steam tunnels.

Exotic weed abatement – In restoration projects and grounds, substitute pesticides with less toxic alternatives, such as torching, concentrated acetic acid, hand pulling and goats, which are used by the adjacent Lawrence Berkeley National Laboratory.

Educate campus safety coordinators – Educate relevant staff about existing program and pest prevention efforts.

Identify mosquito breeding sites – Work with campus trades to identify mosquito breeding sites.

LONG TERM

Electronically track pest control data – Enable easier access to information by electronically tracking pest occurrences and treatment effectiveness.

Alter environment to facilitate pest control goals – Rats eat ivy and use it to access rooftops, so coordination with grounds management in the reduction of species like ivy would provide another alternative means of pest control. (For more information on ivy, see the Landscape & Habitat indicator.)

Organic lawns and playing fields – Implement National Organic Program treatment of lawns and athletic fields. Expand the IPM program to include campus grounds.

Land Use

LAND USE NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Christine Shaff	Communications Manager, Facilities Services	Landscape & Habitat
Steve Beissinger	Professor in ESPM	Landscape & Habitat
Kate Bolton	Project Manager & Assistant Campus Landscape Architect, Capital Projects	Landscape & Habitat, Stormwater
Kristen Hopper	Friends of Sausal Creek coordinator	Landscape & Habitat
Margaret Hurlbert	Pest Management	Landscape & Habitat, Pest Management
Gary Imazumi	Manager of Grounds Operations	Landscape & Habitat
Tim Pine	Environmental Specialist, EH&S	Landscape & Habitat
Vincent Resh	Professor in ESPM	Landscape & Habitat
Judith Stilgenbauer	Assistant Professor	Landscape & Habitat
Mark Walstrom	Staff Research Associate	Landscape & Habitat
Elizabeth Zacharias	Department of Landscape Architecture	Landscape & Habitat
Karl Hans	Senior Environmental Scientist, EH&S	Landscape & Habitat, Stormwater
Steve Maranzana	EH&S	Landscape & Habitat, Stormwater

CITATIONS

[i] Charbonneau, Bob. Strawberry Creek: A Walking Tour of Campus Natural History. 1990.

[ii] Dozier, Jeff. "Greening UCSB: Development of an Assessment Protocol and Policy Statement to Improve Campus Sustainability." June 2001.

[iii] Image and quote from the Landscape Master Plan, page 36.

[iv] http://sunsite.berkeley.edu/uchistory/general_history/campuses/ucb/index.html

[v] http://www.cp.berkeley.edu/LMP.htm

[vi] Personal communication with Gary Izumani 10/20/04

[vii] Personal communication with Judith Stilgenbauer 10/11/04

[viii] Donald, Wm. Goodricke, M.D. The University Physician, Annual Report of the Department of Sanitation, University of California, Berkeley for the Year 1951-52. (TD C3 1951/52-1958/59 Public Health Library)

[ix] Charbonneau, Robert B., Strawberry Creek Management Plan, December 1987

UC Berkeley Campus
Sustainability Assessment

Food

Food Options Provided by Cal Dining

Food Procurement by Cal Dining

Food-Related Waste Disposal

Food Tracking & Education by Cal Dining

FOOD OPTIONS PROVIDED BY CAL DINING

The food we eat helps to shape our health as individuals because, quite literally, "we are what we eat." While there has been – and continues to be – much discussion concerning what constitutes a healthy diet, a relative consensus exists regarding the importance of balance and the inclusion of fresh fruits and vegetables and whole grains as an alternative to refined starches and sugars, artificial preservatives and processed foods. Beyond these principles, culture, convenience and other factors all influence our food choices. For example, many in the Cal community choose a vegetarian, vegan or kosher lifestyle for health or other reasons. By providing a variety of healthy food options, we can empower our students, faculty and staff to sustain their own good health & lifestyle preferences. This indicator examines the degree to which campus residents are provided options for eating healthy and ecologically sustainable foods.

Due to time constraints, the indicators in this system address only Cal Dining, the major source of food on campus. However, there are other food vendors on campus that in aggregate are significant.

How Are We Doing?

Cal Dining is actively supporting a wide variety of foods and innovative ways to meet student needs. Each dining common (DC) features a salad bar and serves clearly marked vegetarian, vegan and numerous other options at every meal. In fact, Cal Dining's complete menu is over 65% vegetarian. There are multiple entrée choices at each meal including staples such as eggs, sandwiches, pizza, and hamburgers in addition to more diverse options based on foods from various cultures and geographies. Individual needs such as soy and lactose-free milk are provided at every DC in addition to foods that meet the needs of students observing kosher restrictions and Ramadan. On-campus dining facilities such as the Golden Bear Café allow students to use their meal plans to purchase a diverse variety of food items such as deli sandwiches, sushi, smoothies and packaged items.

Cal Dining's menu was created, in part, with advice from registered dieticians, and the foods provided are not simply based on the traditional food pyramid, viewed by many as an inadequate representation of a healthy diet. Also, Cal Dining's website provides standard nutritional information (calories, fat, sodium, protein, fiber, etc.) for every item served.

Though Cal Dining provides many food options, including a plentiful variety of healthy options, students are ultimately responsible for their eating choices. Cal Dining does offer some highly processed foods low in nutrients and fiber, some of which include ingredients such as hydrogenated oils or high fructose corn syrup known to be harmful or have low nutritional value.

From an environmental standpoint, Cal Dining buys from a few local vendors including Berkeley Farms for dairy products, San Francisco Bread and Piranha Produce, but most food offered is not known to be local. Cal Dining does not regularly provide organic options in its DC's nor on-campus restaurants (see Food Procurement indicator).

Did You Know?

According to the journal Soil and Water, one acre of arable land could produce 50,000 pounds of tomatoes, 40,000 pounds of potatoes, 30,000 pounds of carrots, or just 250 pounds of beef.[ii]

Food

FOOD OPTIONS PROVIDED BY CAL DINING

Recent Accomplishments

Switch to more natural oils – Cal Dining has recently made the switch to cooking with oils free of trans fats, an important step toward promoting good health.[i]

Nutritional information – In addition to providing nutritional information on everything Cal Dining serves, an internet-based project will soon be unveiled that allows students to create a list of everything they have eaten during the course of a day and to receive a comprehensive report of associated dietary information.

Produce stand – Under the new leadership of Cal Dining, a produce stand is now available two days each week where students can use their meal plan credits to buy produce. This provides a healthy alternative to the many processed and packaged items found items found on and around campus.

Comparing Our Performance

The food options provided by Cal Dining are similar to many other large prominent universities. However, a growing number of universities have begun offering organic and local food options to their students. For example, the University of Wisconsin, Madison has offered local and organic nights to students and community through its residential dining services,[iii] while Yale University has a popular dining facility dedicated to serving food produced organically (when in season) and made from scratch without artificial additives or preservatives.[iv] Cal Dining has explored the potential of offering similar options, but lacks the specific funding the above initiatives require.

Opportunities

NEXT FEW YEARS

Educate students about food – Teaching students about the advantages and benefits of organic, local and fresh foods and further advertising the nutritional information available on Cal Dining's website would increase understanding of our complex food system and how daily choices affect both our health and the world around us.

Eliminate trans fats – Cal Dining could take the additional step of switching to trans fat-free rice oil made from California rice and items like crackers and French Fries, which are often pre-cooked and sprayed with trans fats.

Create an organic food night – An organic night in tandem with educational materials would not only be delicious and healthy, it would help students understand the benefits of organic food and the far-reaching effects of eating choices.

LONG TERM

Include an organic and local entrée at each meal – In conjunction with information about these practices, making these entrées available would encourage students to choose more ecologically sound and healthy foods.

