SUSTAINABILITY AT STANFORD
A YEAR IN REVIEW: 2013-14

Stanford
FEATURED TOPICS

Sustainability in Campus Operations
- Trends in Sustainability Performance
- Stanford Energy System Innovations in Implementation
- Advancements in Energy Efficiency
- Strides in Water Efficiency and Conservation
- Distinction in Building Design, Construction & Renovations
- Expanded Offerings in Transportation
- Minimizing Stanford’s Waste
- Enriched Sustainable Food and Living Programs

Sustainability in Academia
- Solutions-Oriented Research & Training
- Innovative Interdisciplinary Research
- Student Leadership & Activities

Office of Sustainability Programs & Services

Snapshots 2013–2014 Academic Year

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The Office of Sustainability and our campus partners are pleased to present the 2013-14 digital edition of *Sustainability at Stanford: A Year in Review*, which showcases the strides made in campus sustainability during the academic year. The report summarizes operational, academic, and programmatic achievements and presents metrics and trends in campus sustainability.

This annual publication takes a comprehensive view of Stanford as an institution that is investing in sustainability across all its aspects. The first half of this multipurpose report presents featured topics and initiatives in operations and academia, demonstrating Stanford’s commitment to sustainability planning and action. The second half presents a series of news snapshots from throughout the year, complementing the featured topics and capturing the steady pulse of sustainability at Stanford.

The campus has continued to make consistent improvements despite growth, demonstrating its leadership by example in sustainability. Together—as a campus that achieved the highest raw score to date in the most recent model of sustainability assessment by the Association for Advancement in Sustainability in Higher Education, recognition on the Princeton Review’s Green Honor Roll for the second consecutive year, and a top-10 ranking by Sierra magazine for the fifth consecutive year—we look back at a strong year of collaboration and results, and look forward to the journey ahead.

Over 45 departments across the campus community contributed content to our sixth annual report.

With thanks and best regards,

Fahmida Ahmed
Office of Sustainability
Stanford University
Sustainability is a core value at Stanford, deeply integrated into academics, campus operations, communications, and events. Sustainability teachings and practices are enriching our students’ academic experience, reducing the university’s environmental impact, saving resources, and engaging the campus community.

This section of Sustainability at Stanford: A Year in Review, 2013-14 features a number of sustainability topics, with each article summarizing key accomplishments, results and trends, and academic integration, as well as offering some insight into the work ahead. Here are some of the most significant accomplishments featured:

» **Overall sustainability:** For the second consecutive year, Stanford is on the Princeton Review’s Green Honor Roll, which lists universities that achieve the highest score—99—on the Princeton Review’s annual green rating. The Princeton Review tallied green rating scores for 861 institutions and included this information in its print and online guides. The Green Honor Roll can be found online here: [http://www.princetonreview.com/green-honor-roll.aspx](http://www.princetonreview.com/green-honor-roll.aspx).

For the fifth consecutive year, *Sierra* magazine has named Stanford as one of its top 10 “Cool Schools,” out of 173 institutions ranked in 2014. The “Cool Schools” feature story is published in the September/October 2014 issue of *Sierra* magazine, the official publication of the Sierra Club. Stanford’s 2014 profile, as well as information on the other top 10 schools, can be found online here: [http://sierraclub.org/coolschools](http://sierraclub.org/coolschools).

Finally, in July Stanford submitted a comprehensive sustainability assessment report to the Sustainability Tracking, Assessment & Rating System (STARS) of the national Association for the Advancement of Sustainability in Higher Education and received a Gold rating, increasing its 2012 score by 6 percentage points. Stanford’s score became the highest earned to date by any institution to date within the new STARS framework. A total of 314 colleges and universities report into various versions of STARS.
Interdisciplinary research: Stanford continues to produce leading interdisciplinary research to develop solutions to the world’s most pressing environmental problems. The Stanford Woods Institute for the Environment, the Precourt Institute for Energy (PIE), and other institutions award millions of dollars each year to innovative new research projects.

Greening of the energy supply: Stanford is transforming its energy system through Stanford Energy System Innovations (SESI), which will reduce greenhouse gas emissions by 50% and total campus potable water use by 15% upon completion in 2015. Progress on the $485 million program is shown live via the SESI website.

Expanded and flexible sustainability curricula: The 2010 Study of Undergraduate Education at Stanford resulted in a number of recommendations, including new breadth requirements for all students. This new system, launched in 2013-14, shifts undergraduate requirements from a discipline-based to a capacity-based model, which will enable students to take sustainability-related courses that will also count towards breadth requirements. Today, all seven schools offer a wide range of environmental and sustainability-related graduate and undergraduate courses offered across campus.

Reduced drive-alone rate: In 2013, the employee drive-alone rate is at 49%, compared to 72% in 2002 at the inception of the enhanced Transportation Demand Management program. More than 3,800 Stanford commuters started using alternative transportation during this period, and the Commute Club more than doubled its membership. Commute-related emissions remain below 1990 levels.

Higher landfill diversion rate: Stanford increased its landfill diversion rate from 30% in 1994 to 64% in 2013 and reduced its landfilled tonnage to an all-time low.

Behavioral sustainability: The Celebrating Sustainability festival, focused on behavioral sustainability, was held on Earth Day in April. Over 45 departments/entities and 60 presenters hosted over 1,200 guests. Cardinal Green campaigns continued to provide various conservation opportunities throughout the year.

Collaborative governance: The Provost’s Committee on Sustainability finished its second year of collaboration and made progress in integrating sustainability further into campus programs and life.

Leadership in Sustainability

Central to the academic endeavor has been the Initiative on the Environment and Sustainability, which boosted interdisciplinary research and teaching in all seven of Stanford’s schools, as well as in interdisciplinary institutes, centers, and associated programs across campus, in recognition of the fact that solutions to complex challenges demand collaboration across multiple fields. The School of Earth Sciences, the School of Engineering, the Graduate School of Business, the Graduate School of Education, the School of Humanities and Sciences, the School of Law, and the School of Medicine are leaders in sustainability research and teaching. Leading institutes such as Woods (founded in 2006) and PIE (founded in 2009) serve as the academic integration points and coordination platforms for interdisciplinary research and programs.

The Department of Sustainability and Energy Management (SEM) within Land, Buildings & Real Estate (LBRE) leads initiatives on campus physical infrastructure and programs in energy and climate, water, transportation, building operations, and information systems. The Office of Sustainability (founded in 2008 as an entity of SEM) connects campus departments and other entities and works collaboratively with them to steer sustainability-specific initiatives. The office works on long-range sustainability analysis and planning, evaluation and reporting, communication and outreach, academic integration, behavior-based programs, and governance coordination.

Creating a bridge between operational groups and academic entities are the Provost’s Committee on Sustainability and the Sustainability Working Group. With a commitment to uphold sustainability as a visible priority at Stanford, these committees work to encourage and promote collaborations among sustainability programs across schools, institutes, the Office of Sustainability, and students. Additional critical sustainability partners at Stanford include all LBRE departments; Residential & Dining Enterprises, which houses its own sustainable food and student housing programs; the Stanford Recycling Center, run by Peninsula Sanitary Service, Inc.; University Communications; Government and Community Relations; the Alumni Association; and over 20 student organizations.

Feature Topics Ahead

The feature topics in this report provide background and outline progress on sustainability initiatives across key operational, academic, and programmatic areas. The operations section focuses on the year’s milestones and performance achievements, while the section on academia focuses on key programs in schools and institutes, as well as research highlights from this academic year. The Office of Sustainability section showcases the broader programs that enhance the experience of sustainability at Stanford. All of the initiatives highlighted in our feature stories represent collaborative efforts across multiple entities and areas of expertise at Stanford. To demonstrate the fundamental interconnectedness of these campus initiatives, we highlight related sustainability topics at the start of each feature story. Check out the Topic Guide to view a list of these related topic areas and icons.
Stanford incorporates sustainability practices and innovation into every aspect of campus life. The university has undertaken major ongoing initiatives to reduce energy and water use, apply stringent environmental standards to all new buildings, encourage sustainable living, promote low-impact transportation, conserve natural resources, and decrease waste. Stanford continues to analyze the effectiveness of its sustainability programs and identify opportunities for improvement.

Articles featured in this section describe the milestones and performance achievements of the past year across various operational departments and initiatives. These demonstrate Stanford’s continued leadership in sustainable campus operation. To illustrate the collective impact of sustainability programs on campus operations, the section begins with several graphics demonstrating trends in resource consumption over time.
Background

Proper assessment of Stanford’s success in achieving a culture of sustainability depends heavily on tracking performance metrics and reporting them both internally and externally. A commitment to transparency and accountability helps the university strengthen its sustainability programs and services.

Changes in Resource Consumption

The first graphic below depicts trends in resource consumption this past year and compared to baseline program years. Key information on these trends includes the following:

- Because of consistent campus growth, total campus energy use continues to gradually increase. The increase has been small relative to the growth of the campus footprint, meaning that energy intensity is decreasing.
- Decreases in energy intensity since 2000 reflect the effectiveness of construction of energy-efficient facilities as well as retrofits of existing buildings.
- Total greenhouse gas (GHG) emissions decreased slightly from both 2007 and 2012 because a portion of Stanford’s power portfolio comes from the City of Palo Alto, which has a newly carbon-neutral electricity supply. These minor reductions mean that GHG emissions intensity also decreased slightly.
The amount of Stanford’s waste that is landfilled has decreased significantly since 2000 as recycling and composting have become prevalent. However, landfilled waste increased from 2012 because of changes in the way that mixed construction waste is sorted and recycled based on compliance with LEED 4.0 standards.

Stanford has lowered the number of employees who drive to campus alone since 2002. While the absolute number continues to decrease year to year, due to overall change in population size, the trend since the past year is neutral.

Total water use and water intensity decreased in 2013 due to the success of Stanford’s water efficiency programs. The university’s dedicated drought response efforts in the first half of 2014 have reduced its water consumption even further.

Individual Impact: A Look at Per Capita Consumption

In addition to tracking absolute consumption and intensity trends, Stanford considers annual per capita resource use. As the university grows to support its academic mission, responsible growth is both a priority and a tool for informing long-range strategic planning. As the total campus population continues to grow, the suite of efficiency and conservation programs implemented by the Department of Sustainability and Energy Management and its partner organizations ensures that each individual footprint shrinks. Per capita consumption dropped from 2012 to 2013 in most categories; in all categories, it has decreased significantly since the baseline year. A detailed look at the magnitude of these per capita changes, demonstrated in the charts on the next page, illustrates the priority and effectiveness of resource management at Stanford.

Mindful of the continued growth necessary to support and advance its academic mission and enroll more students, Stanford maintains an unrelenting commitment to reducing its impact on resources. An analysis of absolute values over time, displayed in the spread on the following pages, demonstrates this trend.
Historical Energy Consumption Per Capita

Energy Consumption per Capita (kBtu/person)

Historic Domestic Water Consumption Per Capita

Domestic Water Consumption per Capita (gallons/person)

Historic Landfilled Waste Per Capita

Landfilled Waste per Capita (lbs./person)
## Stanford Operational Sustainability Metrics 2000-2013

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**Notes:**
1. In 2010 Stanford transitioned to usable square footage (USF) in lieu of gross square footage (GSF) since tracked campus GSF data now includes attic areas and other spaces not normally used or conditioned. Thus, USF represents utility service area more accurately and is used in this table starting in 2010.
2. In 2012 more accurate historic USF information became available and therefore the service areas have been updated starting in 2000 to better reflect the state of campus at that time.
3. Service areas for electricity, steam, chilled water, and domestic water are different, and USF served by electricity and domestic water exclude parking structures.
5. Emissions for 2013 per the Climate Registry General Reporting Protocol, including simplified estimation (de minimus equivalent) emissions, verification pending.
6. GSF included in the emissions intensity calculation corresponds to the properties included in the emissions inventory as defined by the operational control boundary method.
7. In June 2013 the methodology for calculating commuter drive-alone rates was updated to reflect the differing commute survey response rates in various sub-populations.
8. Calculations for sustainable food purchasing by Stanford Dining correspond to the criteria defined by the Association for the Advancement of Sustainability in Higher Education’s Sustainability Tracking, Assessment, and Rating System. This includes food and beverages grown or processed within 250 miles of campus and/ or third-party certified (USDA Certified Organic, Marine Stewardship Council Blue Ecolabel, Monterey Bay Aquarium Seafood Watch Approved, Fair Trade, Certified Humane Raised and Handled).
9. The square footage of Faculty Staff Housing is not included in the service area for domestic water.
Background

In December 2011, Stanford’s Board of Trustees approved the Stanford Energy System Innovations (SESI) program, designed to meet the university’s future energy needs while reducing greenhouse gas (GHG) emissions and water consumption. Stanford has historically done much to reduce GHG impacts, and in late 2007, the university set out to develop a formal action plan incorporating existing best practices in innovative new ways. The resulting Stanford Energy and Climate Plan is one of the most ambitious carbon reduction programs at any major U.S. university. The plan includes high efficiency standards for new buildings; continued efficiency improvements for existing buildings; and the cutting-edge energy supply system known as the SESI project, which in 2015 will reduce campus emissions 50% from 1990 levels. Conceived in the Department of Sustainability and Energy Management (SEM) and being implemented in collaboration with the Department of Project Management (DPM), the university architect’s office, Land Use and Environmental Planning, Zones Management, Buildings and Grounds Maintenance, and many other departments, the SESI program is an all-hands Land, Buildings & Real Estate engagement that will deliver great benefits for Stanford University in decades to come.

Results

Because there is a large overlap between campus heating and cooling demands, the new Central Energy Facility (CEF) will include an innovative heat recovery design that is significantly more efficient than the existing cogeneration process.
Implementation

The implementation of the SESI program involves significant work throughout the campus between 2012 and 2015. The DPM is managing design and construction of 22 miles of hot-water pipe, conversion of 155 buildings to receive hot water instead of steam, and installation of the CEF and a new campus high-voltage substation.

» Hot-water pipe installation: With the removal of steam as the campus heating utility, over 22 miles of new low-temperature hot-water (LTHW) piping are being installed underground throughout campus. This project has made significant progress this past year. The piping was 98% installed as of July and will be complete by October.

» Building conversion: All of the 141 campus building mechanical rooms that were fed by the outgoing steam service need to be converted to accept the new LTHW utility. By the end of July, 62 buildings were converted, with all 141 scheduled to be converted by March 2015.

This work is being carefully sequenced in multiple phases to minimize disruption to campus life. As each phase of piping and building conversion is completed, that section of campus will be moved off steam to hot water via a regional heat exchanger that will convert steam from the existing cogeneration plant to hot water at a district level. Once all phases of the conversion are complete, a full transition from the cogeneration plant to the new CEF will be made in April 2015, the regional heat exchange stations will be removed, and the cogeneration plant will be decommissioned and removed to make way for new academic buildings within the campus core. The SESI website launched in the summer of 2012 to provide an avenue for interested community members to learn about the program. It includes project fact sheets and links to related articles. Most notably, it contains an interactive campus map and real-time view of associated construction.

» New CEF: In 2012, design of the new CEF was completed, equipment manufacturers were selected, a general contracting firm was hired, and construction began in early October that year. Thus far, the plant foundations and underground utilities have been constructed, thermal energy storage tank installation is one-third complete, and structural steel for the plant
The Road to Carbon Reduction

For the seventh consecutive year, Stanford completed and verified its inventory of Scope I and Scope II CO2 emissions. The 2012 inventory was verified through the Climate Registry. Net emissions decreased for the first time since 2008, despite continual campus growth. Newly available and more precise utility-specific emission factors from non-CEF electricity purchases contributed to the 5% decrease.

Stanford reported approximately 181,700 metric tons of CO2 emissions for 2013 (verification pending), a 3% decrease from 2012 levels. The City of Palo Alto’s adoption of a carbon-neutral electricity supply helped Stanford achieve this decrease.

The university’s emissions intensity remains lower than it was in 2007, which confirms the efficiency of Stanford’s new high-performance buildings and the impact of its numerous retrofit programs. Emissions will significantly decrease in coming years as a result of the SESI program, dropping 50% below 1990 levels upon completion of construction in 2015.

Academic Integration

The Energy and Climate Plan, which was first released in 2008 and evolved into SESI, has been a high priority and incorporated various faculty peer reviews from inception through approval. The first faculty GHG task force convened in 2009 to review the initial plan. Throughout 2011, the heat recovery scheme and proposed financial models were extensively peer reviewed by faculty from the School of Engineering and the Graduate School of Business, as well as a Board of Trustees advisory committee. SESI program studies have also periodically engaged graduate student researchers to supplement industry findings, verify models, and assist with other assessments. SEM partnered with the Stanford Solar and Wind Energy Project, a student group, to study the campus’s solar potential. Solar photovoltaic (PV) integration is one aspect of SESI currently under investigation, and the students assisted in analyzing data while gaining practical hands-on experience. Stanford staff will continue to partner with students and faculty as SESI proceeds.

Looking Ahead

As core elements of the SESI program are implemented, additional potential enhancements to the campus energy system are being considered. These include:

» Rooftop on-campus PV power installations (the provost has already approved installations generating 4 megawatts of power);
» Development of a ground source heat exchange system to complement the core heat recovery process;
» Installation of a new high-voltage transmission line to improve the reliability of the electrical grid serving the university;

The CEF will be a state-of-the-art heat recovery plant featuring both hot-and cold-water thermal storage that relies on a diversified mix of electricity sources for power, unlike the cogeneration plant, which relies on 100% natural gas. SEM will operate the CEF with a new automated control system, Energy Oracle System, invented at Stanford (patent pending) and currently under commercial development by Johnson Controls, Inc. This will assure optimal operation through predictive economic dispatching based on load and market electricity pricing forecasts. The system will also allow fully automated operation to eliminate guesswork by plant operators in running a complex combined heating and cooling system with both hot and cold thermal storage.

Installation of a plug-in electric vehicle infrastructure to support both private and university electric vehicles and electrification of the Stanford bus, truck, and car fleet; and
» Installation of a natural gas–based centralized emergency generation and distributed electrical storage system to replace the current distributed diesel fuel emergency generation system.

Detailed feasibility studies of these potential enhancements are under way and will be completed within the next few months.

Related Snapshot Stories:

» SESI Implementation Forges Ahead

More Information:

http://sesi.stanford.edu
Advancements in Energy Efficiency

Background

Since 2010, a redesigned Facilities Energy Management (FEM) team in the Department of Sustainability and Energy Management has been responsible for coordinating the university’s efforts to reduce energy use in existing buildings and to incorporate energy efficiency best practices into all new buildings. The team works with Operations and Zone Management to ensure buildings are operated efficiently and manages multiple programs that offer technical as well as financial assistance to facility managers, department leads, and building occupants to encourage implementation of energy efficiency projects.

Results

As of 2013, Stanford has reduced energy intensity on campus 6% from a 2000 baseline, despite continued campus growth. Energy efficiency programs have been prominent on campus since the ‘80s. Metering campus buildings has paid dividends throughout the last decade in developing more advanced programs to improve energy efficiency. Specific results this year include the following:

» The Whole Building Energy Retrofit Program (WBERP) seeks to reduce energy consumption in Stanford’s most energy-intensive buildings. This $30 million capital program began in 2004 to address the 12 largest energy-consuming campus buildings and now includes the top 27, which represent 60% of total campus energy use. Retrofits have been completed in 14 buildings thus far and have saved more than $3.9 million a year in energy costs. The program has also yielded over $2 million in financial incentives via
Operations staff continue to monitor building performance, looking for improvement opportunities related to operating schedules, HVAC set points, and maintenance work. Program highlights for 2013-14 include the completion of 26 building HVAC recommissioning projects.

The FEM team received rebates from PG&E totaling over $120,000 for 2013-14 projects, including various projects at Packard Electrical Engineering and Hagey, as well as multiple lighting retrofits. City of Palo Alto Utilities rebates totaled nearly $40,000 for 2013-14 projects, including a major lighting upgrade in the Grant, Alway, Lane, and Edwards buildings and the HVAC measures at Falk Center.

The FEM team worked closely with the campus planning office to conduct a life cycle cost analysis of various new high-efficiency outdoor lighting technologies. All of the technologies were first evaluated in the field to ensure they will meet rigorous aesthetic and safety requirements. LED technology was found to be more cost effective than the alternatives, with a potential life cycle benefit on the order of $1.8 million if all Stanford-owned fixtures were upgraded. Large-scale demonstrations are now under way, and if all goes well, the combined effort will culminate in a retrofit program that will reduce the electricity used for lighting campus streets, walking paths, and parking lots by half.

Since 1993, the Energy Retrofit Program (ERP) has provided rebates to Stanford Utility users who install efficiency upgrades within their facilities. Rebates cover some or all of the upgrade costs, depending on the project payback period. Projects completed in 2013-14 include new LED lighting, better lighting controls, fluorescent fixture retrofits, variable frequency drives (VFDs) for electric motors, and server virtualization. Over 40 projects were completed in academic buildings, with a total estimated savings of over $90,000/year. In addition, the School of Medicine completed lighting retrofit projects at Fairchild, the Medical School Office Building (MSOB), MLSL, and Hagey; these are saving over $82,000 per year and improving light quality. Air flow modifications at Hagey are saving over $10,000 per year. Air handler upgrades at Falk and MSOB will save over $40,000 per year. The Department of Athletics, Physical Education and Recreation installed VFDs on fans at the Arrillaga Center for Sports and Recreation and is completing a major HVAC upgrade at the Arrillaga Family Sports Center with ERP support, and has several more projects slated for fiscal year 2015-16. Residential & Dining Enterprises (R&DE) Stanford Dining undertook an LED upgrade at Wilbur Hall.

Pacific Gas & Electric (PG&E) rebates. In 2013-14, construction was completed on controls upgrade projects at the Alumni Center and the Paul Allen Building and Annex. An HVAC upgrade at Research Animal Facility (RAF) II was also completed and will save an estimated $325,000 in energy costs per year. Construction began on a controls upgrade for Clark Center that is expected to save over $400,000 per year. Designs were completed for retrofits at Mitchell Earth Sciences and the Mechanical Engineering Lab, and energy studies were completed for two large School of Medicine buildings, the Center for Clinical Science Research and the Medical School Lab Surge (MSLS) building.

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In the coming year the FEM team will be working collaboratively with building occupants and operations and management staff to develop a formal implementation program to further improve air flow management in large laboratory buildings. These facilities are typically the largest energy consumers on campus due to the high air change rates required for occupant safety, which represent a large HVAC load. Studies conducted in 2014 have identified innovative strategies to reduce HVAC-related energy needs in lab buildings, while also improving occupant comfort and enhancing safety. The metrics derived from the studies will be used to develop cost-effective retrofit plans.

Stanford will continue to develop means to leverage the “big data” available through the operation systems used to monitor and control buildings and the critical processes within. This entails the evolution of data management systems and the deployment of new, smart analytic systems. Examples include next steps for the Automated Fault Detection and Diagnostics pilot project conducted last year; completion of a study on real-time building energy use modeling and demand forecasting; and research into data analytics technologies that can automate the identification of maintenance needs and integrate with maintenance work order systems.

In 2015, the FEM team will start to leverage the benefits of the Stanford Energy System Innovations project to further optimize the energy efficiency of the campus. The new Central Energy Facility (CEF) and campus buildings will work together with unprecedented synergies that enable macro-level tuning of energy efficiency. Actively managing building-level energy demand will maximize the efficiency of the CEF, and conversely, optimizing the energy supply conditions to the campus can optimize building efficiency. Using the controls and instrumentation at the CEF and the buildings, the team will develop smart algorithms to pursue the best energy performance possible for the campus.

Related Snapshot Stories:
» Bing Concert Hall Earns Savings By Design Certificate of Recognition
» A Renovated Florence Moore Dining Hall Highlights Sustainability

Looking Ahead

Under WBERP, construction will begin early next year at Mitchell Earth Sciences and the Mechanical Engineering Laboratory. An HVAC upgrade at RAF I will also be under way. When completed, these projects are expected to save over $250,000 per year.

Overall energy intensity (measured in thousand British thermal units per usable square foot, kBtu/USF) remains less than it was in 2000. The suite of energy-saving programs targeting large-scale building retrofits, small-scale retrofits, and HVAC controls, coupled with new construction standards, has contributed to this trend.

Other notable performance trends include the following:
» Steam consumption per usable square foot has remained relatively flat. A notable decrease starting in 2009 correlates with the completion of major HVAC upgrade projects in multiple buildings.
» Chilled-water consumption per usable square foot also remains lower than it was in 2000. This further illustrates the benefits of energy retrofits in multiple large buildings.

**Academic Integration**

The FEM team engages frequently with research faculty to better understand energy demand inherent to their work and tailors program offerings accordingly. FEM staff also continue to participate in ideation meetings with the Energy & Environment Affiliates Program. FEM provided input on the types of HVAC and energy management sensors deployed in buildings, the quality and resolution of the resultant data, how the data are currently managed and utilized, and future opportunities for improvement in sensor performance, data storage, and smart applications for processing the data. FEM staff also regularly interact with faculty in the Center for Integrated Facility Engineering (CIFE). FEM team members serve as guest speakers for CIFE courses, help review student projects, and provide feedback on research needs regarding the operation of high-performance buildings.

Stanford’s Energy Conservation Incentive Program, established in 2004, provides schools and administrative units a financial incentive to use less electricity. The program sets budgets based on past consumption and lets participants “cash in” unused kilowatt-hours; those that exceed their electricity budgets pay the difference out of their own funds. FEM completed a large analysis in 2013 to recalibrate the budgets of the schools and units to more closely match them with expected performance. The analysis highlighted that on average, most units are coming in well under budget.

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**Related Snapshot Stories:**

» Bing Concert Hall Earns Savings By Design Certificate of Recognition
» A Renovated Florence Moore Dining Hall Highlights Sustainability

**More Information:**

http://lbre.stanford.edu/sem/energy_conservation
http://sustainable.stanford.edu/buildings
Strides in Water Efficiency and Conservation

Background
Stanford has expanded its sustainable water use practices by managing available resources to meet its needs while preserving ecological systems and this vital resource for future generations. The university has developed innovative alternative water supplies and expanded water conservation efforts for its buildings, grounds, and residential leaseholders. Stanford increased water use efficiencies even further in the face of the 2014 drought.

Results
As of fiscal year 2014, Stanford has reduced domestic water use on campus 23% from a 2001 baseline, despite adding nearly 2 million gross square feet to the campus buildings portfolio and over 1,400 units of faculty, staff, and student housing. The 2003 Water Conservation Master Plan identified 14 water conservation measures for campus implementation; today, more than 20 such measures are employed. Campus domestic water use averaged 2.1 million gallons per day in 2014, the lowest average daily use since the start of the water conservation program in 2001. Specific activities this year included the following:

» Governor Brown declared a drought in California in January 2014, asking Californians to reduce water use by 20%. The San Francisco Public Utilities Commission, which supplies domestic water to Stanford and many other Bay Area agencies, then announced a 10% voluntary reduction goal for its water agency customers. In response, Stanford expanded its ongoing Water Efficiency (WE) program, developing and implementing drought
conservation measures. These measures include monthly water use reports to each campus group, updates on drought conditions on the WE website, a call for action to the campus community, which yielded hundreds of pledges to conserve water, and WE program rebates for campus residents.

» Since the beginning of 2014, WE staff have sent over 50 monthly reports to campus zones and groups to track water usage, compare it to the 10% reduction goal, and promote savings. The reports have helped inform campus managers and residents and reduce water consumption. The statewide metric for drought water use reductions is a comparison of use from February through December 2014 to use in the same months in 2013. Comparing February through September 2014 to February through September 2013, Stanford has reduced its campus-wide domestic water consumption by 6%. Landscape irrigation with nonpotable lake water has been reduced by 20%. Areas showing the most savings have been those with an integrated approach to water-saving best management practices, including open communication between area managers and WE staff, the use of smart or weather-based irrigation controllers (for landscape sites), and the use of smart or real-time water meters. The chart below depicts Stanford’s consistent monthly domestic water savings as a result of dedicated drought response efforts.

» WE staff collaborated with Gilbert Biology Building staff to retrofit their steam sterilizer equipment, which is used to sterilize glassware and lab instruments. Upgrading the water misers on the sterilizers allows use of cold quenching water only when the sterilizer is emitting hot condensate/effluent, eliminating the constant flow of quenching water. Since the upgrade, in April 2014, the building’s water use has been cut by 50%.

» Drought and monthly supply updates have been posted on the water efficiency website to make information and resources more easily accessible for the campus community. The website, which has proved to be a successful outreach tool, also includes information about rebates for water-efficient fixtures and landscaping.

» WE staff have conducted residential landscape water audits at more than 50 residences and other campus grounds and buildings. The purpose of the...
from 2002 to the present. A variety of sorting parameters allow users to quickly search more than 300 indoor and outdoor projects. Clicking on the map’s icons provides details on the water-efficient equipment installed during retrofit projects, as well as the estimated water savings, when available. The map also includes general water profiles for each new building opened since 2007.

» In 2014, WE hosted the first annual water conservation video contest for students. The winners were honored during the Celebrating Sustainability event on Earth Day, and the video is available on the WE website.

The chart above shows the cumulative effect of water conservation on campus: domestic water intensity has dropped 37% since 2001.

Looking Ahead

Later in 2014 and into 2015, the water services group will continue investigating Stanford’s water resources and demands to inform the development of a sustainable water management plan. Investigations are being conducted on Stanford’s surface water supplies (reservoirs and creeks), groundwater, and storm water capture opportunities. A wide-ranging study of options for the future of Searsville Dam and Reservoir, including a public input process, is well under way and is expected to be completed later this year. Based on this information, campus leadership is expected to make decisions about the long-term future of the facility, which will then allow development of a campus-wide Sustainable Water Master Plan.