Prepare meals from scratch – By preparing more meals from scratch, Cal Dining would take a step towards offering healthier and often better-tasting food while steering clear of many over-processed and additive-laden foods. Significant additional labor support would be required to implement such a strategy.

FOOD PROCUREMENT BY CAL DINING

While it is obvious that the nutritional value of the food we eat has a tremendous impact on our health, less consideration is generally given to the effects our food production and distribution systems have on public health and the environment at large. Local food procurement strengthens the local economy while reducing negative transportation-related impacts such as air pollution and climate change. Organic agriculture eliminates many of the harmful impacts of typical farming practices on soil and water quality, habitat and human health.

At Cal, we have an opportunity to consider these issues in making our food procurement decisions. This indicator examines the presence of policies consistent with sustainable food purchasing and the extent to which Cal Dining acknowledges these issues in its food procurement process.

How Are We Doing?

While Cal Dining has made several noteworthy efforts towards more sustainable food procurement, we currently have no policies that call for the procurement of organic or local foods. Currently, Cal Dining buys most of its food from large vendors such as BiRite, Coca Cola, Core-Mark and other large corporations. BiRite and Core-Mark are food distributors that serve as middle-men between Cal Dining and food manufacturers/producers. Food provided by these distributors could come from all over the nation – even world – and little information about the specific origins of our food is accessible under the current system. Given our proximity to California's growing region, however, it is reasonable to assume that a relatively high percentage of our produce comes from within a 200-mile radius.

Cal Dining does purchase some items locally, such as bread and milk from San Francisco French Bread and Berkeley Farms, respectively. Cal Dining also deals with a local produce distributor, Piranha Produce, with whom it has had preliminary discussions concerning the purchase of organic produce. Cal Dining has also begun to purchase a small selection of items from United Natural Foods/Mountain People's Warehouse, the largest distributor of natural foods in the country, including a vegan cheese product, with plans to add more items, such as organic canned goods, tempeh, tofu and a non-hydrogenated, all natural margarine.

Because Cal Dining requires a large volume of food, switching to local or organic vendors isn't easy. We have the desire to move in this direction, however, and with additional financial and staffing resources, Cal Dining could be empowered to become a sustainable food procurement leader in the university dining world.

Recent Accomplishments

Serving fair-trade and organic coffee – Cal Dining offers fair-trade and organic coffee in some of its locations. Like all organic food, this coffee has certain environmental advantages, while fair-trade certification ensures better treatment of workers who produce the crop.

Exploration of free-range and organic options – Cal Dining recently completed a study looking into the logistics of purchasing organic food and has been actively meeting with potential suppliers. In addition to discussions with Piranha Produce and United Natural Foods/Mountain People's

Did You Know?

According to World Watch Institute, food in the U.S. often travels between 1,500 and 2,500 miles from farm to table – as much as 25% farther than it did two decades ago.[v]

FOOD PROCUREMENT BY CAL DINING

Warehouse, Cal Dining also recently met with Niman Ranch, a local company based in Marin and Sonoma that sells a variety of free-range meats, though primarily at costs affordable only to high-end restaurants. Although overall study results showed that a sudden and complete switch to organic food would pose significant price and volume challenges, the fact that Cal Dining is investigating organic food procurement is significant.

Comparing Our Performance

At least a few colleges and universities have implemented policies promoting the purchase of more sustainable food, often in association with educational programs aimed at their students. Cal Dining could use Oberlin College as an example, which in 2003 bought about five percent of its food from local farmers (both through vendors and directly from four farmers), 35% of which was organic. Foods purchased included baked goods, dairy products, and fruits and vegetables. It should be noted that Oberlin has a considerably smaller campus population than Cal.[vi] Stanford University has also taken important steps: hosting an organic farmers' market every week, serving some organic produce in its residential dining halls, doing business with local farmers, and even serving some organic produce grown on the Stanford organic farm.[vii] The Farm to College Program of the Community Food Security Coalition provides support for campuses that wish to establish this kind of relationship with food producers in their respective regions. Several institutions, including Cornell University and Vassar College, have joined this program to pursue more local food purchasing. Outside funding, from private donors, grants, or other campus resources, has typically played a large role in the success of these notable sustainable food programs.

Opportunities

NEXT FEW YEARS

Include support for sustainable agriculture in Cal Dining mission statement – Making local and organic foods part of Cal Dining's mission would be an important step towards a more sustainable food system, though implementation would take several years.

Local produce in one dining common – Cal's dining commons (DC's) serve roughly 5,580 students per day. A single DC could begin working with local farmers so the challenge of system-wide implementation does not hinder initial progress.

Become a certified organic processor/retailer – Through a recognized agent like California Certified Organic Farmers, become certified to help ensure that the integrity of any organic products UC Berkeley purchases will be maintained and to demonstrate our commitment to the standards set forth by the U.S. Department of Agriculture.[viii]

Provide and promote at least one organic option in dining commons from local farmers' markets – Though many organic foods are more expensive than their conventional counterparts, it is possible to purchase some organic items with very modest cost premiums. Identifying and purchasing these items locally could provide the opportunity for educational displays explaining the benefits of sustainable food at minimal cost.

LONG TERM

Develop one campus restaurant and/or dining common with a sustainable food theme – One dedicated on-campus restaurant or dining common could significantly support organic, local and seasonal food. This would provide Cal students a healthy and more environmentally friendly dining option.

Formalize consideration of local and organic criteria – Add local, organic, and/or small business criteria for consideration in all food procurement RFPs/RFQs to the extent feasible.

Establish a Cal farmer cooperative – Local organic farming cooperatives could be established to supply Cal Dining's large volume procurement needs. This would provide healthy and ecologically sound food to Cal and great business security to local farmers, while providing the same kind of distribution channel offered by high-volume wholesalers. Further consideration of this strategy would need to include an exploration of procurement practice limitations mandated by the State of California on a UC system-wide basis.

FOOD-RELATED WASTE DISPOSAL

Fully 13% of the total waste produced at UC Berkeley comes from our dining commons. Since we pay for waste disposal by weight, any waste reduction would reap economic and environmental rewards. Food waste in general can largely be composted to make natural fertilizers for use in farms and gardens, and a great deal of pre-consumer food waste can be diverted toward food-rescue operations that supply local food banks and homeless shelters.

In addition to pre- and post-consumer food waste, we generate a food-related *inorganic* waste stream consisting of recyclable and non-recyclable materials. Through a combined strategy of dining hall recycling and deliberate procurement practices, this stream can also be minimized.

How Are We Doing?

Organic Waste: Each year, the campus collects 60 tons of pre- and post-consumer organic waste from dining halls, campus restaurants and other facilities. This collection is done by Berkeley Worms, a non-profit composting enterprise supported, in part, by the Associate Students of the University of California (ASUC) and Cal Dining. Unconsumed edible cooked food is given to homeless shelters in Berkeley and Oakland (See Figure 1).

Recyclable Waste: Approximately 350 tons per year of corrugated cardboard food packaging is collected by Campus Recycling and Refuse Services (CRRS) and brought to a local paper processor, and 40 tons of beverage containers made of glass, bi-metal, aluminum and plastics are recycled at East Bay Conservation Corps.

Inorganic Non-Recyclable Waste: CRRS pays $120 per ton to collect and dispose of this waste in landfills. A large portion of the annual 700 tons of this waste going to landfills could be diverted into the above two categories through implementation of new sorting procedures.