The WE team will continue to work with students, faculty, staff, campus groups, and residents to promote efficient practices, track water savings, and implement projects that promote water conservation. Staff will continue to reach out to

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residential landscape water users for water-saving actions and conduct outdoor water surveys at the homes of customers in the top 10% in monthly water use.

**Related Snapshot Stories:**
- SLAC Implements Successful Water Conservation Measures
- Stanford Studies Drought
- New Center for Wastewater Recovery Research Breaks Ground on Campus
- 1st Annual Water Efficiency & Innovation Film Competition picks the Tale of Hydro Warrior
- Stanford Enacts Water Reduction Plan; Water Wise Launches
- Stanford Announces New Water Reduction Requirements as Drought Persists

**More Information:**
http://lbre.stanford.edu/sem/Water_Efficiency
http://sustainable.stanford.edu/water_initiatives
Distinction in Building Design, Construction & Renovations

Background
To evolve as a center of learning, pursue world-changing research, and respond to pressing environmental concerns, Stanford designs and creates buildings that use resources wisely and provide healthy, productive learning environments. Energy generation for building heating, cooling, and electricity accounts for the majority of Stanford’s carbon emissions—and from 2000 to 2025, the university expects to add nearly 4 million usable square feet of building space to the core campus, as well as housing for 2,400 students, faculty, and staff.

The Department of Project Management (DPM) oversees major construction on campus. Advancements in high-performance building design, construction, and renovation continue to ensure that Stanford delivers and maintains new facilities in accordance with its project delivery process guideline. Since 2001, DPM has incorporated sustainability through guidelines for life cycle cost analysis, sustainable buildings, and salvage and recycling programs, as well as a strong emphasis on commissioning. Designing buildings to be more efficient reduces the demands on the main campus heating, cooling, and electrical systems, creating a ripple effect of cost savings and environmental benefits.

Results
The specific examples below highlight achievements from 2013-14 that help the Stanford campus progress towards sustainability in new construction and major renovations.
a large (83.2kW) photovoltaic system. Other key features include variable-volume fume hoods, zone-level heating and cooling, and heat recovery systems similar to those in the Lokey Stem Cell Research Building (completed in 2010 and performing 43% better than required by energy codes). This building also has 21 electric submeters that will be used to evaluate efficiency performance and help provide a critical database of how energy is used in large laboratory buildings. Since research laboratories are typically the largest energy users on campus, the benefits of these high-efficiency building components are magnified.

» Construction continued on several components of the Stanford University Medical Center Renewal Project, including the Welch Road Utility Project, renovation of the Hoover Pavilion, and site work for the Lucile Packard Children’s Hospital (LPCH) expansion. Both the LPCH expansion and the new Stanford Hospital are expected to achieve LEED New Construction Silver equivalency.

» Finding new uses for older buildings is now a common practice at Stanford. The former home of the Graduate School of Business (GSB) is now the Lathrop Library and will contain the East Asian collection, Academic Computing Services, and other programs currently housed in Meyer Library. As mentioned below, the Old Chemistry Building is being transformed into the Science, Technology, and Learning Lab. The underutilized Roble Gym is currently undergoing renovation to become a more efficient space for the Theater and Performance Studies Department.

Academic Integration

Collaboration with faculty and research staff, particularly in the programming of interdisciplinary space, remains a DPM hallmark. The school/department user group is the program advocate throughout each project. This group may include the dean/director, faculty, staff, and/or students. It designates a representative who is responsible for gathering and disseminating information and communicating it from the project team to the group and vice versa, within project schedule constraints. The DPM project manager coordinates directly with this representative. DPM relies on this collaboration to express the needs of the program to the university administration and to manage communication and decision making within the school/department.

One great example from 2013-14 is the Start.Home. The two-bedroom, one-bath house was Stanford’s entry in the Solar Decathlon, a biennial competition run by the U.S. Department of Energy that challenges students to design and build innovative solar houses that will help usher green technology into modern home construction. Students worked with faculty and campus staff to design the house...
to further optimize building operation and to inform design decisions for future projects, thus optimizing conservation of resources in those buildings as well.

The Old Chemistry Building, built in 1903 but not occupied since the 1989 earthquake, will be transformed into the Science, Technology, and Learning Lab and will promote sustainability through reuse of materials. The building will include teaching laboratories for chemistry and biology and a new library facility. With a prime location facing Palm Drive, this building will create a new formal entrance to the biology/chemistry district. While the design team is still working to determine specific water and energy targets, the building is expected to combine the best of historic Stanford architecture with innovative energy features found in the rest of the recently completed laboratories on campus.

The Bass Biology Building will be constructed as part of Stanford’s Science, Engineering, and Medical Campus Initiative. The building will be located between Gates Computer Science and Mudd Chemistry and will provide shared spaces for collaboration, innovative instrumentation, and laboratories for students, faculty, and research staff. Two institutes—Chemical Biology and Neuro Institute for Chemical Biology and Neurosciences—will occupy this new 180,000-gross-square-foot facility. Because this building will have a combination of fume hood labs, engineering labs, and computational space, it will be the first “test case” for the new energy and water goals.

Several large residence halls and housing complexes are in design or construction in an effort to further improve the out-of-classroom academic experience, reduce traffic, and reduce commutes. The Kennedy Graduate Residences (Comstock was the working project title) will be ready for occupancy in September 2014. Four residential buildings and a common area will provide a net increase of 362 beds for graduate students. Manzanita Park Residence Hall will provide 125 beds for upper-class undergraduate students and will be open in August 2015. A new dorm near Lagunita will provide beds for 200 students and open in 2016.

Additional high-performance renovation and construction projects under consideration for the 2014-15 academic year include the Crown Quad renovation, C. J. Huang (780 Welch), and McMurtry Art and Art History. Continued renovation of Panama Mall, to be completed in 2014, will fully convert a former back alley into an open boulevard and inviting academic space.

The Redwood City campus for Stanford is about to become a reality. After over five years of project design, environmental review, and community outreach, the City Council of Redwood City adopted the conceptual master plan for the new campus in September 2013. The university intends to redevelopment the site in phases over time, depending on its needs. Due to General Use Permit limitations on core campus development, the university studied options for relocating administrative organizations off campus, thus reserving core campus space and received guidance during construction. In the October 2013 competition, the Start.Home placed first in the affordability and energy balance categories and fifth overall. A new team has convened to prepare a new house for the 2015 competition with plenty of lessons learned from the 2013 team. The 2013 Start. Home was moved to the 1,000-acre Jasper Ridge Biological Preserve and is now the home for the resident ranger and his family.

**Looking Ahead**

Stanford is further revising its energy and water efficiency targets for new construction and large remodels. In 2008, an exceedance goal of 30% for energy and 25% for water beyond current code requirements was given to each design team. Each project had the flexibility to determine the best way to meet the goal while attending to budget and programming realities. However, additional energy and water code requirements from state and local jurisdictions made straightforward target setting more of an accounting challenge than an actual feature improvement exercise. As a result, Stanford is considering a new methodology that will include processes for setting, tracking, and enforcing energy targets. In addition, Stanford continues to explore methods to increase space efficiency to reduce the need for new construction.

To support excellence in building design, post-occupancy energy studies of high-performance buildings will continue. These studies compare expected building performance with actual measured data. Stanford uses this information to further optimize building operation and to inform design decisions for future projects, thus optimizing conservation of resources in those buildings as well.

The McMurtry Building, anticipated to be completed in 2015, has been designed to conserve resources through its prominent outdoor spaces. The large courtyards will foster networking and collaboration without a need for heating and cooling.

Stanford’s Start.Home placed fifth in the Solar Decathlon, an international competition to design, build, and operate solar-powered houses that are cost effective, energy efficient, and attractive.
for Stanford’s highest academic priorities and objectives. The satellite campus will accommodate nonacademic user groups not required to be on the main campus. The concept design responds to guiding principles and objectives that will enrich and carry forward the existing Stanford culture, as well as offering benefits to the surrounding community. The project will also set an example of Stanford’s commitment to environmental responsibility and sustainability. High-performance strategies for the structures and landscape, coupled with an aggressive transportation management program, will demonstrate responsible stewardship of the site and respect for the community.

All these construction projects will ensure that Stanford has the most environmentally responsible and innovative facilities possible, allowing the university to fulfill its academic mission.

Related Snapshot Stories:

» Bing Concert Hall Earns Savings By Design Certificate of Recognition
» Student-Built Home Ranks 5th in Green Building Competition
» Provost Approves Solar Panel Installation

More Information:
http://sesi.stanford.edu
http://lbre.stanford.edu/dpm/our_projects
http://sustainable.stanford.edu/green_buildings
Expanded Offerings in Transportation

Background

Stanford’s Transportation Demand Management (TDM) program to reduce university-related traffic impacts is one of the most comprehensive in the country. Stanford developed the program to meet peak-trip reduction goals in its General Use Permit, issued by the County of Santa Clara, which governs campus growth and development. Despite significant campus growth, the TDM program has resulted in measurable reductions in commuter emissions, and it plays an essential role in the university’s sustainability effort.

The Stanford Commute Club is a key element of the TDM program. The Commute Club rewards each member with up to $300 a year, among other incentives, for commuting primarily by alternative transportation. Stanford has also continued to expand other transportation programs, including car sharing, which has grown from three Zipcars in 2007 to more than 65 cars at 26 locations today, making it the largest university Zipcar program in the nation.

Designated the nation’s first Platinum-Level Bicycle-Friendly University in 2011, Stanford has expanded its bicycle program to accommodate the estimated 13,000 bikes on campus each day. The expansion has included adding bicycle safety repair stands, which now total seven, and increasing bicycle parking capacity. Stanford now has 395 secure bike parking spaces (286 bike lockers and 109 bike cage spaces). In addition, bike racks provide more than 18,000 bike parking spaces on campus.

These TDM advances, coupled with extensive marketing outreach and promotions, have enabled Stanford to reduce its drive-alone rate, with more
than half of university employee commuters now primarily using sustainable transportation.

Results
Stanford has been transitioning to more sustainable campus shuttles and fleet vehicles, expanding electric vehicle (EV) charging stations, and increasing shuttle route efficiency. It expanded its sustainable transportation efforts in 2013-14, and performance achievements include the following:

» In 2014, the employee drive-alone rate was 49%, compared to 72% in 2002 at the inception of the enhanced TDM program. Commute-related emissions remain below 1990 levels, decreasing from 1.82 metric tons of CO2 per commuter in 2000 to 1.47 metric tons of CO2 per commuter in 2013. The Commute Club has more than doubled its membership since 2002, with more than 8,750 members today.

» Marguerite shuttle passenger numbers rose from 1.9 million in 2012 to an estimated 2.3 million in 2013.

» Bike to Work Day at Stanford saw a record turnout in 2014. More than 2,034 riders were counted, and 829 riders reported logging a total of 8,783 miles, for an average of 11 miles per trip. By biking instead of driving, these commuters eliminated an estimated 7,958 pounds of CO2 emissions on Bike to Work Day.

» In 2013-14, Stanford bolstered support for vanpools by increasing its subsidy from $200 to $300 per month for each Stanford vanpool. The Commute Club marketed special offers to drive-alone commuters, including a new carpool and vanpool promotion and free monthly transit parking, to encourage new riders. The Commute Club also offered a new, sustainable membership gift: a reusable mug with the Commute Club “every trip counts” logo. In addition, members were encouraged to submit photos of what motivates them to choose a sustainable commute. Selected photos will be used to encourage others to consider the benefits of sustainable commuting.

» In June 2014, Stanford’s vice provost for graduate education announced that graduate students and postdocs would be able to purchase the Caltrain Go Pass as part of a pilot program beginning on Sept. 1, 2014. The Go Pass provides unlimited rides in all zones throughout the calendar year.

» Larger 49- and 57-passenger motor coaches were added to the East Bay Ardenwood Express route to serve increasing ridership.

» Over one-third of Stanford’s 1,177 fleet vehicles are electric, and the number of hybrid vehicles increases each year. Several electric bicycles are also being piloted in the campus fleet. The Marguerite shuttle fleet increased from 3 to 13 electric buses, and includes five diesel-electric hybrid buses and 53 buses fueled by biodiesel and renewable diesel.

Academic Integration
Stanford’s Parking & Transportation Services (P&TS) office is working with the School of Education’s Social Ecology Lab to examine the relationship between learning and travel behavior: what conditions and mechanisms impact that link and the role(s) that institutions do or do not play in commute choices and behavior?
Based on the performance of three electric buses added to the Marguerite fleet as a trial project in 2013, Stanford plans to add 20 more electric buses, which will replace older buses in the fleet.

TDM remains a priority sustainability program at Stanford, with implications beyond the university’s main campus. With current commute trends in Silicon Valley pointing to an increase in traffic congestion, Stanford is also launching a regional transportation planning initiative under the leadership of Land, Buildings & Real Estate.

Related Snapshot Stories:
» Stanford Offers New Pilot Go Pass Programs for Graduate Students and Postdocs
» Two dorms win in Stanford’s Bike Safety Dorm Challenge
» Stanford Wins Best Workplaces for Commuters Gold Award
» Stanford Wins Marketing Award for Commute Club Campaign

More Information:
http://transportation.stanford.edu
http://commuteclub.stanford.edu

The research will span five to seven months. Research methods include a survey of employees; interviews and commute documentation with a subset of up to 10 employees; observation of transportation-related events (e.g., Bike to Work Day, employee orientation events, Commute Club events); focus groups; and document analysis. Existing survey and other data from P&TS will be used as background and baseline data.

The findings of this research are expected to be reported through academic (peer-reviewed) journals and through recommendations to P&TS.

Looking Ahead

Many new and exciting TDM initiatives are in development, including plans to address Stanford’s long-term growth both on and off campus. P&TS is assessing various aspects of campus growth in its continued commitment to support the academic mission of the university.

The existing EV charging policy is undergoing a review that includes assessing the number and location of stations to be installed in the future and determining charging-level options. Seven EV charging stations on campus are available to Stanford commuters, residents, and the public. In keeping with its development of renewable and efficient energy supplies through the Stanford Energy System Innovations program, the university is developing plans to potentially add more EV charging stations on campus.
Minimizing Stanford’s Waste

Background

Minimizing waste contributes to a more sustainable Stanford. By using less, reusing more, recycling, and composting, the university sends less waste to landfill; preserves natural resources by providing recyclable materials to manufacturers; and contributes to efforts to reduce greenhouse gas emissions and other pollution, to conserve water, and to save energy. Stanford has increased its landfill diversion rate, also referred to as its recycling rate, from 30% in 1994 to 64% in 2013.

Stanford’s waste reduction, recycling, and composting program serves all academic and athletic areas, student housing and dining, Faculty & Staff Housing, Stanford University Medical Center, SLAC National Accelerator Laboratory, and construction sites. The university continually improves and expands recycling and composting collection activities, identifies new markets for waste materials and recyclables, and raises awareness so that reducing, reusing, recycling, and composting become an ingrained set of behaviors. Stanford partners with Peninsula Sanitary Service, Inc. (PSSI), its recycling and waste management service provider, to reduce waste, increase landfill diversion, achieve the new state goal of 75% diversion by 2020, and move closer to zero waste (defined as at least 90% diversion).
Results

Efforts to reduce waste have significantly reduced the total amount of material Stanford sends to landfill: 8,739 tons in 2014 compared to 14,000 tons in 1998. This year:

» Stanford achieved a recycling rate of 64% in 2013, up from 30% in 1994.

» The recycling rate for construction and demolition waste generated by campus projects (which is taken to a specialized facility) was 89%.

» Stanford scored in the top 20 in six of the eight categories in the RecycleMania 2014 contest: Gorilla (6th), corrugated cardboard (9th), bottles and cans (11th), paper (13th), food service organics (16th), and per capita classic (20th). Stanford designed a professional video about the campus recycling and composting program for the RecycleMania Campaign and played a RecycleMania relay game during halftime at a women’s basketball game to promote waste reduction, recycling, and composting.

» The desisde recycling and mini-trash can program expanded into 30 buildings after successful completion of the pilot program. PSSI has plans to expand it into all academic buildings.

» Education efforts on composting were refocused based on data analysis from the compostable collection route to determine which student housing locations composted the most and which composted the least. New educational posters were created showing how to distinguish between what is compostable serviceware and what is not, how important it is to compost uneatable food so it can go back to growing new food (fork to farm), how recycling saves water, and how to order event recycling and compost bins.

» Composting collection sites were doubled on campus, in collaboration with Residential & Dining Enterprises (R&DE) Student Housing. All student residences with kitchens now have access to collection sites, an increase of 80% over the past year. The overall addition of 80 campus collection sites allowed PSSI/Stanford Recycling to collect 88 more tons of food waste this academic year than last.

» Over 70 individuals are participating in the Voluntary Compost Program, which enables buildings and departments to collect food and other compostable materials from break rooms and kitchens and take them to nearby compostable collection bins.

» Students, with support from RD&E and PSSI, held a Food Waste Awareness Week.

» Stanford’s R&DE Student Housing completed pilot projects to collect more compostable materials in undergraduate dorms and bathrooms.

» PSSI conducted regular waste audits of campus buildings and determined that more than 50% of the remaining landfilled waste is either recyclable or compostable. Food waste makes up the largest percentage of material sent to landfill and remains the primary target for program development.

» SLAC National Accelerator Laboratory expanded its food waste and paper towel composting program to additional office buildings as well as its premier experimental facility, the Linac Coherent Light Source (LCLS). Over one-third of SLAC’s 1,400 staff and LCLS’s visiting research scientists are now participating in the program.

![Graph showing waste diversion trends since 2000](image-url)

Calendar Year

Tons of Material

- Recycled (tons)
- Landfilled (tons)
Expansion of the deskside recycling and mini–trash can system to more campus buildings will continue to make paper recycling more convenient. Capturing clean, source-separated paper represents a major opportunity for the university. Ongoing waste audits will provide relevant information, including building-level waste data, to guide expanded program implementation and a building rating system that the Office of Sustainability is developing for 2015.

Related Snapshot Stories:
» New Students Learn about a Sustainable Stanford
» Stanford Further Reduces Waste During the RecycleMania Competition
» Compost Collection Expands to All Student Residences, Doubling Collection Points
» Give & Go Campaign Diverts Tons of Reusables and Recyclables from Landfill
» Stanford Celebrated for Sustainability in Athletics

More Information:
http://recycling.stanford.edu
http://sustainability.stanford.edu/waste

Academic Integration
PSSI regularly partners with faculty and student groups to conduct waste audits across campus. These events enable the campus community to experience Stanford’s waste story in a hands-on setting while providing valuable data to PSSI about the content of campus landfill bins. In addition, PSSI continues to provide tours of the university’s recycling facility to classes and other groups on campus. In keeping with a tradition of engaging students with ideas for improving Stanford’s waste program, PSSI worked this year to advise students on a variety of initiatives. Student projects on waste-related issues ranged from designing infographics to studying the connection between psychology and recycling bin design. PSSI also organized a field trip for students to visit the Newby Island Compost Facility, where Stanford sends its compostable materials.

Looking Ahead
The state of California (through AB 341) has set a policy goal of a 75% recycling rate by 2020. Stanford’s Department of Buildings and Grounds Maintenance (BGM) has completed a comprehensive review of all current recycling and diversion programs and identified several new waste management initiatives and technologies that will further increase the university’s recycling rate. The primary focus will be on capturing more organics and paper.

BGM is evaluating several new technologies related to capturing and processing food waste, and prototype or demonstration projects are likely. PSSI will continue to focus on increasing the availability of composting services on campus by expanding compost collection in offices, cafés, and student housing, as well as at Stanford Stadium and other event venues.

PSSI will continue to work with the Department of Athletics, R&DE, and the Office of Sustainability to promote and improve recycling and composting at the stadiums and increase green cleaning practices. These projects will be part of efforts related to Stanford’s membership in the Green Sports Alliance.
Enriched Sustainable
Food and Living Programs

Background

Residential & Dining Enterprises (R&DE), which comprises R&DE Student Housing, R&DE Stanford Dining, R&DE Stanford Hospitality & Auxiliaries, Stanford Conferences, and Central Support Services, is one of Stanford’s largest auxiliary departments. R&DE has strategically aligned itself with the academic mission of the university by providing the highest-quality services to students and other members of the university community in a sustainable and fiscally responsible manner.

R&DE provides housing and food for over 12,000 students and family dependents, and hosts over 20,000 summer conference visitors each year, in nearly 350 buildings that make up one-third of the campus. R&DE is also the largest provider of food service on campus, serving more than 4 million meals annually. R&DE’s efforts directly impact student learning, the overall campus culture, and the lives of Stanford’s students after graduation.

Sustainability Programs

An ongoing commitment to two full-time professionals on staff again in 2014 honors R&DE’s core value that sustainability is a way of life. R&DE Student Housing’s Sustainable Living Program and R&DE Stanford Dining’s Sustainable Food Program are two hallmark sustainability initiatives among many across R&DE. Both programs seek to create positive impacts by collaborating with strategic partners such as students, staff, faculty, other campus stakeholders, vendors, and suppliers; reporting on sustainability indicators; providing...
education and outreach for staff and students by hosting lectures and instructional sustainability events; and auditing operational practices and standards for conservation across R&DE.

The Sustainable Living Program is committed to influencing generations of students to lead sustainable lifestyles. The program creates awareness on matters from how students can set up their rooms using environmentally preferred purchasing to the impact of plug loads from their room devices. Students have an awareness of how they can interact with their residence’s building design and heating and cooling systems to be sustainable. The program fosters behavioral change through residence workshops, competitions, and campaigns that incentivize individual action. All residences are equipped with energy- and water-saving features and offer access to recycling and composting for students and staff, thus making a sustainable lifestyle convenient. The Sustainable Living Program also advises on green building practices for new buildings and renovations and provides guidance on sustainable purchasing throughout R&DE Student Housing.

The Sustainable Food Program is committed to meaningfully participating in the education of the world’s future leaders by sharing knowledge and creating awareness of food culture, food systems, and food production. R&DE Stanford Dining’s purchasing guidelines favor food that is grown using environmentally sound practices that encourage biodiversity and utilize earth-friendly systems. The organization also favors food that comes from farms that respect the land and are committed to ensuring future generations’ food supply. By that R&DE means sourcing product that is local, organic, humanely raised, fair trade, and from family-owned farms and sustainable fisheries. Hands-on experience is also offered for students throughout the year in cooking classes and at organic gardens at all of the major dining halls. The program is aligned with wellness through the EatWell program. R&DE continues to demonstrate that the freshest, seasonal, sustainably grown, “farm to table” ingredients not only are more nutritious, but also taste better.

Results

Key programs for R&DE Student Housing in the 2013-14 academic year included the following:

- **Sustainability internships** offered throughout R&DE connected students interested in creating more sustainable residences and food programs with the mentorship and support needed for success. The program ran the full academic year, with eight students working on a variety of different projects, including reducing waste during student move-out, expanding composting in undergraduate housing, reducing energy usage for heating, and creating a video complement to the Stanford Sustainable Living Guide that all students receive upon moving to Stanford.

- Rebranded in 2013, the Give & Go program seeks to reduce waste sent to landfill as students move out at the end of the academic year, and to motivate students to “give” to their local community conveniently as they “go” on to their next adventure. The 2014 program increased outreach materials and visibility, broadened availability to multiple locations at all residences, increased recycling and donation opportunities for bulky and difficult-to-handle materials, added incentives to better track student participation, and achieved an even higher reduction in materials sent to landfill.

- **Compost collection** was expanded to all students living in graduate housing and all kitchens throughout undergraduate housing. This emphasis on access to compost bins increased students’ ability to compost 80% while saving R&DE Student Housing nearly 10% in annualized costs for waste management.

- **A rainwater catchment system** made possible by funds received from the Office of Sustainability’s Green Fund was installed by R&DE at the Synergy residence. The 1,500-gallon system will enable residents to maintain fruit trees and landscaping by using captured rainwater.

- Sustainability interns in R&DE Student Housing conducted a study to explore thermal comfort and energy efficiency problems in the residences at Stern Hall. Over three weeks the students collected data on the frequency and timing of windows being opened and compared them with recorded temperature and CO2 levels using data loggers. Additionally, they conducted...
surveys and several in-depth interviews with residents. After collecting the data, the students partnered with a consulting firm to perform a more in-depth analysis of the mechanical system. The project resulted in documented demand for improved thermal comfort, individual room control, and improved ventilation. As a result, control valves have been installed on a pilot basis to provide more control over heating in individual rooms. Their efficacy is being determined before more widespread use throughout Stern Hall and elsewhere on campus.

» R&DE Stanford Dining and R&DE Stanford Hospitality & Auxiliaries focus on buying local, organic, and fair food. Food is sourced from many local farms, bakers, ranchers, and others, and over 40% of food purchases are locally grown, raised, or processed. R&DE Stanford Dining’s commitments include organic apples (apples are number one on the “Dirty Dozen” pesticide list); organic, local spring mix from Earthbound Farms; organic, local tofu; organic, cage-free eggs (both liquid and whole) from Wilcox Farms; seafood designated as “good” and “best” choices by the Monterey Bay Aquarium Seafood Watch (with which R&DE Stanford Dining is a business partner), including wild Alaskan salmon direct from the Taku River Reds fishery; hamburger patties made of local, grass-fed beef from Marin Sun Farms and Bartels Farm; Fair Trade coffee from Starbucks; and pork butt from pigs raised sustainably and humanely at Niman Ranch. R&DE Stanford Dining also continues to manage the organic gardens by all the dining halls and has created a seed library that makes 10 free organic seeds available to all Stanford affiliates.

New programs in 2013-14 include the following:

» R&DE Stanford Dining is purchasing organic and local milk from Straus Family Creamery, organic and local herbs from Jacobs Farm, organic and local swiss chard from Coke Farm, sustainably caught canned tuna fish from American Tuna, and local and organic romaine from Earthbound Farms.

» R&DE Stanford Dining increased its purchase of wild Alaskan Taku River Red salmon from the Hardcastle family fishery by 10,000 pounds to 25,000 pounds in total. The Alaska Seafood Marketing Institute recognizes Stanford as the only university it knows of that buys directly from a single-family fishery in Alaska. R&DE Stanford Dining pays for the salmon during the fishing season and prior to delivery to Stanford, which supports the social and economic viability of the fishery. This process and relationship support not only the current fishing community but a healthy and sustained fishing community for future generations.

» R&DE Stanford Dining shifted its beef purchasing to Australian beef. The Australian cattle industry is committed to producing beef sustainably. This includes restoring natural ecosystems, managing water resources, increasing biodiversity, and ensuring good animal welfare. Cattle are raised on land and vegetation that are largely unsuitable for food production. Angus Pure livestock (served in the Schwab Executive Dining program) are never treated with antibiotics or hormones. The Australian beef R&DE Stanford Dining serves is halal certified and guaranteed to adhere to Islamic laws. All of our beef is shipped from Australia by container ship.
R&DE Stanford Dining created a **drought response plan** and reduced domestic water use by 12% and irrigation water use by 79% through more efficient equipment. Over 50 replacement sink aerators use 75% less water; replacement nozzles, including 25 pre-rinse spray nozzles and 10 hose nozzles, are also more efficient. The drought response plan set a goal of a 20% reduction in the dining halls and put a process in place to achieve this goal.

R&DE’s **Love Food Hate Waste campaign** encourages students and employees to actively participate in reducing food waste. Reduced plate sizes, appropriately sized food portions, a voluntary trayless program, and having diners scrape their own plates to witness the amount of food waste they are responsible for have significantly reduced food waste (and cultivated healthier eating habits) and have reduced water and energy usage for cleaning trays. This year, R&DE Stanford Dining added Lean Path waste-weighing trackers to all dining halls and worked with two student groups to donate leftovers to homeless shelters.

Over the summer of 2013, Florence Moore Dining Hall was renovated to a sustainable design standard. The renovation included using Energy Star-rated and water-efficient equipment, uncovering the clerestory to use daylighting, and changing the layout to encourage healthy and sustainable dining.

In October, R&DE Stanford Dining hosted **Sustainable Seafood Week**, which featured a seafood-focused menu, cooking classes, film screenings, a guest chef, and a visit from the Hardcastles, owners of Taku River Reds, which supplies R&DE Stanford Dining’s Alaska wild salmon.

The Sustainable Food Program partnered with BeWell to create five new classes focused on sustainability for staff, including classes on gardening, tea, and sustainable food labels.

R&DE Stanford Dining hosted the second annual **Earth Day Celebration** and **Earth Day Dinner** in Arrillaga Family Dining Commons. It featured a local, seasonal, and organic menu, and many key sustainability vendors hosted tables to meet and answer questions from Stanford students. R&DE also supported Stanford’s Celebrating Sustainability event in ways ranging from sustainable catering by Stanford Catering to educational tables hosted by R&DE Stanford Dining and R&DE Student Housing.

In addition to making its regular events even more sustainable (such as by purchasing pasture-raised, local, organic turkeys for Thanksgiving), R&DE Stanford Dining expanded participation in Jamie Oliver’s Food Revolution Day with a green-roof food truck. R&DE Stanford Dining hosted a vegetarian cooking demonstration at the Stanford Wellness Fair. Stanford Hospitality & Auxiliaries expanded Healthy Taste of Stanford to include more sustainable vendors, educational tables from food-related student groups, and a farmers’ market.

The Sustainable Food Program created a biweekly sustainable food newsletter that reaches over 1,000 students, staff, and faculty.

R&DE Stanford Dining partnered with the Mushroom Council to provide a reduced-carbon-footprint burger patty that blended beef and mushrooms. The umami of the mushrooms also increased the flavor of the burger. In addition, the partnership offered a vegan mushroom-cooking class for students.