Figure 2 illustrates the approximate percentage constituents of our food-related waste, derived from a waste audit conducted in 2000. Organic food wastes constitute an alarming 45% of this waste stream, while reusable food accounts for just three percent. The remainder is comprised primarily of food packaging, much of which could be recycled.[ix]

Figure 1. Disposal of Food-Related Waste

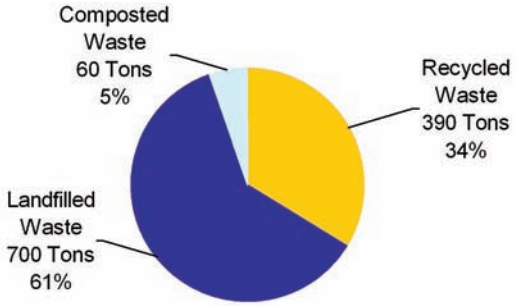
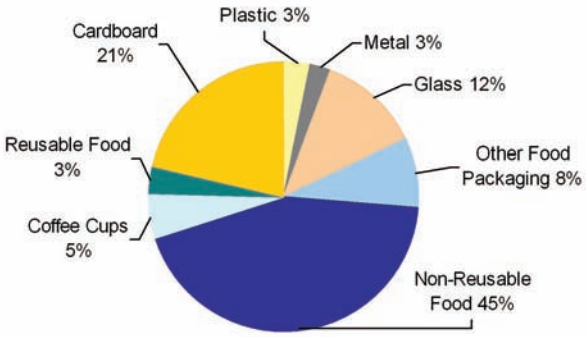


Figure 2. Food-Related Waste



Did You Know?

We waste 2850 pounds (1.2 tons) of food each day across 4 dining halls by not finishing the food we take. This is equivalent to **5600** 6" Subway™ sandwiches in weight.

Food

FOOD-RELATED WASTE DISPOSAL

Recent Accomplishments

Food composting – Berkeley Worms, a student-run collective, manages to divert 50 tons per year of organic food waste for composting into soil fertilizer. However, perhaps 300-400 additional tons of food waste is landfilled, so our food waste diversion rate is likely only 10-15%. Cal Dining provides almost $50,000 annually to support Berkeley Worms.

Recycling efforts – Our recycling program has diverted about 16% of used beverage containers (40 tons per year) from landfills, and we are continuously implementing new efforts to improve this figure.

Reduce and reuse – Cal Dining offers beverage discounts for the use of plastic reusable mugs as an alternative to disposable cups. In concert with the Residential Sustainability Education Coordinators (RSEC's), Cal Dining has also offered an ongoing initiative since Fall 2003 entitled "Eat the World, Save the Earth." This program combines a semesterly collection of wasted food and monthly tabling by the RSEC's to encourage students to eat what they take and take only what they can eat, offering the reward of a special treat for a clean plate after certain meals.

To-Go containers – Cal Dining offers biodegradable to-go containers designed to begin decomposing within one week.

Paper napkins – Some campus restaurants are now using unbleached paper napkins. Napkin dispensers are also being placed on tables to avoid wastage due to people taking more than they need.

Comparing Our Performance

While most colleges in the U.S. have introduced recycling programs, few have composting programs. UC Berkeley, a community of about 45,000 people, is one of the few to have both. However, a number of other universities have taken additional steps from which we might draw valuable lessons. With nearly 19,000 students, Cornell captures an estimated 700 tons of composted food scraps annually, equivalent to 17% of the University's landfilled waste stream. Tufts University, with just 12,000 total campus users, composts 147 tons, and recycles 100 tons of beverage containers, about 5% of its total trash. SUNY-Buffalo has persuaded companies to develop packaging using more recyclable materials and has even discontinued some products because of non-recyclable packaging. The University of Wyoming offers a handsome discount of 25-30 cents on refills of reusable mugs, decreasing purchasing costs and reducing waste.

Opportunities

NEXT FEW YEARS

Improve compost collection and processing – Provide a mechanism for students to easily scrape compostable food waste into collection bins to ease collection and sorting. In conjunction, strengthen the capacity of Berkeley Worms or an alternative organization to handle increased volume.

More biodegradable packaging – Expand the innovative use of biodegradable to-go containers to include other food packaging products that also contribute significantly to our food-related waste stream and make these products available campus-wide.

LONG TERM

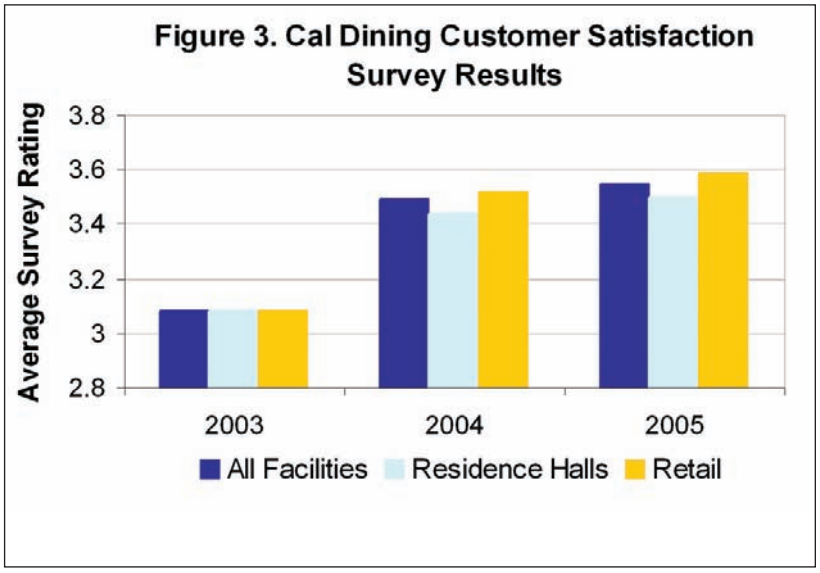
Reduce our sources of waste – Reducing incoming material flows is the best way to minimize waste. By changing our procurement practices and policies to emphasize purchasing from companies that use less or recyclable packaging, we can reduce the incoming waste we have to deal with later. (See the Procurement Policies & Options indicator in the Purchasing & Waste system.)

FOOD TRACKING & EDUCATION BY CAL DINING

In order to examine the performance of our food system and identify improvement opportunities, Cal Dining needs a clear understanding of student opinions and preferences on a variety of issues. Knowledge of student preferences for specific foods, perceptions of nutrition and food-related sustainability issues, and behavioral tendencies can empower Cal Dining to tailor its educational outreach efforts and provide the highest quality service. Likewise, students consuming food provided by Cal Dining can benefit from more information about the origin, packaging and preparation of their food.

How Are We Doing?

Cal Dining's staff and operations have undergone significant change and improvement since Fall 2003. Prior to this, Cal Dining conducted little research on student opinions, and kept fewer records. In 2002, a customer satisfaction survey was administered by the National Association of College and University Food Services after a less-than-flattering news article on the state of Cal's food system appeared in the Wall Street Journal. This survey has been repeated annually since, and over the past two years has shown a marked improvement in customer satisfaction (see Figure 3). Cal Dining also collected data in February 2004 in the form of the Echo Network research project, consisting of one on-campus and one off-campus survey to determine lifestyle and dining habits of its customers. Cal Dining has conducted dozens of student focus groups, met regularly with the student residence hall association and the Associated Students of the University of California (ASUC) (and with other groups upon request), and implemented an online comment card system to collect student feedback. Menu changes in the dining halls and new options in retail locations are now made in response to this feedback when resources allow. Through these research outlets, a majority of students expressed a desire not to pay any additional costs for Cal Dining to supply local or organic food options, and funding limitations continue to impact Cal Dining's ability to move toward a more sustainable ood system.



Cal Dining's outreach and education efforts are primarily focused on programs already in place, with an emphasis on student satisfaction, nutrition and convenience. No outreach is currently conducted in support of environmentally or socially responsible food choices and practices. However, Cal Dining plans to conduct more advertising about its sustainability-related programs, such as biodegradable food containers and organic choices offered at the weekly produce stand, in the near future.

Did You Know?