**Academic Integration**

R&DE supports students and faculty interested in performing academic research throughout its facilities. This year R&DE Student Housing and R&DE Stanford Dining partnered with students and faculty from the departments of Sociology, Civil & Environmental Engineering, and Psychology, as well as the Woods Institute, the Stanford Persuasive Tech Lab, the School of Education, and the Stanford d.school, to research and create behavior change campaigns around reducing energy and water consumption in on-campus residences.

A faculty member from Civil & Environmental Engineering advised the two students who created and implemented the Stern Hall heating study described above. With a faculty adviser from the Woods Institute, a graduate student in the School of Education developed and implemented an intervention to test the effectiveness of different messaging methods in reducing soap use and encouraging the washing of full loads to save water in laundry rooms in Escondido Village. In partnership with R&DE Stanford Dining, a psychology PhD student studied behavioral change messages and reducing meat consumption. Other R&DE Stanford Dining partnerships involved multiple classes and students working on food waste best practices. Still more partnerships are being explored with students and faculty across campus on the potential impacts of normative messaging, social networks, and tools such as shower timers on energy and water conservation behaviors in residences.
R&DE works with many schools and academic disciplines to benefit from the extensive resources of Stanford’s renowned faculty. In partnership with Residential Education, R&DE supports student community building in the living and learning environment of the residential community-based dining halls. Further, faculty regularly collaborate with R&DE to provide educational opportunities to students. R&DE’s program includes sponsoring a faculty speaker series, partnering with faculty to teach in various classes throughout the university, and promoting food as a multidisciplinary educational experience. Examples of these offerings include the Food Summit (an interdisciplinary food conference involving all seven schools at Stanford) and the Farm to Fork lecture/workshop series.

In addition, R&DE hires a group of student gardeners each year to manage seven organic gardens across campus. These gardens, strategically located adjacent to campus dining halls, are designed to provide an experiential model of the food system for students to observe at every meal.

R&DE also supports student groups, students working on class projects, and student interns implementing projects within residences and dining halls. For example, R&DE provides the student-run Green Living Council with funding, staff mentors, and access to utility data, among other resources, to help them educate their peers about sustainable living and to implement sustainable practices in their residences.

Looking Ahead

R&DE’s sustainability programs continue to strive toward many enhancements:

» The purchase of antibiotic-free chicken (all chicken but halal chicken breast) and local and organic vegetables direct from the educational farm Pie Ranch for all dining halls

» Increased sustainability outreach and education in the dining halls and cafés

» Green Restaurant Association certification for Florence Moore Dining Hall and U.S. Healthful Foods Council Responsible Epicurean and Agricultural Leadership (REAL) certification for all dining halls

» The development of an animal protein reduction strategy

» Green building and green equipment standards for all dining halls

» Continued progress on plans for improving utilities management through a new platform that allows more access to and flexibility with usage data and installation of more smart meters

» Continued design of awareness events and sustainability campaigns in alignment with and support of R&DE’s strategic partners

» Expanded opportunities for students to design, implement, and manage Sustainable Food Program and Sustainable Living Program initiatives

» Establishment of an ongoing initiative with faculty, researchers, and student groups to implement creative design solutions that promote and encourage healthy and sustainable behaviors in the dining halls and residences

Related Snapshot Stories:

» A Renovated Florence Moore Dining Hall Highlights Sustainability

» R&DE Continues Commitment to Sustainable Foods

» New Students Learn about a Sustainable Stanford

» Homecoming Weekend Features Sustainability Tour

» R&DE Sustainable Food Program Initiative Goes into Full Gear

» Green Fund Announces Funding for Student Conservation and Outreach Projects

» Energy and Water Wars Encourage Conservation Through Friendly Competition

» Water Conservation Became a Top Priority in R&DE Student Housing

» R&DE Hosts Earth Day Dinner & Food Revolution Day

» R&DE’s Sustainable Food Program Launches Seed Library

» R&DE Hosts Fifth Consecutive Healthy Taste of Stanford

» Sustainable Stanford Interns Make an Impact on Campus

» Compost Collection Expands to All Student Residences,Doubling Collection Points

» Give & Go Campaign Diverts Tons of Reusables and Recyclables from Landfill

» Green Building Standards Are High in R&DE Student Housing

» Synergy House Installs Cistern to Reduce Water Consumption During Drought

More Information:

http://www.stanford.edu/dept/rde/cgi-bin/drupal/rde/sustainability

http://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/sustainable-food-program
Stanford has long been a leader in cutting-edge research and innovative teaching on energy, the planet’s resources, and environmental sustainability. Driven by a pioneering, entrepreneurial spirit and historic dedication to public service, Stanford is well positioned to seek solutions that create a more livable planet and educate generations of scientific and policy leaders equal to that challenge. Central to Stanford’s approach to sustainability research and curricula is the idea that solutions to the world’s environmental problems will require an interdisciplinary effort.

Today, dozens of laboratories, research centers, and student organizations at Stanford are working to solve the most urgent challenges facing humanity, from food security and clean water to global warming and clean energy. Across campus, Stanford’s schools incorporate sustainability into research and academic programs. All seven schools offer a wide range of environmental and sustainability-related courses and research opportunities, with over 750 sustainability-related graduate and undergraduate courses offered across campus.

The following sections outline how Stanford’s scientists, researchers, faculty, and students continue to deliver novel and high-impact solutions to address a range of sustainability issues.
An Evolution in Sustainability at Stanford

History

Stanford’s academic focus on the Earth and its resources dates back to the founding of the university in 1891. The first professor hired—John Casper Branner—and the first recipient of a Stanford doctorate were both geologists. In the early 20th century, Stanford built on that foundation, pursuing use-inspired research in areas such as energy and natural resources, and serving as a pioneer in the scientific study of groundwater. Also among the first cohort of faculty was Charles David Marx, the first chairman (1912-15) of the California State Water Commission, who helped frame the water laws of this state.

Over the years, innovative research continued, with a focus on energy resources, biological conservation, and global environmental change. In 1962, Rolf Eliassen and Perry McCarty started the first broad, interdisciplinary environmental engineering program in the country. In 1973, the university created the 1,200-acre Jasper Ridge Biological Preserve above the campus; the preserve continues to serve as a living laboratory for ecosystem and climate research. In addition, several academic programs launched decades ago are still going strong, including the Energy Modeling Forum, founded in 1977, and the Center for Conservation Biology, established in 1984.
Development of an Interdisciplinary Approach

In the 1990s, a group of visionary faculty members began to recognize that addressing key global sustainability challenges, such as climate change and universal access to clean energy, water, and food for a growing population, would require the collaboration of experts from many disciplines. At the heart of this evolution was, and remains, the belief that sustainability challenges cannot be addressed by individual disciplines working alone, but must draw on every discipline and field across campus and beyond. During this period, the interdisciplinary Earth Systems bachelor’s of science and coterminal master’s programs were launched within the School of Earth Sciences. The Center for Environmental Science and Policy was also created within the Freeman Spogli Institute of International Studies, bringing together faculty from a range of disciplines to focus on challenges at the interface of environment and development.

As the Stanford community grew in size and experience with interdisciplinary research, faculty called for graduate programs for interdisciplinary students. In 2001, the Emmett Interdisciplinary Program in Environment and Resources (E-IPER) was founded within the School of Earth Sciences. The program was proposed by faculty from across the university and established on their behalf. Likewise, cross-cutting research efforts continued to flourish. In 2002 the Global Climate and Energy Project (GCEP), an industry partnership that supports innovative research on game-changing energy technologies, was formed. To date, GCEP has funded 80 research programs at Stanford and 26 other institutions in 10 countries. GCEP has had a transformative effect across campus, unleashing long-term faculty interest in energy and providing new opportunities for students in the energy field.

In 2003, Stanford President John Hennessy worked with an ad hoc Provost’s Committee on the Environment to launch the campus-wide Initiative on the Environment and Sustainability. The following year he launched the Stanford Woods Institute for the Environment to serve as the initiative’s central organizing force. Envisioned as a hub for Stanford’s environmental researchers, the institute brings together experts from across the university’s seven schools to pursue interdisciplinary, solutions-oriented research addressing the planet’s most complex environmental challenges while preparing the next generation of environmental leaders. Centers and programs within the Woods Institute include the Center for Ocean Solutions, the Center on Food Security and the Environment (joint with the Freeman Spogli Institute for International Studies), and Water in the West (joint with the Bill Lane Center for the American West).

In 2009, President Hennessy announced the creation of the Precourt Institute for Energy (PIE) and the TomKat Center for Sustainable Energy. In 2011, the Stanford Law School and the Graduate School of Business jointly established the Steyer-Taylor Center for Energy Policy and Finance. Today, PIE serves as the campus-wide hub of energy research and education, providing support to more than a dozen energy research centers and programs, including the TomKat Center, the Steyer-Taylor Center, and the Precourt Energy Efficiency Center, which predated PIE. In addition, two new interdisciplinary departments—Environmental Earth System Science and Energy Resources Engineering—were created in the School of Earth Sciences, complementing the efforts of many disciplinary departments across the university.

Over the decades, the academic programs and initiatives in sustainability have achieved remarkable breadth, contributing to Stanford’s international reputation for solving major environmental and energy-related challenges.

Sustainability Courses and Programs

Stanford schools and departments offer an array of courses, degree programs, and research opportunities focusing on sustainability. All seven degree-granting schools incorporate courses and research in sustainability, with interdisciplinary institutes and programs supplementing these efforts. The seven schools offer over 750 sustainability-related graduate and undergraduate courses.

In spring 2013, a cross-campus Student Energy Curriculum Review Panel met and developed a searchable database of 400+ Stanford energy courses, which is available on the PIE website. Similar efforts around agriculture and water resources are underway. Many departments around the university offer courses focusing on environmental, resource, and sustainability issues, although...
the largest numbers are offered in the departments of Civil & Environmental Engineering, Environmental Earth System Science, Energy Resources Engineering, Anthropology, and Biology, and in the Earth Systems Program. New courses announced or available in 2013-14 include the following:

- **Thinking Matters: Energy? Understanding the Challenge, Developing Solutions**, Chris Edwards, Jim Sweeney, Lynn Orr
- **Thinking Matters: A Transition Toward Sustainability**, Jeff Koseff and Pam Matson, winter 2015
- **Potential Impacts of Highly-Innovative Emerging Technologies on Climate and the Economy**, Cathy Zoi and Stefan Heck, winter 2014
- **Energy in the West**, Sally Benson, B. Cain, David Freyberg, summer 2014
- **Sustainable Energy: Business Opportunities and Public Policy**, Dan Reicher and Stefan Reichelstein, autumn 2014
- **Seminar on Clean Energy Project Development and Finance**, Dan Reicher, Jeff Brown, David Rogers, winter 2015
- **China’s Solar Industry and Its Global Implications**, Jeff Ball, winter/spring 2014

### Sustainability in Stanford’s Schools

The **School of Earth Sciences** (which focuses solely on Earth resources, hazards, and environmental issues) led a campus-wide discussion on key gaps in faculty expertise and is now planning to increase faculty strengths in the human dimensions of sustainability concerns. The school is also leading discussions on the development of sustainability degrees at the undergraduate and graduate levels. Faculty who recently joined the school include:

- **Kevin Boyce**, Associate Professor of Geological and Environmental Sciences. His research and teaching focus on the biological and environmental impacts of the evolution of the structure, development, and physiology of both living and fossil plants. He received a MacArthur Fellowship in 2013.
- **Rod Ewing**, the Frank Stanton Professor in Nuclear Security and Senior Fellow at the Freeman Spogli Institute for International Studies. He combines science and policy expertise to tackle issues ranging from nuclear wastes to renewable energy sources.
- **Rob Jackson**, Professor of Environmental Earth System Science and Senior Fellow at the Woods Institute for the Environment and at the Precourt Institute for Energy. He examines different ways that people affect Earth to build predictive, scientific frameworks that help guide policy solutions for global warming, energy extraction, and other environmental issues.
- **Jenny Suckale**, Assistant Professor of Geophysics. Her work focuses on creating and disseminating knowledge that can help reduce the social and economic impacts of natural and environmental disasters.

E-IPER in the School of Earth Sciences is home to doctoral programs, as well as joint master’s of science programs with the Graduate School of Business, Law School, and Medical School.

The **School of Engineering** houses dozens of researchers across several departments devoted to developing, enhancing, and discovering new products, practices, and policies to ensure sustainability. Researchers are working to improve the efficiency of alternate energy sources, enhance battery performance, explore unique methods of resource conservation, and much more. In 2013-14, Re-Inventing the Nation’s Urban Water Infrastructure (ReNUWIt), a National Science Foundation–sponsored engineering research center, began its first full year of operation. Led by researchers in Stanford’s Civil & Environmental Engineering Department, ReNUWIt seeks to change the ways we manage urban water to achieve safe, sustainable urban water infrastructures that are enabled by technological advances in natural and engineered systems and informed by a deeper understanding of institutional frameworks.
The School of Medicine’s magazine, Stanford Medicine, published a special report looking at the connection between health and the environment through the work of Stanford Woods Institute senior fellows and others. The school’s annual Stanford Food Summit continues to build upon past success in educating academic and external communities on the link between nutrition and health.

The Graduate School of Business’s Center for Social Innovation and Stanford Value Chain Innovation Initiative co-hosted a conference titled Designing Supply Chains for Positive Impact in spring 2014. This event convened over 250 executives to discuss proactive strategies that can make a positive impact on environmental, social, and ethical sustainability in global corporate supply chains.

Stanford’s Interdisciplinary Institutes

Stanford’s interdisciplinary institutes, including the Woods Institute and PIE, offer a diverse array of sustainability-related research and academic opportunities to examine and solve environmental problems through cross-disciplinary collaboration.

Stanford Woods Institute for the Environment: The Stanford Woods Institute works to protect and nurture our planet so it can meet the vital needs of people today and of generations to come. As the university’s hub for interdisciplinary environmental scholarship, Woods pursues this mission by catalyzing breakthrough, solutions-focused research by Stanford’s faculty, researchers, and students. The institute convenes global experts for research collaborations, workshops, and dialogues. Woods prepares students, scientists, professionals, and decision makers to serve as environmental leaders through innovative leadership programs. The institute also actively links research to action, providing decision makers with unbiased scientific data while advancing decisions central to solving the world’s most critical, complex environmental challenges. In 2014, the Stanford Woods Institute is celebrating 10 years of producing practical environmental and sustainability solutions for people and planet.

The following centers and programs, which interact through Woods, represent significant strands in the fabric of interdisciplinary environmental research at Stanford:

» Center for Ocean Solutions
» Center on Food Security and the Environment
» First Nations Futures Program
» Fisheries Leadership and Sustainability Forum

» Global Freshwater Initiative
» Initiative on Osa and Golfito
» Leopold Leadership Program
» Natural Capital Project
» Program on Water Health and Development
» Program on Water in the West
» Stanford Environment and Energy Affiliates Program (joint with PIE)

Precourt Institute for Energy: PIE serves as the hub of energy research and education at Stanford. The institute fosters opportunities for scientists, engineers, social scientists, and legal and business scholars to address the world’s energy problems. Its seed grant program has provided funding to more than 35 faculty members to conduct research with the potential for high impact on energy supply and use. The institute also encourages energy literacy via a monthly newsletter, an online e-book on energy co-developed with KQED, and numerous educational programs and forums, including the weekly Energy Seminar and the annual Energy@Stanford & SLAC conference for incoming graduate students.

In 2013-14, Sally Benson was appointed director of PIE. She holds two additional appointments at Stanford: professor of energy resources engineering in the School of Earth Sciences and director of GCEP. Roland Horne, the Thomas Davies Barrow Professor in the School of Earth Sciences, was named deputy director of PIE. Senior PIE fellow and mechanical engineering Professor Arun Majumdar was appointed the Jay Precourt Provostial Chair Professor at Stanford University.

The following centers and programs, which interact through PIE, represent interdisciplinary energy research at Stanford:

» Bay Area Photovoltaic Consortium
» Center for Advanced Molecular Photovoltaics
» Center on Nanostructuring for Efficient Energy Conservation
» Energy Modeling Forum
» Global Climate and Energy Project
» Precourt Energy Efficiency Center
» Program on Energy and Sustainable Development
» Shultz-Stephenson Task Force on Energy Policy
» Stanford Environmental and Energy Policy Analysis Center
» Stanford Institute for Materials & Energy Science
» Steyer-Taylor Center for Energy Policy and Finance
» SUNCAT Center for Interface Science and Catalysis
» TomKat Center for Sustainable Energy

Related Snapshot Stories:
» Incoming Graduate Students Participate in Energy Research and Education Across Campus
» Continuing Studies and Earth Sciences Launch Earth Matters Lecture Series
» Interdisciplinary Team Hosts Fourth Annual Food Summit
» Center for Ocean Solutions Celebrates Five Years of Linking Science to Policy
» George Shultz Co-Authors Book About Energy R&D at Stanford and MIT
» Precourt Institute and KQED Launch an E-book Series on Energy
» SPOT Farming Program Introduces New Students to Food and Farming
» Vail Global Energy forum discusses a model for U.S Oil & Gas Development
» GCEP Annual Research Symposium
» Former EPA Secretary Discusses her Sustainability Journey from Public Sector to Silicon Valley
» New Energy Research Website Showcases Work Across Campus

More Information:
» Initiative on the Environment and Sustainability: stanford.io/19t5SbI
» School of Earth Sciences: earthsci.stanford.edu
» Stanford Woods Institute for the Environment: woods.stanford.edu
» Stanford Precourt Institute for Energy: energy.stanford.edu
» School of Engineering: engineering.stanford.edu
Researchers at Stanford continue to set the bar for interdisciplinary collaboration and development of research projects that have practical impact both locally and around the world. Stanford’s interdisciplinary institutes have the distinction of appointing their own faculty, allowing researchers to carry out cross-disciplinary work most effectively. With significant breadth and depth across multiple related sustainability fields, Stanford researchers are leading the way in everything from clean-technology improvements to sustainable development.

Focal areas of active solutions-oriented research at Stanford include energy; freshwater; oceans and estuaries; ecosystem services; food security, land use, and conservation; biodiversity; sustainable development; climate; and public health. Below, a few selected research initiatives and related 2013-14 accomplishments are highlighted to illustrate the vast array of research activities under way at Stanford.

Energy

Stanford has more than 200 faculty conducting research in renewable energy conversion, energy efficiency, advanced fossil-fuel resources, advanced energy materials, transmission and distribution, transportation, economics, politics, and energy impacts and policy. Highlights from 2013-14 research initiatives include the following:
» Impacts of the North American natural gas boom: A Stanford-led study that reviewed more than 200 earlier studies confirmed that methane emissions from the North American natural gas system are at least 50% higher than U.S. government estimates. Leaks from the nation’s natural gas system are an important part of the problem. Results were published in the February 2014 volume of the journal Science.

» Major advance in thermophotovoltaic electricity production: Stanford researchers developed a robust, heat-resistant device that converts solar thermal energy into infrared light, which photovoltaic cells can absorb to generate electricity. Results were published in the October 2013 volume of Nature Communications.

» High-energy batteries for the portable electronics market: Amprius, a Stanford spinoff that received early support from the Global Climate and Energy Project, began producing lithium-ion batteries with a bigger storage capacity than conventional batteries used in electronics.

» Novel water splitter made of low-cost, durable silicon and nickel: Stanford scientists created a low-cost water splitter made of silicon coated in nickel that uses sunlight to separate water into oxygen and clean hydrogen fuel. Results were published in the November 2013 volume of Science.

» Energy Innovation Transfer Program at the TomKat Center for Sustainable Energy: Created to help Stanford inventors bridge the gap between research and commercialization, the Energy Innovation Transfer Program assists Stanford faculty, staff, and students with research funding and prototype development and provides mentors to guide research teams through the commercialization of inventions.

» Net energy analysis: Net energy analysis provides a quantitative way to compare the amount of energy a technology produces over its lifetime with the energy required to build and maintain it. A commentary on the value of net energy analysis was published in the July 2014 volume of Nature Climate Change.

» Nanotube technology to improve electronic energy efficiency: A team from the School of Engineering built a basic computer using carbon nanotubes, a semiconductor material that has the potential to launch a new generation of electronic devices that run faster, while using less energy, than those made from silicon chips. This unprecedented feat culminates years of efforts by scientists around the world to harness this promising material.

» Research into photovoltaic lifespans: The U.S. Department of Energy awarded researchers within the School of Engineering $1.165 million to study how factors such as heat fluctuations and moisture changes will affect the photovoltaic arrays that utility companies would use to build large-scale solar power plants. The award is part of the SunShot Initiative, which is designed to make solar energy fully competitive with traditional energy sources before the end of the decade.

» Generating electricity from wastewater: Engineers at Stanford have devised a new way to generate electricity from sewage using naturally occurring “wired microbes” as mini power plants, producing electricity as they digest plant and animal waste. It is estimated that the microbial battery can extract about 30% of the potential energy locked in wastewater. The new Codiga Resource Recovery Center at Stanford will accelerate commercial development of such promising technologies by testing at a scale large enough to demonstrate a process’s effectiveness and stimulate investment for full-scale implementation. The center will also test technology that is mobile and can be deployed at remote locations.

» Reducing carbon emissions in hydrogen production: University researchers have engineered an efficient and environmentally friendly catalyst for the production of molecular hydrogen (H2), a compound used extensively in modern industry to manufacture fertilizer and refine crude oil into gasoline.

» Generating energy and calming weather patterns with offshore wind farms: Computer simulations by civil and environmental engineering Professor Mark Z. Jacobson showed that offshore wind farms with thousands of turbines have the potential to significantly decrease hurricane winds and accompanying storm surge, possibly preventing billions of dollars in damages. In addition to these savings, the wind turbines could pay for themselves in the long term by generating electricity, providing energy stability while reducing air pollution and global warming.

» “Holy grail” of battery design: Stanford researchers took a step toward accomplishing what battery designers have been trying to do for decades—design a pure lithium anode. This development could lead to smaller, cheaper, and more rechargeable batteries to meet the power storage needs of everything from handheld gadgets to electric cars. The research team is led by Yi Cui, a Stanford professor of materials science and engineering, and includes Steven Chu, the former U.S. secretary of energy and Nobel laureate who recently resumed his professorship at Stanford. Results were published in July in the journal Nature Nanotechnology.

» Discovering catalysts for cleaner production of methanol: Scientists from Stanford, SLAC, and Denmark created a new nickel-gallium catalyst that could someday be used to convert hydrogen and carbon dioxide emissions...
into methanol, an important industrial chemical and potential fuel. Results were published in the March 2 online edition of the journal *Nature Chemistry*.

In addition to several of the centers and programs listed above, the School of Engineering houses energy-related research programs in most of its departments aimed at making renewable energy sources more practical, creating more efficient batteries and other fuel storage devices, converting waste into energy, developing more energy-efficient computers and circuits, and much more. The School of Earth Sciences also supports a number of energy research initiatives and programs, including the Stanford Geothermal Program, the Stanford Center for Carbon Storage, and the Environmental Assessment and Optimization Group.

**Freshwater**

Changes in human and natural systems will drive serious threats to freshwater resources in the 21st century. Stanford researchers are working to generate policy evaluation models, provide targeted analyses of viable policy interventions, and train the next generation of water resource experts. Highlights from 2013-14 research initiatives include the following:

- **Water security around the globe**: Researchers with the Global Freshwater Initiative (GFI), an initiative of the Stanford Woods Institute for the Environment, are developing strategies to promote the long-term viability of freshwater supplies for people and ecosystems threatened by climate change, shifts in land use, increasing population, and decaying infrastructure. In September 2013, GFI received a major National Science Foundation grant to coordinate the Jordan Water Project, an international, interdisciplinary research effort aimed at developing new approaches for enhancing the sustainability of freshwater resources in Jordan and, ultimately, arid regions throughout the world. The project is focused on developing a hydro-economic model to evaluate new water allocation strategies.

- **International water policy and investment**: Working with partners in Asia, Africa, and the Caribbean, researchers with the Stanford Woods Institute’s program on Water, Health & Development (WHD) are identifying ways to improve and increase the sustainability of water supply and sanitation service delivery, while also enhancing the capacity for sustainable water and wastewater management in some of the world’s poorest countries. In 2013, WHD researchers influenced decision makers to include a water tariff reform component in a $178 million World Bank–funded project that will connect approximately 100,000 households in Mozambique’s capital, Maputo, to the formal water supply system. The government of Mozambique then asked WHD researchers to translate their research findings into a policy and research agenda to help guide the country’s water sector policy and infrastructure investments toward a goal of universal urban water coverage by 2025.

- **Saving water, energy, and money**: Water in the West (WitW), a joint program of the Stanford Woods Institute and the Bill Lane Center for the American West, examines the root causes of water challenges and develops practical tools and technologies to deal with them. In September 2013, WitW researchers published a major survey report revealing missed opportunities to save water, energy, and money. The report, “Water and Energy Nexus: A Literature Review,” also points out a lack of data about the amount of water needed to extract energy resources and to generate electricity. WitW is also assisting the National Fish and Wildlife Foundation in developing its western water conservation strategy, which will help determine the foundation’s investment priorities in seven critical ecoregions.

- **Center for Groundwater Evaluation and Management (GEM)**: The GEM Center, housed within the School of Earth Sciences, provides a cross-cutting approach to research on groundwater evaluation and management, with a focus on integration of data to monitor and model subsurface hydrologic processes. A Stanford-led team proved that satellite-collected data can accurately measure aquifer levels, a finding with potentially huge implications for management of precious global water sources.
Oceans and Estuaries

Approximately 1 billion people depend on the ocean for sustenance and a livelihood. Stanford researchers are finding ways to improve ocean health by applying the best available science and policy expertise to challenges such as ocean governance, ocean acidification, and sea level rise. For example, the Center for Ocean Solutions (COS) is a joint program of the Stanford Woods Institute for the Environment, Stanford’s Hopkins Marine Institute, the Monterey Bay Aquarium, and the Monterey Bay Aquarium Research Institute. Its researchers are advancing solutions to complex problems related to the ocean by integrating advanced science and technology with economic, legal, social, and political expertise.

In 2013, COS generated a number of key policy resources on ocean acidification, including an article in the *Harvard Environmental Law Review*, “10 Ways States Can Combat Ocean Acidification (and Why They Should).” The article outlines practical steps that states can take to address the issue. In addition, the federal Ocean Research and Resources Advisory Panel’s Ocean Acidification Task Force adopted a novel COS analysis of how local, state, and federal agencies and policy makers can proactively address ocean acidification and increase coastal ecosystem resiliency.

Food Security, Land Use, and Conservation

Interdisciplinary researchers across a number of institutes, centers, and initiatives are focused on addressing the challenges of providing for the world’s growing population without depleting the planet’s natural resources. Highlights from 2013-14 research initiatives include the following:

» **Feeding the world without harming the environment:** An interdisciplinary team of scholars at the Center on Food Security and the Environment (FSE)—a joint effort of the Stanford Woods Institute and the Freeman Spogli Institute—designs new solutions to help alleviate global hunger, poverty, and environmental degradation; train scholars and policy leaders; and provide sound policy advice on issues related to agricultural development, food and nutrition security, and climate change. In 2013, William Wrigley Senior Fellow and FSE Director Rosamond “Roz” Naylor (Environmental Earth System Science) edited a new book, *The Evolving Sphere of Food Security* (Oxford University Press, 2014), that presents an integrated story of how global food security affects human lives, resource use, and policy. The book includes contributions from Stanford scholars in several disciplines and examines the potential of agricultural systems to provide the world with adequate nutrition without harming the environment.

» **Quantifying the benefits of nature:** The Natural Capital Project, a joint venture of the Stanford Woods Institute, the Nature Conservancy, the World Wildlife Fund, and the University of Minnesota’s Institute on the Environment, develops software-based tools to enable decision makers to quantify nature’s values, assess trade-offs associated with alternative land use choices, and integrate conservation and human development into land and water use and investment decisions. In 2013, the project rolled out its newest open-source software tool, which is designed to guide cost-effective investments in nature for clean and reliable water supplies. The Resource Investment Optimization System was developed with partners in Latin America, where countries such as Colombia, Mexico, and Brazil are experimenting with new conservation financing and water security mechanisms known as water funds. These funds are intended to improve the reliability of clean water supplies by managing watersheds, the green infrastructure that supplies, regulates, and cleans water.

» **Fostering sustainable development and environmental stewardship:** The Stanford Woods Institute’s Osa & Golfito Initiative—known as INOGO, the acronym for its name in Spanish—is helping to facilitate the development of a strategy for sustainable human development and environmental stewardship in Costa Rica’s ecologically sensitive Osa and Golfito region. In 2013, INOGO researchers completed an in-depth analysis of land use and land cover in the region using RapidEye satellite images. This analysis, called...
INOGO Mapas, provides visual insights into the region’s changing landscapes and fosters understanding of how different forested areas might connect and form biological corridors. INOGO Mapas is the highest-resolution land cover classification ever prepared of the Osa and Golfito region. The map and associated spatial data are available to research scientists, nongovernmental organizations, and any other interested parties, and will be updated in the years to come.

The School of Engineering also supports a number of environmental research initiatives, including Re-Inventing the Nation’s Urban Water Infrastructure, the Center for Global Projects, and the Center for Sustainable Development and Global Competitiveness.

Human Health

The human element in virus transmission: Researchers within the Center for Innovation in Global Health have been working to identify how bird flu is transmitted between people. They are focusing on human social networks—specifically the dynamics among people who spend time on farms and in poultry markets. The team has identified specific functions of small-group interaction that may be the best targets for medical interventions like vaccinations or antiviral treatment.