Although about 60-70% of processed foods sold in America contain genetically modified organisms (GMO's), only roughly 20% of Americans realize that they consume GMO's on a regular basis.[x]

FOOD TRACKING & EDUCATION BY CAL DINING

Recent Accomplishments

Waste education – In Fall 2003, Cal Dining initiated a program called "Eat the World, Save the Earth," encouraging diners to take only what they plan to eat in order to minimize food waste.

Student nutrition assistants – Since Fall 2003, University Health Services has provided student nutrition assistants to serve as a more direct communication link between students and staff on food-related health concerns. Nutrition interns living in the residence halls also provide nutritional outreach to other students.

Local/organic survey questions – Cal Dining has conducted discussions with student groups and the Dining Committee, held focus groups, and distributed surveys to learn about student preferences regarding local and organic foods.

Comparing Our Performance

Cal Dining actively looks to other leaders in university dining for additional improvement ideas. Middlebury College, located in Vermont, has an "open kitchen" policy, allowing students to check labels on foods themselves if an ingredient list has not been made available for a particular entrée.[xi] This policy also allows students to speak directly to the cooks about any food concerns they may have. Yale University has begun offering a "Cooking 101" program aimed at graduating seniors.[xii] This program teaches students who may not be used to dealing with buying and preparing their own food basic shopping and cooking skills. A website of UC Santa Cruz links to the National Institutes of Health–National Heart, Lung, and Blood Institute (NIH-NHLBI) Portion Distortion Quiz, designed to educate about the caloric content of their meals compared to similar meals served twenty years ago.[xiii]

Opportunities

NEXT FEW YEARS

Provide fun facts about food served – Use small-scale advertising in the form of posters, placemats or even napkin holders to give students "factoids" about their food. For example, these factoids could include a map showing the location of local farms and bakeries from which applicable foods have been purchased, the types of ingredients substituted for meat in vegetarian dishes, or the nutritional values of meals based on different types of diets.

Education and outreach to Cal Dining staff – Inspire new innovative ideas for moving toward a more sustainable food system by educating dining staff regarding these issues and encouraging their creativity.

LONG TERM

Research and education regarding food sources – Keep track of where our food comes from, as far down the chain as possible. Label all foods served with geographic origin information, using the system by which nutritional information is already stored and conveyed.

FOOD NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Food-Related Waste Disposal
Chuck Davies	Assistant Director and Executive Chef, Housing and Dining	Procurement, Options, Waste, Tracking
Shawn LaPean	Director of Dining, Housing and Dining	Procurement, Options, Waste, Tracking
Kim LaPean	Marketing Coordinator, RSSP Marketing Communications	Procurement, Options, Waste, Tracking

CITATIONS

i http://www.fda.gov/fdac/features/2003/503_fats.html

ii Tom Aldridge and Herb Schlubach, "Water Requirements for Food Production," Soil and Water, no. 38 (Fall 1978), University of California Cooperative Extension, 13017; Paul and Anne Ehrlich, Population, Resources, Environment (San Francisco: Freemna, 1972), pg. 75-76.

iii Fuller, Erin, April 2002 http://www.cias.wisc.edu/archives/2002/03/01/public_invited_to_organic_dinners_at_uwmadison/index.php

iv http://www.yale.edu/sustainablefood/berkeley.html

v Worldwatch Institute. "Worldwatch Paper 163. Home Grown: The Case for Local Food in a Global Market.:" http://www.worldwatch.org/pubs/paper/163/

vi Dellorco, Adriane, http://www.oberlin.edu/cdsrecyc/localfoods/History/localcalc.html April 2003

vii http://www.stanford.edu/dept/hds/dining/resdinng/environment.html Sept. 17, 2004

viii For more information, visit the California Certified Organic Farmers website. http://www.ccof.org/

ix All tonnage has been approximated from data tracked by Campus Recycling and Refuse, calculated on the basic assumption that a full 2 cubic yard bin weighs 300 lbs with a variance of 50 lbs.

x Percentages obtained from a Frontline/Nova Special Presentation entitled "Harvest of Fear," originally aired 4/23/2001, and from lecture given by Carolyn Merchant on 10/25/2004

xi http://www.middlebury.edu/campuslife/dining/how/

xii http://www.yale.edu/dining/features/#Cooking101

xiii http://hin.nhlbi.nih.gov/portion/

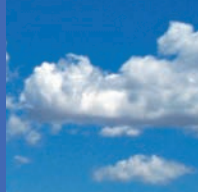
UC Berkeley Campus
Sustainability Assessment

Health & Wellbeing

Green Custodial Chemical Use

Indoor Air Quality

Workplace Injuries



GREEN CUSTODIAL CHEMICAL USE

Many traditional chemical cleaning products contain toxins that pose public health risks and cause environmental damage.[i] These dangers may present themselves during resource extraction, processing, transportation and storage, and may persist for years after their use and disposal, as wastes make their way back into the environment. Fortunately, recent years have seen a surge in the availability of more environmentally friendly "green" institutional cleaning products that rival the effectiveness of their traditional competitors. This indicator examines the degree to which green custodial products and cleaning strategies are being used at UC Berkeley.

How Are We Doing?

While the University continues to rely primarily upon standard institutional cleaning products, some environmentally preferable purchasing (EPP) testing is currently underway at Cal. Most campus units that purchase cleaning products do not yet have purchasing processes aimed at addressing public health and environmental concerns. There are no campus-wide green purchasing guidelines for custodial cleaning products. Purchasing is handled in a largely decentralized and independent manner by five campus units: Physical Plant–Custodial Services (PP-CS), Residential Student Services Program (RSSP) – which includes both housing and dining, each with its own custodial staff – the Associated Students of the University of California (ASUC), Athletics, and International House. These units each clean and maintain their own spaces on campus, though some boundaries are not rigidly defined. In general, they order their own cleaning supplies with a focus on cost, familiarity and ease of use. Whether or not a green product can replace a traditional one frequently depends on the preferences of the custodians who actually use them.

At the state-wide level, the UC Office of the President (UCOP) is developing a Strategic Purchasing Initiative to consolidate multi-campus purchasing. It is not clear whether these guidelines will include environmental performance criteria (see also the Procurement Policies & Options indicator in the Purchasing & Waste system).

Recent Accomplishments

Hazardous stockpiles eliminated – Two years ago, PP-CS hired an Inventory Manager who discovered that custodial closets in many of the buildings that Custodial Services cleans had developed large stockpiles of chemicals over the years. He requested that custodians use up the old products, saving the campus over $200,000.

Action on leaky packaging – Some of the cleaning products PP-CS has relied on for 15 years or more are shipped in five-pound plastic bags, which tend to tear and leak. Custodial Services is experimenting with new "Fill Station" technology, which makes use of concentrated cleaners in sealed containers, greatly reducing handling and therefore leak and exposure potential.

Pilot testing of Green Seal certified products – Management in PP-CS is currently selecting four Green Seal-certified cleaning products for on-the-job testing by custodial staff and plans to test more in the near future.[ii]

Campus-wide green purchasing discussions – Recently, stakeholders from the five campus units and others met with EPP experts from the City of Berkeley to discuss purchasing greener cleaning products. The groups committed to meet further on the topic.

Comparing Our Performance

Other institutions have taken steps toward more sustainable custodial chemical use, partly because the impact of chemical use on indoor air quality has become an increasingly important issue nationwide. Oregon State University and Vassar College have dropped all traditional cleaning products in favor of Green Seal certified citrus-based cleaners and have implemented a monitoring and management procedure which balances cost, worker safety and environmental toxicity.

The University of Oregon recently instituted a highly successful three-pronged effort to reduce custodial chemical risks and

GREEN CUSTODIAL CHEMICAL USE

impacts: the creation of a Safety Trainer position, the institution of a review process for all new chemicals proposed, and a one-time culling of dangerous and unnecessary products from existing inventories. The culling reduced both the total volume of stocks and the number of chemicals, while the Safety Trainer and review process have together increased safety and improved environmental performance.