Affordable technology to diagnose infectious diseases: Manu Prakash, assistant professor of bioengineering, has designed a fully functional microscope that can be assembled from folded paper and a tiny bead of glass. The Foldscope includes no mechanical moving parts, is disposable, and only costs about 50 cents. Prakash designed the Foldscope after witnessing the deadly toll of infectious diseases, including malaria. He intends to use this technology in education, from training health workers to teaching science, technology, and engineering.

Looking Ahead

The Stanford Challenge provided all seven schools with resources to build or augment sustainability programs and initiatives. (From last year’s report) The School of Earth Sciences will continue to focus on the broadening concerns of energy, water, agriculture and land change, minerals, the environment, and hazards and risks. The school plans to complement its faculty expertise in the physical sciences and engineering with increased expertise at the interface of coupled human-environment interactions to address both societal needs and student interests. At the same time, the school will advance its use of complex technologies, such as remote sensing, satellite imaging, and high-performance computing, in both research and teaching.

In 2014, the Stanford Woods Institute is celebrating 10 years of producing practical environmental and sustainability solutions for people and planet. In its next decade, the institute will develop a number of new initiatives to engage leaders in business, government, and nongovernmental organizations in efforts to pioneer further breakthrough environmental solutions and advance their implementation. In 2014-15 Woods will build on the success of its pilot Washington, D.C., office with events, programs, and briefings for key decision makers in the nation’s capital. Woods will also follow up on its inaugural Sustainability Summit, held in spring 2014, with an encore gathering of Stanford researchers and top-level decision makers in the corporate world. Woods continues to support several programs focusing on ongoing water challenges both close to home and around the globe, and it will be rolling out a series of tools and dialogues designed to help policy makers better manage this critical resource. The Woods flagship program, Environmental Venture Projects, is moving into its next phase of development, with a focus on theories of change and moving research into action. Finally, Woods plans to deepen its support of Stanford’s educational mission by helping students contextualize their academic coursework through work with Woods centers and programs.
Related Snapshots:
» New Center for Wastewater Recovery Research Breaks Ground on Campus
» Scientists Discover the Power of “Wired Microbes” to Generate Electricity from Sewage
» Earth Sciences Professors Boyce and Lobell Receive MacArthur “Genius” Awards
» Research Programs Award Funding for 11 New Projects in Sustainable Energy
» White House Nominates Lynn Orr to Head DOE Energy Research
» Stanford Announces Inaugural Recipient of the Bright Award
» Scientists Explain How “Ridiculously Resilient Ridge” Is Causing California Drought
» Stanford Team Leads IPCC Climate Report
» New, Heat-Resistant Materials Could Vastly Improve Solar Cell Efficiency
» Study Reveals Trends and Best Practices in Ultrathin Solar Cells
» Dr. Jennifer A. Dionne Receives Presidential Early Career Award
» Obama Administration’s Environmental Policy Leader Speaks at Silicon Valley Energy Summit at Stanford
» Breakthrough Provides Picture of Underground Water
» Stanford-Led Team Develops More Efficient Self-Cooling Solar Cells
» Climate Scientist and Nobel Prize Winner Stephen H. Schneider Inducted into California Hall of Fame
» Biomass Burning May Play a Much Bigger Role in Climate Change and Human Health Than Previously Thought
» Pam Matson Named to New U.S. Food and Agriculture Research Foundation
» Undergraduate Trio Makes “30 Under 30” List for Energy Innovation
» America’s Natural Gas System Is Leaky and in Need of a Fix

More Information:
» Research groups at the School of Earth Sciences: earthsci.stanford.edu/research-groups
» Research centers at the Stanford Woods Institute: woods.stanford.edu/research/centers-programs
» Energy research centers and programs at Stanford: energy.stanford.edu/research
Background

Students interested in sustainability at Stanford can find many avenues to explore that interest: student groups, academic courses, sustainability-focused and -related majors, and internships and research opportunities with faculty and staff. In fact, student ideas often galvanize change on campus and lead to improved sustainability offerings.

More than 20 student groups at Stanford work towards increased sustainability. Most of these groups include both undergraduate and graduate students, who leverage talent and passion to initiate change in everything from slow food to green living and solar cars. Students are the core of the Stanford community, and their passion and enthusiasm result in remarkable outcomes every year.

Highlights

Student Group Accomplishments

Student groups provide opportunities for students to apply their interest in sustainability to solving real-world problems on campus and beyond. In 2013-14, these groups had a number of accomplishments:

Fossil Free Stanford launched its inaugural campaign in fall 2013, requesting that Stanford freeze any new investment in fossil-fuel companies and divest from direct ownership of any fossil-fuel public equities and corporate bonds within five years. In 13 months, the student group reached out to over 3,000 students,
alumni, faculty, and staff. Following a week of Fossil Free Stanford’s divestment-themed events and petitions, the student body passed a referendum in favor of divestment with a 78% approval rate.

The Stanford Energy Club hosted a number of seminars, networking events, and visits to local cleantech companies throughout the year. The club also organized Stanford Energy Week in spring quarter, a week of cross-campus collaboration to produce high-quality energy-centric events. Energy Week’s keystone event, the Spring Energy Showcase, highlighted the different facets of energy access in the developing world through a three-part interactive speaker series. The showcase’s Finance Night, Policy Night, and Technology Night attracted well over 100 students and professionals to learn about the challenges and opportunities in global energy access.

Students for a Sustainable Stanford organized a number of events throughout the year to raise student awareness of environmental issues. Most notable were the second annual Stephen H. Schneider Memorial Lecture, featuring Lisa Jackson (in collaboration with Stanford in Government, Speakers Bureau, the Woods Institute, and the Haas Center for Public Service); the Mimi and Peter E. Haas Spring Distinguished Visitor Workshop Series with Buzz Thompson; Fracking Demystified: An Interdisciplinary Panel; and Solplay Field Day, an environmentally themed carnival.

The Green Living Council expanded its annual Energy and Water Wars to the Wilbur, Stern, and Florence Moore residence halls. During February and March, over 700 students actively participated in the competitions, which were facilitated by online dashboards providing real-time energy and water use monitoring. In just three weeks, participating dorms reduced electricity consumption by over 4,500 kilowatt-hours and water consumption by nearly 12,000 gallons.

Student Projects

Green Fund

Having completed its sixth year, the Student Green Fund continues to foster student engagement by encouraging leadership in sustainable improvement projects on campus. The fund awarded $30,000 in grants to projects addressing a range of campus sustainability topics. A final report detailing all 2013-14 projects is publicly available online. Reports over the years provide a database of previous projects to inspire students to build upon past successes and enable them to learn from their predecessors. This year’s projects reached across the university to tackle sustainability in a variety of forms, as described below.

» Winter Heating Study: Inspired by the observations of Stanford civil and environmental engineering Professor Gil Masters, Residential & Dining Enterprises (R&DE) interns conducted a study to better understand why so many windows in student residence halls are wide open on cold winter mornings. Their initial goal was to reduce this wasted energy, but student comfort proved to be an equally relevant focus. The interns designed a study that would investigate both the infrastructural and the behavioral sides of the situation. After three weeks of data collection in 32 student rooms at
Stern Hall, they partnered with kW Engineering, an outside consulting firm, to develop a final report with recommendations for R&DE.

» Synergy Rainwater Catchment System: Students for a Sustainable Stanford installed a 1,500-gallon rainwater catchment system at Synergy House to complement the previously installed drip irrigation system. The catchment system, which uses solar power to transport the water to Synergy’s three gardens, will reduce the house’s need for potable water during the dry season. It will also reduce the water runoff that currently enters Stanford’s storm drain system.

» Water Bottle Filling Station: Students for a Sustainable Stanford and the Graduate Student Council partnered to install a water bottle filling station on the second floor of Old Union in late May. The station has the ability to track how many plastic bottles its use avoids. The students hope to use these data to justify future stations in other high-traffic buildings on campus.

» Residential Restroom Composting Pilot: Because the majority of restroom waste in undergraduate residences is compostable paper towels, R&DE Student Housing interns decided to pilot a restroom composting project. This monthlong pilot tested new bins and customized signage in three residences: Potter, Adams, and Storey. The new system diverted approximately 60% of landfill waste from these restrooms to the compost stream, reducing disposal costs. In addition, feedback surveys showed that 87% of students preferred the new system to the old landfill-only system.

» Green Cleaning Initiative: Residents in Columbæa, a co-operative living community at Stanford, reduced their use of chemical cleaning substances by piloting a sustainable cleaning system. During two weeks in spring quarter, residents used an aqueous ozone cleaning solvent to clean their bathrooms and kitchens. Feedback showed that the solvent was just as effective as traditional chemical cleaners; however, the machine that created the solvent was prohibitively difficult to use.

» Climate Week @ GSB: Climate Week was created to help Graduate School of Business (GSB) students gain a better understanding of climate risks and opportunities for business. From April 14 to 18, GSB students hosted a series of events highlighting the ways climate change affects how business is done today and will be done in the future. Guest speakers included Cathy Zoi, Gro Brundtland, and George P. Shultz. Throughout the week, GSB students were encouraged to take immediate action by investing in local and global initiatives that reduce carbon emissions.

Academic Integration

Stanford’s sustainability course offerings continue to grow in scope and vision in response to student demand. An increasing number of sustainability courses integrate practical, service-learning components. Students are also challenged to think beyond their majors, to reach across disciplines, and to develop practical solutions for a sustainable world.

The 2012-13 academic year was the first of a new university-wide undergraduate curriculum resulting from the two-year Study of Undergraduate Education at Stanford (SUES). The new curriculum places greater emphasis on interdisciplinary thinking and provides new opportunities for introductory courses that incorporate aspects of sustainability. Introduction to the Humanities courses for freshmen have been replaced with Thinking Matters courses, which help freshmen develop an understanding of what constitutes a genuine question or problem and how to address it in a creative and disciplined manner. Sustainability-related Thinking Matters courses in 2013-14 included Energy: Understanding the Challenge, Developing Solutions; Sustainability and Collapse; and Evolution on Earth.

Also as a direct result of the SUES report, Stanford is rapidly expanding its community-engaged-learning (service-learning) program in environmental sustainability and has added a director of that program. This director is consulting with faculty to expand course offerings that allow students to engage with an off-campus community regarding environmental sustainability. The hope is to double the number of these courses over the next academic year. One goal is to increase student civic engagement with crucial public issues, such as
global change. Another is to facilitate interaction among faculty, students, and the public around projects and ideas related to long-term (local and global) sustainability. The team is also working with nonprofit organizations around the Bay Area to develop internship placements for students who want to get involved in local sustainability issues.

As students and faculty continue to derive value from practical training, Stanford’s environmental curriculum continues to evolve. A list of sustainability and environmental courses can be found at the Earth Systems website (see More Information section for link).

Looking Ahead

As part of Stanford’s strategic sustainability plan (Sustainability 3.0), faculty will further evolve a sustainability curriculum. Implementation of SUES recommendations is ongoing. New breadth requirements for all students, entitled Ways of Thinking/Ways of Doing, debuted in 2013-14. This new system shifts requirements from a discipline-based to a capacity-based model, recognizing the diversity of approaches to learning within any given discipline. Sustainability-related courses may be able to count for more breadth requirements under the new system, enabling students who would not previously have been able to take a sustainability course to fit one into their schedule.

Faculty and staff also continue to expand the number of hands-on, service-learning courses that solve problems within the university as well as elsewhere in the world. In parallel, many student groups are working to enhance year-to-year continuity and build upon past successes.

Related Snapshot Stories:

» Fossil Free Stanford’s Outreach Campaign Engages More than 3,000 Campus Members
» Student-Led Sustainability Course Empowers Freshmen to Make a Difference
» Green Fund Announces Funding for Student Conservation and Outreach Projects
» Energy and Water Wars Encourage Conservation Through Friendly Competition
» Climate Week Highlights Urgency and Opportunity of Climate Change in Business World
» Energy Showcase Brings Global Perspective to Campus Community
» Sustainable Stanford Interns Make an Impact on Campus
» Energy 360 Event Hones in on Sustainable Transportation
» Synergy House Installs Cistern to Reduce Water Consumption During Drought

More Information:

http://www.stanford.edu/dept/undergrad/sues/
http://sustainable.stanford.edu/students
Background

Formed in 2008, Stanford’s OOS works in six key programmatic areas: evaluations and reporting, outreach campaigns, training and education, communications and events, infrastructural planning support, and collaborative governance. In its first few years, the office focused on institutionalizing sustainability through conservation and communication programs and services. In academic year 2013-14, it focused on expanding program adoption and creating new assessment programs to strengthen the foundation for a pervasive culture of sustainability. This article provides an overview of the office’s key programmatic areas, as well as program results from 2013-14.

In addition to promoting a campus culture of sustainability through outreach and behavior programs, the office works directly with operational and academic leadership to incorporate sustainability thinking into planning for the university. In a unique position to articulate sustainability initiatives across all campus stakeholder groups, OOS places priority on communicating Stanford’s sustainability efforts not only across campus, but also to external groups, peer institutions, and rating entities.

Highlights

This section highlights programmatic developments and achievements from this academic year, provides a glimpse of initiatives that lie ahead, and outlines how the collaborative governance that is the engine for all OOS programmatic areas works. Through strategic partnerships among administrative departments,
faculty, and students, sustainability is embedded as a core value and value-add supporting Stanford’s mission of education, research, and outreach.

**Evaluations and Reporting**

OOS diligently tracks key performance indicators related to campus resource use and trends. This evaluation work is critical to assessing Stanford’s success in advancing the sustainability of both its physical campus and its programmatic and academic offerings. The following overview provides background and results for the key elements of the OOS evaluations and assessment program.

**Third-party evaluations:** OOS regularly participates in various annual third-party sustainability evaluations. Its 2013-14 results in this area include the following:

- In early 2014 OOS collated and submitted data for the Association for the Advancement of Sustainability in Higher Education (AASHE)’s Sustainability Tracking, Assessment & Rating System (STARS) evaluation, version 2.0. This year Stanford achieved the **Gold rating for overall sustainability performance**. The Gold remains the highest rating awarded to date. Among all reporting institutions, as of the date it submitted its report, Stanford had the highest raw score under the new rating system.


- *Sierra* magazine’s annual “Cool Schools” edition ranked Stanford in the top 10 for the fifth consecutive year.

**Building performance:** OOS has worked closely with buildings and facilities staff to determine the best path towards building sustainability and how to engage the campus community in improving building performance.

- To better understand plug load energy consumption in buildings, OOS planned and executed a **Plug Load Equipment Inventory** collecting data on standard types of electricity-consuming equipment campus-wide. The data will be used to quantify plug load energy consumption on campus and determine the most compelling conservation opportunities in the coming years.