Opportunities

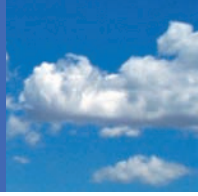
NEXT FEW YEARS

Adopt green purchasing standards at UC Berkeley - The five non-academic unit stakeholder meeting was an excellent start, but this momentum must be maintained. Regardless of what happens at the UC system-wide level, Cal has an excellent opportunity to share knowledge between its own departments, set campus-wide policies, and consolidate purchasing power to negotiate cost-saving contracts.

Adopt green purchasing standards across the UC system - UCOP's Strategic Purchasing Initiative (SPI) offers an excellent opportunity to establish EPP guidelines across the UC system. As directed by the Regents' Green Building Policy and Clean Energy Standard, UCOP is currently examining the Leadership in Energy and Environmental Design (LEED™) for Existing Buildings rating system, which promotes the purchasing of environmentally friendly cleaning products. Cal could become a leader among the UC campuses by insisting that EPP policies be incorporated in the SPI.

LONG TERM

Inform, train and empower custodial staff - Manufacturers could be invited to campus to train custodial staff on use of green products. On-the-job training is essential to increase staff awareness of the health and environmental issues arising from the use of institutional cleaners.



INDOOR AIR QUALITY

Some air pollutants can build to higher concentrations indoors than outdoors, and the EPA's Science Advisory Board has recently ranked indoor air pollution in the top five environmental risks to public health. This is a growing concern, as most Americans are now estimated to spend as much as 90% of their time indoors. Over the last two decades, scientific and public understanding has grown regarding the dangers of environmental tobacco smoke (or "second-hand smoke"), asbestos, lead dust, hazardous materials, and mold. However, the additional presence of potentially harmful air contaminants from a huge range of ordinary products – building materials, office equipment and furniture, cleaning products, and personal care products such as deodorants and perfumes – is only now coming to light. The EPA estimates that poor indoor air quality accounts for tens of billions of dollars in health care costs and lost productivity across the nation each year.

While there is much debate about the magnitude of the health risk associated with chronic exposure to low level carcinogens, at the very least, off-gassing from these products causes discomfort in many, particularly those suffering from allergies and respiratory infections. There are two main approaches to addressing air quality problems: reducing the source of pollution and controlling exposure with ventilation and filtration. This indicator examines UC Berkeley's efforts to ensure healthy indoor air for all members of the campus community.

How Are We Doing?

One major preventive step that UC Berkeley has taken with regard to indoor air pollution was the implementation of our Smoke Free Policy, effective August 1, 1990. The policy applies to all facilities owned or leased by the University and, with some exceptions, within University housing. The policy prohibits smoking in any indoor area or within 20 feet of building entrances, exits, and operable windows. It has been updated several times over the years, and currently prohibits smoking in outdoor facilities used for spectator sports, meetings, entertainment, and dining as well. In conjunction with implementation of the policy, Health*Matters, Cal's worksite wellness program, has provided resources and information to help members of the campus community quit smoking.[ii]

UC Berkeley has taken steps to protect campus users from harmful indoor air pollution, but has done so thus far largely in response to complaints rather than through a proactive prevention program. Cal's Office of Environment Health and Safety (EH&S) runs an Indoor Air Quality Program employing one full-time specialist. This specialist is responsible for responding to indoor air quality complaints from staff and faculty in all on-campus and off-campus buildings owned and leased by the University. Complaint categories include: unpleasant odors, uncomfortable temperatures, allergy aggravation, dust, construction dust, and fumes from cigarettes, paint, perfumes, office equipment and roofing tar. While Physical Plant–Custodial Services (PP-CS) is responsible for ensuring that heating, ventilating and air conditioning (HVAC) equipment is regularly maintained to comply with minimum fresh air intake and circulation standards, no test-

Did You Know?

In 1988 EPA headquarters were extensively renovated. Indoor air quality was so severely affected that 25% of the building's occupants suffered symptoms including chronic head-aches, nausea and joint pain. Some filed a successful lawsuit against the renovators. The EPA has taken extensive measures to improve the air quality since, but several workers have become permanently sensitized to trace chemicals and must work in an adjacent building.[iv]

INDOOR AIR QUALITY

ing for the presence of contaminants is done until a complaint is lodged. Follow up air testing usually shows that indoor air contaminants are well below established exposure limits.

Recent Accomplishments

Flash Point Newsletter – In 1998, EH&S published an article in its "Flash Point" newsletter, alerting staff and faculty to indoor air quality issues, advising how to lodge complaints and suggesting steps they could take to improve air quality, including:

- Refraining from smoking near outdoor ventilation intakes and open windows;
- Not using heavy perfumes, colognes, oil-based paints, solvents, pesticides or strong-smelling fertilizers;
- Not installing carpets in high traffic areas, as carpets trap and concentrate contaminants tracked in from outdoors; and,
- Minimizing dust and disposing of food waste quickly to minimize mold and odors.

Comparing Our Performance

Vassar College and Cornell University have implemented a variety of indoor air quality measures including upgrading HVAC standards in new and existing buildings, performing regular preventive testing for contaminants, and purchasing low-volatile organic compound (VOC) building materials, paints and cleaning products. Cornell also has an Integrated Pest Management Program to reduce the volume of pesticides used inside its buildings, a strategy we implement here at Cal as well.

Opportunities

NEXT FEW YEARS

Inform staff, faculty and students about how they can improve indoor air quality – Many people are unaware of potential indoor air quality problems and simple improvement steps they could take. The Flashpoint newsletter was a great start in 1998, but a new email notification could reach all staff, faculty and students.

LONG TERM

Seek LEED credits for indoor environmental quality – The recently approved Regents' Green Building Policy and Clean Energy Standard and the voluntary Leadership in Energy and Environmental Design (LEED™) Rating System for Existing Buildings offer an excellent opportunity to set higher standards and receive recognition for indoor air quality improvements in our new and existing buildings.

Coordinate purchasing across departments – Controlling sources of contaminants, which often include office furnishings, cleaning supplies and other commonly purchased products, can be one of the most effective ways to improve air quality. Coordinated purchasing efforts might draw upon the extensive green product databases provided by the EPA, US Green Building Council, and Green Seal certification programs.

Track number, type and location of air quality complaints – Consider implementing a comprehensive indoor air quality monitoring program which synthesizes information from purchasing departments, University Health Services, and EH&S. For example, this system might allow for comparison between indoor air quality complaint records held by EH&S and claims of indoor air quality related illnesses maintained by UHS.

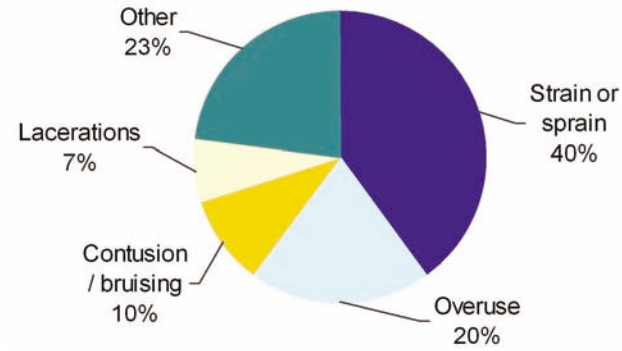
WORKPLACE INJURIES

UC Berkeley cares deeply about the safety of all our faculty, staff and students. Injuries are not only costly to both individuals and the University in terms of lost productivity and health care costs, but more importantly can impact the quality of life of those who suffer them in both the near and long term. While individuals must take ultimate responsibility for their own behaviors, the University can take steps to minimize some risks such as exposure to toxic chemicals, repetitive stress injuries, and other workplace injuries directly related to the campus work environment. This indicator examines how effectively UC Berkeley promotes a safe working environment for its employees, including consideration of training accessibility on ergonomic safety and monitoring of progress.

How Are We Doing?

Similar to trends observed in the larger U.S. workforce, computer-related repetitive motion injuries remain the single most common work-related injury on the UC Berkeley campus. These injuries are costly to individual faculty and staff, and to the University community. Many of these could be prevented with ergonomic changes to computer workstations and improved work practices. The top four types of injury are strain or sprain (40%), overuse (20%), contusion/bruising (10%), and lacerations (7%) (Figure 1). Injury numbers have increased in recent years, but are expected to decrease with the implementation of several new and revised programs including Ergonomics and Body Mechanics.

Figure 1. Major Injury Types at UC Berkeley



Since March 1992, UC Berkeley policy has required each department on campus to develop, implement and document its own Injury and Illness Prevention Program (IIPP). An IIPP is a department's program for creating a safe and healthy work environment but can only be effective if department management, researchers and other supervisors are made aware of their roles in communicating hazards and requiring safe work practices. Managers and Principal Investigators need to be held accountable for the safety of their staff and students.

The two primary health and safety organizations on campus are the Office of Environment Health & Safety (EH&S) and University Health Services (UHS). In addition, there are various committees that provide oversight for the implementation of campus health and safety requirements. However, in order to implement its IIPP, each campus department or unit must establish its own procedures, activities and records, and not all have done so.

The State of California Division of Occupational Safety and Health (Cal/OSHA) conducts unannounced inspections of University departments. EH&S helps departments comply with Cal/OSHA throughout the inspection process. In a recent investigation, one department received numerous citations totaling $7,130 in penalties. These penalties could have

Did You Know?

The Ergonomics@Work Program provides an array of services to help faculty and staff prevent repetitive motion injuries.

WORKPLACE INJURIES

been much greater, given the number of citations issued. Nonetheless, this experience and other regulatory inspections provide lessons for improvement that benefit the University as a whole.

Recent Accomplishments

Health*Matters – Health*Matters is Cal's worksite health promotion program for faculty and staff. In partnership with several campus departments, Health*Matters programs are designed to prevent work-related injury and illness, encourage healthy lifestyles, and support a healthy campus environment. In partnership with EH&S, Health*Matters trains managers and supervisors on their health and safety responsibilities to promote a safe and healthy work environment. The program's current priorities are to promote more active lifestyles and better eating habits for faculty and staff and to create a campus environment that supports healthier lifestyles.[v]

Ergonomics@Work – UC Berkeley's ergonomics program for faculty and staff provides an array of services and helps departments prevent repetitive motion injuries and comply with Cal/OSHA standards. This program has established campus ergonomics guidelines for computer users, trains department computer workstation evaluators, provides computer ergonomics and back care training, and provides ergonomic interventions in campus work environments.[vi]

Computer Ergonomics Matching Funds Pilot Program – This fund offers up to $500 per employee in matching funds to modify on-site computer workstations. The intent is to provide campus departments a cost-effective way to minimize and/or prevent the effects of computer-related repetitive motion injuries, the single most common work-related injury on campus.

Revised Shop Safety Manual – EH&S has wholly revamped and updated the Shop Safety Manual which provides guidance for all employees working in shops on safe work practices and how to comply with applicable regulations.

Training for new employees and graduate students working in laboratories – Since Fall 2002, all new employees and graduate students working in laboratories with hazardous materials must take a laboratory safety course.

CARE Services – CARE is an employee assistance program providing counseling, consultation, education and training, referral and crisis intervention services to faculty, staff, and their family members.[vii]

Opportunities

NEXT FEW YEARS

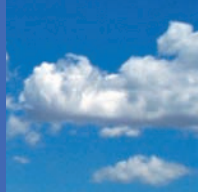
Promote available programs – Promote opportunities available through the Computer Ergonomics Matching Funds Pilot Program, the campus Ergonomics Program, Health*Matters, and CARE Services to all faculty and staff.

Facilitate implementation of IIPP's – Revise the campus IIPP program to make it easier for departments to effectively implement their IIPP's.

LONG TERM

Investment in ergonomic and other safety equipment – With the growing prevalence of ergonomic injuries, consider allocating significantly larger amounts of funding toward ergonomic improvements across campus.

Partnership between UHS and Capital Projects – This partnership could ensure that ergonomic design is incorporated into new building construction from the design stage to help prevent ergonomic injuries. Additionally, shower facilities could be included in building renovations and new construction to support physical activity throughout the workday, helping prevent injury and illness and supporting health and productivity.



HEALTH & WELLBEING NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Green Custodial Chemical Use
Brandon DeFrancisci	Associate Director – Training, Emergency Response, and Audit Programs, EH&S	Green Custodial Chemical Use, Indoor Air Quality, Workplace Injuries
Ali Mansour	Operations Coordinator Custodial Services	Green Custodial Chemical Use
Mike Morgan	Inventory, Custodial Services	Green Custodial Chemical Use
Barbara Pottgen	Health Educator, University Health Services	Workplace Injuries
Geoffrey Won	Indoor Air Quality Specialist	Indoor Air quality

CITATIONS

[i] http://www.mass.gov/epp/info/whyepp.htm

[ii] Green Seal is an independent, non-profit organization that strives to achieve a healthier and cleaner environment by identifying and promoting products and services that cause less toxic pollution and waste, conserve resources and habitats, and minimize global warming and ozone depletion. www.greenseal.org

[iii] For more information on the campus Smoke Free Policy, please see

[iv] http://campuspol.chance.berkeley.edu/policies/ucbsmokefreepolicy.htm.

[v] Congressman Bernard Sanders. http://www.bernie.house.gov/earth/iaq-5.asp

[vi] Health*Matters. http://www.uhs.berkeley.edu/facstaff/healthmatters/index.shtml

[vii] Ergonomics@Work: http://www.uhs.berkeley.edu/facstaff/ergonomics/index.shtml

[vii] CARE Services for Faculty and Staff. http://www.uhs.berkeley.edu/facstaff/care/index.shtml

UC Berkeley Campus
Sustainability Assessment

Academics & Culture

Sustainability-Related Courses

Sustainability-Related Organizations

Town & Gown Relations

SUSTAINABILITY-RELATED COURSES

As a leading institution of higher learning, UC Berkeley often sets the bar for new educational programs and research directions. As we educate future leaders and active members of our global community, Cal can further the integration of sustainability-related issues into teaching, learning and practice by increasing the opportunity for related studies. Sustainability-related courses, which span a wide range of disciplines, can provide our students with the knowledge and tools necessary for fostering our collective movement toward sustainability. This indicator explores the number of courses related to sustainability issues offered at Cal.

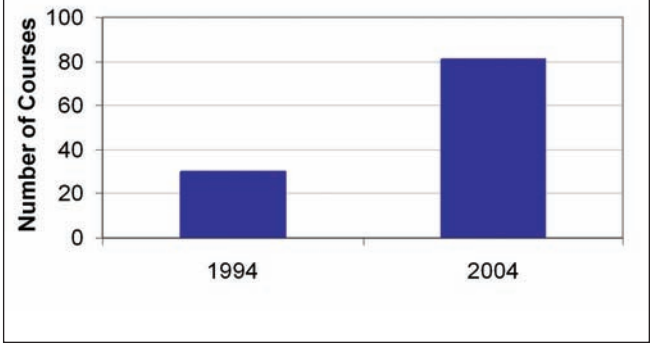
How Are We Doing?

Decisions regarding the composition of UC Berkeley's academic offerings – which include more than 6,000 courses per semester – are highly decentralized, with individual departments deciding which courses to offer each semester. This organizational method enables freedom for innovation and proactive departments to offer courses on new topics.

Based on a selective keyword search of all course titles and brief descriptions available in UC Berkeley's online General Catalog and Online Schedule of Classes (OSOC), Cal offered 81 approved sustainability-related courses in 2004.[i] This is roughly 50 more courses related to sustainability issues than were listed in the General Catalog a decade ago (Figure 1). An additional 46 sustainability-related courses appearing in the General Catalog were not offered in 2004, but many of these will likely be offered in the near future.[ii] Together, these sustainability-related courses represent offerings from 30 campus departments.

This methodology of counting sustainability-related courses inevitably leads to the omission of many relevant courses (adjusting the eleven keywords used as search criteria even slightly can yield significant changes in the number of sustainability-related courses found). Yet despite these limitations, it does provide an effective glimpse into the recent tremendous growth of sustainability-related course offerings here at Cal. Not only have additional courses with elements related to sustainability been developed, but new courses focused entirely on the concept and application of sustainability have been emerging in recent years.[iii]

Figure 1. Sustainability-Related Courses Offered at UC Berkeley



Some individual departments and research centers now maintain their own lists of sustainability-related courses as resources for interested students. For example, the Consortium on Green Design and Manufacturing maintains a list of approximately 65 "Green Courses" on its website.[iv]

Recent Accomplishments

Freshman and sophomore seminars – Twenty of the 81 sustainability-related courses offered in 2004 were freshman and sophomore seminars in which students work in small groups directly with professors at the cutting edge of research. Courses such as "Sustainability: What Can You Do" and

Did You Know?

The College of Environmental Design is creating a new "Sustainable Design" program

SUSTAINABILITY-RELATED COURSES

"Sustainable Energy Sources: Solar Biomass, & Conservation" allowed many students to form relationships with faculty with whom they might continue to pursue additional research.

Interdisciplinary studies & partnerships – Interdepartmental collaboration on many sustainability-related issues is both critical and growing at UC Berkeley. For example, students and faculty in the Consortium on Green Design and Manufacturing come from the College of Engineering, School of Public Health, Energy and Resources Group and the Haas School of Business.

Opportunities

NEXT FEW YEARS

Establish a current and updated list of sustainability-related courses – As demand grows for these courses, the Chancellor's Advisory Committee on Sustainability (CACS) should maintain and publicize a list of sustainability-related courses at http://Sustainability.Berkeley.edu. CACS might also explore the potential for a sustainability-related course search option through the Online Schedule of Classes (OSOC). One option for this might be to encourage department schedulers to include consistent text in the "special title" field when submitting course information to Classroom Scheduling for applicable courses. This would allow students to find identified courses through a keyword search of OSOC.[v]

Sustainable leaders by example – Encourage sustainability-related service-learning courses where experiential learning contributes to the community beyond the campus.

LONG TERM

Sustainable development or environmental literacy requirement – Individual colleges could integrate a requirement for one or more approved sustainability-related courses into their existing sets of general education graduation requirements.

Sustainability academic advisory committee – Create an academic advisory committee, possibly within the context of CACS, to monitor all related courses, ensure that new topics of research and interest are offered, foster additional interdisciplinary collaboration, and document the number of graduates in related fields.

SUSTAINABILITY-RELATED ORGANIZATIONS

Sustainability-related organizations provide an important avenue for students, staff and faculty to learn and share information about issues and to generate and advocate new ideas for further movement toward campus sustainability. They provide a valuable forum for the exchange of ideas and development of networks and help to build knowledge and leadership capacity in the campus community. This indicator reviews the presence of organizations promoting and/or implementing sustainable practices on campus.

How Are We Doing?

In response to a student request, the Chancellor's Advisory Committee on Sustainability (CACS) was founded in February 2003, by former Chancellor Robert Berdahl following the third annual UC Berkeley Recycling Summit. CACS has since blossomed into a structured, continuous voice for sustainability at UC Berkeley. According to its charter, the purpose of CACS is to promote environmental management and sustainable development at UC Berkeley throughout the campus, in academics as well as operations. The term "sustainability" is defined "as the ability to meet the needs of the present while living within the carrying capacity of supporting ecosystems and without compromising the ability of future generations to meet their own needs."[vi]

CACS is comprised of a representative mix of staff, faculty and students (per its charter), and features a number of subcommittees, each working on a specific campus sustainability issue (e.g., green buildings and clean energy, green fund development, public outreach, materials procurement, and assessing campus sustainability – the subcommittee that spearheaded this report). Each year, CACS also organizes an annual Chancellor's Sustainability Summit, at which the first Chancellor's Sustainability Awards were given to seven recipients in 2004. These awards are given to individuals or teams who have made significant contributions toward the goals of engaging the campus in an ongoing dialogue about reaching environmental sustainability, integrating environmental sustainability with existing campus programs, and instilling a culture of sustainable long-range planning and forward-thinking design.

Over 60 student sustainability-related organizations now exist on campus, varying widely in purpose and membership. These include the Berkeley Animal Rights Coalition, Berkeley Society for Bioethics, Campus Greens, Education for Sustainable Living Project, Engineers without Frontiers, Green Architecture Research and Design, Rainforest Action Group, and Students for a Greener Berkeley, to name only a few. UC Berkeley has a progressive and environmentally friendly reputation, and this is reflected by the amount of student participation in these groups. This vibrant community of student environmental groups provides valuable learning experiences for active students, as well as an opportunity to develop knowledge and skills relevant to generating positive change in the campus community and beyond.

Recent Accomplishments

Chancellor's Advisory Committee on Sustainability – CACS was commissioned by former Chancellor Robert Berdahl in February 2003, and has since provided leadership in moving the campus toward sustainability.

Establishment of ECO – ECO, the student Environmental Coalition, is hoping to bring the many environmental groups on campus together in a coordinated fashion, developing a shared network, allowing them each access to resources that they might not otherwise individually have, and providing an avenue by which students can become involved in new and existing environmental initiatives.[vii]

Wide variety of student environmental organizations on campus – A wide range of campus student groups now engages with issues from refuse management to green building design to environmental theme housing in campus residences.[viii]

Did You Know?

The Cal Re-USE center accepts discarded items from campus facilities and in turn offers a variety of services (e.g., a bike repair station) and reused goods to the campus community free of charge.

SUSTAINABILITY-RELATED ORGANIZATIONS

Comparing Our Performance

Like UC Berkeley, Michigan State University has seen a rise in student participation in environmental organizations on campus in recent years.[ix] The University of Vermont (UVM) is also home to an active environmental student population, and boasts one of the largest annual Earth Day celebrations among college campuses in the nation. Likewise, UVM's *Consortium for Ecological Living* has been successful in bringing many speakers to campus to discuss sustainability with the student population.[x] Stanford University also has gained recognition for its environmental organizations across many divisions of its campus that aim to bring together faculty and students for a common cause.[xi]

Students throughout the UC system have started the California Student Sustainability Coalition (CSSC), an organization with members from almost every UC campus coming together to share lessons learned and to implement joint projects and advocacy efforts. CSSC has been acknowledged by the UC Regents and Office of the President as having played a vital role in motivating the development of the UC Regents' Green Building Policy and Clean Energy Standard.

Opportunities

NEXT FEW YEARS

Better media coverage for Sustainability Weeks – Groups on campus celebrate "Sustainability Week" twice each year: once as a theme week of various environmental events centered around Earth Day in late April, and again in the Fall as a set of activities primarily targeted at first-year students and others living in campus residence halls.

LONG TERM

Increase support for CACS – The Chancellor's Advisory Committee on Sustainability has the potential to play a significant central role in fostering campus-wide movement toward sustainability, and would benefit greatly from additional staff support for coordination and implementation of the Committee and its activities.

TOWN & GOWN RELATIONS

Clear, open communication is the keystone of local community sustainability, and supportive dialogue is the foundation of lasting relations and strong partnerships. UC Berkeley and its surrounding community have a symbiotic relationship whose linkages are as diverse and complex as the University's own internal structure. While the impacts of campus size and activity within a densely built urban environment can be sources of occasional friction, a growing environment of collaboration opens new doors to mutual development. This institution of higher learning and the city that houses it are inexorably linked. The two Berkeleys, the University and the City, are an active and diverse community – together.

How Are We Doing?

The University has maintained a Community Relations office for almost twenty years. Currently, its four full-time staff members serve as liaisons between the campus and the neighboring communities of Berkeley, Albany, Richmond, and Oakland to "promote mutual understanding and supportive relationships." The Office interacts with local governments, business associations, neighborhood associations, and residents. Additionally, staff from several other campus departments regularly meet with citizens and public officials to maintain the best relations possible.

Two years ago, UC Berkeley and the City of Berkeley (COB) partnered to form the Campus Community Partnership Initiative, wherein senior staff from both institutions organized and attended a series of retreats to foster new and better ways of communicating. A consultant was hired to train the attendees in Appreciative Inquiry, a form of facilitation and community-building based on analysis of best practices and past successes. Participants from both the University and the City Manager's office agreed that the retreats created many new alliances as well as formal and informal partnerships that have greatly improved channels of communication between related City and University departments.

"It is a privilege to work with such important community groups, and a key part of our public mission is to share our knowledge and resources with society."

— Chancellor Birgeneau
At the 5th annual University and
Community Partners Recognition reception

Recent Accomplishments

University and Community Partnership Recognition – Each year the Chancellor recognizes community programs that contribute to the University's public service mission, as nominated by campus administrators. The six recipients in 2004 were in the areas of access to higher education, technology in education and literacy, public health, nutrition, community empowerment, and environmental stewardship.

Berkeley Alliance – The Berkeley Alliance is a non-profit partnership between Cal, the City of Berkeley, and the Berkeley Unified School District through which issues of mutual concern can be addressed collectively in neutral

Did You Know?

UC Berkeley has a daily campus population of approximately 50,000, while the population of the entire City of Berkeley is about 115,000.[xii]

TOWN & GOWN RELATIONS

territory. Through the efforts of the Berkeley Alliance, several groups have begun to meet together, including the COB/Cal/Lawrence Berkeley National Lab Sustainability Meeting Group that meets voluntarily to discuss sustainability issues.

Berkeley Sustainable Business Working Group – A joint project of the City of Berkeley's Mayor's Office and the Office of Energy and Sustainable Development, this working group partners with Cal and 100 local businesses working toward making Berkeley a world leader in environmental innovation and a "sustainable community."

Green Gathering – The Vice Chancellor for Facilities Services is providing a campus venue for the City of Berkeley's annual Green Gathering in April 2005, continuing a new tradition of cross-institutional support of green building efforts and sustainable development. Staff-to-staff partnerships on sustainability and green building issues are also established, including quarterly "Green Bag lunches" at which staff from both institutions and students meet to share information about various sustainable and green building practices.

Comparing Our Performance

Town and gown relations are a significant issue for many institutions, both public and private, and numerous examples of successful partnerships exist. The Univerisity of North Carolina, Chapel Hill (UNC) identifies community participation and public service as one of the key elements of its mission. To acknowledge this formally in students' official academic records, the University awards students who perform at least 300 hours of public service work to the community a *Distinction in Public Service* designation on their official transcripts. Community-oriented partnerships are the focus of UNC's $16.5 million *Active Living by Design* program, through which up to $200,000 over five years will be awarded to 25 interdisciplinary organizations that promote physical activity by changes in local community design, transportation and architecture.

Opportunities

NEXT FEW YEARS

Create a master list of all Cal/COB partnerships, joint task forces, and other collaborative efforts – There are more partnerships between the two entities than ever before.

Continue Partnership Initiative activities for staff at all levels – The paradigm shift derived from using Appreciative Inquiry techniques produced a notable change in relations between the City and the University.

Institute regular "town hall" meetings – Let the community have a forum to air concerns and to meet the faces of the students, faculty and staff that populate our city within the City.

LONG TERM

Collective legislation – UC Berkeley and the City of Berkeley, possibly in concert with other institutions and host-cities around the state, could jointly promote additional public policy analysis to identify and advocate for fair state compensation for municipal services.

Public service as formal achievement – To demonstrate a commitment to the surrounding community, the University could provide a way for public service to meet graduation breadth requirements. Similarly, the University could offer a formal certificate program or official transcript recognition (as at UNC) of community service and more awards/recognition for faculty and staff who participate in public service.

ACADEMICS & CULTURE NOTES

Staff interviewed in the assessment of this system (bold indicates primary contributors):

NAME	CAMPUS ROLE	INDICATOR(S) OF RELEVANCE
Susanna Castillo-Robson	University Registrar, Office of the Registrar	Sustainability-Related Courses
Alix Schwartz	Dir. Academic Planning - L&S Undergrad Div.	Sustainability-Related Courses
Linda Song	Assoc. Dir of Academic Senate	Sustainability-Related Courses
Susan Tonus	Systems Analyst/Publications Editor, Office of the Registrar	Sustainability-Related Courses
Lisa Bauer	Manager, Campus Recycling & Refuse Services	Sustainability-Related Organizations
Adam Borelli	ECO	Sustainability-Related Organizations
Tom Cordi	Director, ASUC Auxiliary	Sustainability-Related Organizations
Janice Crowder	Manager, ASUC Office of Student Affairs	Sustainability-Related Organizations
David Siddiqui	ECO	Sustainability-Related Organizations
Arrietta Chakos	Assistant Manager, City of Berkeley	Town & Gown Relations
Jennifer Lawrence	Principal Planner, Physical and Environmental Planning, Capital Projects	Town & Gown Relations
Judy Chess	Manager for Policy and Programs, Capital Projects	Town & Gown Relations
Elizabeth Gillis	Coordinator, Campus Community Initiative	Town & Gown Relations
Irene Hegarty	Director, Community Relations, Government and Community Affairs	Town & Gown Relations
Christine Shaff	Communications Manager, Facilities Services	Town & Gown Relations

CITATIONS

i Keywords used to search the online Schedule of Classes (http://schedule.berkeley.edu) included the following: sustainable/sustainability; environment/environmental; ecological; conservation; solar; green; biodiversity; renewable; hydrogen. This methodology obviously leads to the omission of many relevant courses and the inclusion of some irrele vant courses. Despite these limitations, this methodology allows a glimpse into the relative change in the number of sus tainability-related course offerings at Cal over the years.

ii Not all courses included in the General Catalog are expected to be offered annually.

iii Calendar years 1994 and 2004 were used rather than academic years in order to reflect courses that were offered in Fall 2004, the last semester available for study at the time our research was performed.

iv Consortium on Green Design and Manufacturing. http://cgdm.berkeley.edu/cgdmEnvClasses.html.

v Special titles display on the Online Schedule of Classes in the "Note" field and are limited to no more than 660 characters including spaces and punctuation. Users can search for special titles by entering a keyword in the Additional Information field. Special titles are submitted to Classroom Scheduling by the designated department scheduler.

vi http://recycle.berkeley.edu/sustainability/cacs/index.html

vii ECO website: http://www.berkeleyeco.org

viii Excel file provided by David Siddiqui

ix Michigan State University assessment: http://www.ecofoot.msu.edu/

x Vermont University assessment: http://www.uvm.edu/greening/trackinguvm.pdf

xi Stanford University website: http://www.stanford.edu

xii http://www.ci.berkeley.ca.us/planning/landuse/plans/generalPlan/1977masterplan/77htm/intro.htm

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