- In 2013-14, OOS continued to refine its **campus-wide existing-building rating system**, which is set to launch in 2015. The system uses the Leadership in Engineering and Environmental Design (LEED) for Existing Buildings: Operations and Maintenance (EBOM) rating system as a foundation, complemented by collaboratively developed Stanford-specific criteria that enable a more complete story of building performance on campus. A pilot of the new rating system in 2012 highlighted opportunities to further refine it through streamlined data collection and automation and underscored the opportunity for action. Development of the system was enabled by the collaborative LEED-EBOM equivalency analysis, which confirmed that all buildings on Stanford’s campus are LEED-EBOM-certified equivalent.

**Building dashboards via systems integration project:** The Department of Sustainability and Energy Management (SEM) has initiated a systems integration project that will address immediate and long-term information system needs. The Utilities, Metering, Billing, Reporting & Sustainability (UMBRS) project is expected to come online in late 2014. UMBRS will directly support the creation of school-level sustainability report cards via sustainability metrics, as well as populate intuitive and user-friendly dashboards. Over 100 buildings across campus will have their own sustainability dashboards available through the new Sustainable Stanford portal.

**Outreach Campaigns**

Individual awareness and actions conserve resources, lower utility bills, and contribute to a campus experience consistent with the university’s overall commitment to sustainability. To increase institutional awareness and achieve results, OOS annually launches campus-wide **Cardinal Green** conservation campaigns on specific programs led by the office or its partners. Each campaign has a specific program goal, relevant messaging, and meaningful incentives to drive conservation and efficiency. The following overview provides background and results for each of the campaigns.

- The 2013 **Cardinal Green Buildings** campaign combined Turn Off for Break/Winter Closure and the Building Level Sustainability Program (BLSP). The campaign was a success, with 33 buildings volunteering to participate in BLSP and 177 in Winter Closure. A new online tool was created to streamline the process and record response and feedback from hundreds of building managers across campus. The resulting savings totaled nearly $250,000 in energy costs, which represents 1.6 million kilowatt-hours of electricity or 838 metric tons of CO2 emissions avoided.
» **We Recycle, Stanford Wins** includes the annual RecycleMania contest and the programs supported by the Stanford Recycling Center. Through a series of online pledges, trainings, and communications, Stanford has been able to increase awareness of waste reduction best practices and ultimately reduce the amount of waste sent to landfill. In 2013-14, Stanford competed against over 250 other universities in the national RecycleMania competition and scored in the top 20 in six of the eight categories: Gorilla (6th), corrugated cardboard (9th), bottles and cans (11th), paper (13th), food service organics (16th), and per capita classic (20th).

» The **Water Wise campaign** sought to increase awareness of Stanford’s Drought Response Plan through a series of events and digital and media campaigns, with an end goal of students and staff taking some conservation action. Over 650 faculty, staff, and students pledged to conserve water, and 350 shower timers were given away in eight weeks. Student leadership group Green Living Council supported a companion campaign, **Energy and Water Wars**. From February 15 to March 7, 2014, over 700 residents in Florence Moore, Wilbur, and Stern Halls competed to reduce Stanford’s collective water and energy footprint as part of Campus Conservation Nationals. The competitions were facilitated by online dashboards providing real-time energy and water use monitoring. In just three weeks, participating dorms reduced electricity consumption by over 4,500 kilowatt-hours and water consumption by nearly 12,000 gallons.

» **Residential & Dining Enterprises (R&DE)** supported the **Give & Go Move-Out program**, which seeks to divert students’ unwanted reusable items from landfill by making it convenient for them to donate those items to those in need in the local community. The campaign was a partnership between R&DE and Goodwill of Silicon Valley. Some 400 students pledged online to participate, and the outreach efforts resulted in diversion of 115,110 pounds of materials, including clothing, food, appliances, furniture, and books.

As the Cardinal Green campaign series continues to evolve, OOS will incorporate findings from the latest research and best practices in promoting behavior change, drawing on current academic, operational, and student work across campus.

### Training and Education

Creating a culture of sustainability on campus requires equipping the community with the tools and information necessary to empower individual change. OOS interacts with faculty, staff, and students to design and implement training and engagement opportunities so that hands-on experience in sustainability is integrated into not only the students’ overall learning experience at Stanford, but also professional opportunities for campus staff. The following are the key elements of the sustainability training and education programs portfolio.

**STUDENT TRAINING AND EDUCATION**

» **Student Green Fund**: Having completed its sixth year, the Student Green Fund continues to foster student engagement by encouraging leadership in sustainable improvement projects on campus. The 2013-14 fund awarded $30,000 in grants for projects that studied energy waste in the dorms, installed a water bottle filling station in Old Union, piloted a residential restroom composting program, converted a residential garden irrigation system to use collected rainwater, and built awareness around climate change at the Graduate School of Business. Highlights from this year’s projects are detailed in the Student Leadership and Activities article in this report and online in the 2013-14 Green Fund report. Past projects also continue to benefit campus sustainability.

» **Student internships**: Each year, OOS has worked with sustainability partners across campus to provide internship opportunities for students. In 2013-14, the office and its partners formalized and launched the cross-departmental Sustainable Stanford Internship Program. Nearly 25 Sustainable Stanford interns worked on projects on various campus sustainability topics (waste, water, housing, food) under the supervision and direction of campus sustainability staff. Internship position descriptions and final presentations are available on the program’s website.
Staff training and education

Sustainable Stanford training series: Delivering formal training to the Stanford community was one of the key actions identified through the Sustainability 3.0 strategic planning process in 2011. Focused on sustainable behavior and choices, the Sustainable Stanford training series provides a portfolio of training opportunities each year. In 2013-14, OOS partnered with Stanford’s BeWell program to increase training incentives and reach a broader audience base.

» Sustainable Office Spaces (SST 1000) was offered in October 2013 and reviewed the BLSP and other actions that support the Cardinal Green Buildings campaign. Attendees were trained in using energy auditing tools and gained experience quantifying office energy use and identifying areas for conservation.

» Waste Management Reduction (SST 2000) was the second installment of the new training series. Launched in winter 2014, this course provided a hands-on exploration of waste reduction and management processes and measures at Stanford.

Communications and Events

A campus culture of sustainability cannot be created without widespread awareness of Stanford’s sustainability plans, programs, and achievements. OOS works to promote existing sustainability programs and to publicize campus-wide sustainability actions through a variety of communication and publication channels. The following are the key elements of the outreach programs portfolio.

Publications

» Sustainability at Stanford Annual Report: Since 2008, OOS has published this annual document highlighting sustainability achievements from the past year. A campus-wide effort incorporating sustainability milestones and achievements from operational, academic, and student partners, the report continues to be the office’s flagship publication and an invaluable resource to the sustainability community at Stanford.

» Sustainable Stanford website and new portal: The Sustainable Stanford website provides a single source of information on sustainability work across campus. The website includes extensive information on campus metrics, trends, and initiatives, as well as details on how individuals can get involved. A new portal with the content from the current website plus a new engagement platform for the campaigns is expected to launch during Reunion Homecoming in October. OOS finalized the plans, selected the vendor, and completed design and discovery for the portal in 2013-14.

» Cardinal Green Newsletter: As part of its new outreach efforts, OOS maintains an electronic newsletter. Now sent as an HTML email on a monthly basis, the Cardinal Green eNewsletter aims to make broadly available a digestible, current update on all things sustainability.

Campus Events

» Celebrating Sustainability annual event: On Earth Day, OOS hosted Celebrating Sustainability, jointly sponsored by academic and operational entities. This year’s event was an interactive festival designed to educate the campus community about Stanford’s sustainability achievements through fun, engaging activities and displays. More than 35 campus departments, groups, and entities, over 60 presenters, and more than 20 volunteers hosted 1,200+ attendees at the Science and Engineering Quad.

» Keys to Sustainability student reception: This annual reception served as an opportunity to educate students about the variety of sustainability offerings in research, academics, and extracurricular activities, and to inspire them to explore environmental sustainability issues. Hundreds of students attended.

OOS also regularly engages in on- and off-campus community outreach programs and events. Staff participate in approximately 50 outreach opportunities every year, including conferences, presentations, tours, tabling, and other activities. All campus communications and publications on sustainability are heavily influenced by and consciously integrated with those of OOS’s academic partners in the School of Earth Sciences, the Stanford Woods Institute for the...
Environment, the Precourt Institute for Energy, the Haas Center for Public Service, and their affiliates.

Infrastructural Planning Support
As the programmatic arm of operational sustainability efforts at Stanford, OOS works with SEM and various other units across campus operations and academic groups to help develop long-term plans to improve campus operations and infrastructure. The following are the key elements of these activities and their results in 2013-14.

Greenhouse gas (GHG) emissions inventory: Completing an emissions inventory is the first step in developing an effective energy and climate plan. Stanford GHG emissions totaled approximately 181,700 metric tons of CO2 in 2013. Stanford has prepared and filed independently verified emissions inventories for its Scope I and II emissions since 2006. Emissions have remained relatively flat for a number of years but will significantly decrease in coming years as a result of the Stanford Energy System Innovations (SESI) program.

SESI outreach support: In 2013-14 OOS provided consistent support for departmental outreach and presentations on the SESI program across campus. The program is now in full implementation mode, and the office is working alongside SEM and the Department of Project Management to keep the campus and surrounding community informed. In 2013-14, the office authored, updated, and maintained informational materials and the SESI website and provided tours of and information and a live-feed webcam on the Central Energy Facility construction site.

Collaborative Governance
In 2011-12, a group of faculty, staff, and student leaders initiated Sustainability 3.0. This process sought to map out a shared and actionable vision for sustainability at Stanford over the next five to 10 years, a strategic blueprint building on the Initiative on the Environment and Sustainability (2003-11) and the formalization of Sustainable Stanford (2007-present). Major goals stemming from this effort include leading sustainability by example through on- and off-campus actions and maintaining a global influence through sustainability in research, education, and operations. With these goals in mind, the following three components of collaborative governance actively support the continuation and refinement of sustainability programs. OOS staffs their coordination activity and content creation, and is a steady leader and partner to the groups, whose guidance in turn benefits OOS programs.

PROVOST’S COMMITTEE ON SUSTAINABILITY (SINCE 2012)
The Provost’s Committee on Sustainability continues to implement Sustainability 3.0. This committee was launched in spring 2012 with the intention of bringing key leaders on campus together to focus on sustainability as a core value at Stanford. It meets four times a year, and its functions include the following:

» Overcoming institutional barriers: Cross-functional projects may encounter barriers in the form of processes, people, and resource constraints. The committee participates in addressing these barriers to support the goal of sustainability.

» Giving advice: The committee provides guidance to the Sustainability Working Group (SWG) and other action groups on how to proceed on strategic programs.

» Enabling action: The committee discusses and in some cases volunteers follow-up actions, and is responsible for reporting progress to the campus administration.

» Balancing leadership: The committee brings academic and operations leadership together on sustainability in classrooms, elsewhere on campus, and off campus (at home and in the community), and encourages and promotes collaborations among sustainability programs across schools, institutes, OOS, and students.

The committee’s 2013-14 highlights include the following:

» **Outline of a sustainability curriculum:** After consulting with faculty, staff, students, and leaders of corporate and nongovernmental organizations, the committee developed an outline of a sustainability curriculum that could be helpful at the undergraduate, coterm master’s, joint and stand-alone master’s, and executive education levels. It will prototype the curriculum in the coming year.

» **The Celebrating Sustainability festival** was held on April 22, with 45 departments coming together to showcase their sustainability services and engagement opportunities. The committee guided the theme, and the event attracted 1,200 staff, student and faculty participants across campus.

» **Sustainability portal:** The committee reviewed and approved a new sustainability engagement portal—a hybrid of informational website (Sustainable Stanford) and sign-on-based activity platform (Cardinal Green). Produced by OOS, the portal is expected to go live in Fall 2014.

» **Annual sustainability assessment:** The committee reviewed the 2014 sustainability assessment submitted to AASHE in July. Stanford received a Gold rating, scoring 6 percentage points higher than it did on its last
submission, despite a more rigorous scoring system.

» **Green Events (pilot) program:** The committee discussed and explored the need for a campus sustainable events program. OOS developed a webpage that contains the Green Event Guide from 2010 as well as easy-to-use green event planning checklists. In 2014-15, the committee will solicit volunteers among the schools for a pilot, starting with some events during Reunion Homecoming.

» **Additional rollout of deskside recycling and composting:** The committee reviewed and supported the rollout of deskside recycling for every campus office and classroom. The program encourages occupants to minimize the number of items they put in the trash and to maximize the number they recycle. The committee also reviewed and supported expansion of the currently voluntary composting program to all break rooms on campus.

» **Annual Academic Council address:** Members of the committee participated in a panel discussion and presentation at President Hennessy’s annual Academic Council address.

**SUSTAINABILITY WORKING GROUP (SINCE 2006)**

The SWG prepares policy and program recommendations to advance and implement sustainability practices on campus. It works to implement programs identified by the Provost’s Committee on Sustainability. Chaired by the director of OOS and comprising representatives from all parts of the university, including faculty, staff, and students, the SWG meets monthly. Its mission is to:

» Continuously improve Stanford’s leadership in demonstrating environmental sustainability in campus operations;

» Incorporate faculty, staff, and student expertise in the evolving field of sustainability to enhance program development; and

» Advance opportunities for hands-on sustainability-related learning and service in the campus community.

In 2013-14, the SWG met eight times in a workshop format, showcasing problems the university is trying to solve in specific program areas and actively listening for solutions and feedback. The workshops addressed the following topics:

» October 2013: Climate change adaptation—an early scoping study for Stanford

» November 2013: Stanford’s new sustainability building rating system and plug load inventory

» December 2013: Design finalization of the Cardinal Green program

» January 2014: Sustainable Stanford portal design and discovery

» February 2014: Water conservation at Stanford/Water Wise conservation campaign design

» March 2014: Sustainable Stanford Internship Program, Celebrating Sustainability, greening events at Stanford

» May 2014: Road to 75% waste diversion/recycling rate

» June 2014: R&DE food and living programs

All agenda topics are available online.

**SUSTAINABILITY WORKING TEAMS (SINCE 2008)**

The Sustainability Working Teams assembled in 2008 to develop program recommendations, assess progress, and help implement policy recommendations in major operational areas related to sustainability. Each team activates when a specific initiative is under way and may be dormant once a project is being or has been implemented. In 2013-14, working teams were active in water, food and dining, zero-waste, and building programs.

**Looking Ahead**

OOS has evolved significantly since it was founded in 2008. Moving forward, the office will continue its current programs and support new and additional programs. In the coming academic year, OOS will analyze the data collected during the campus-wide Plug Load Equipment Inventory to draw conclusions regarding potential conservation efforts. The results will not only lead to immediate action to reduce plug loads, but also aid in long-term energy planning.

In fall 2014, the office expects to launch the new sustainability portal. Envisioned as a hub of engagement in sustainability initiatives at Stanford, the portal will incorporate various tools and resources to provide an engaging and inspiring platform for sustainability action on campus.
Building on the successful pilot rating of campus office/classroom buildings in 2012-13, OOS will work to further refine the internal building rating system, tailor the balanced scorecard for all building types, and roll out the system through additional pilots. OOS will then proactively deliver schools and departments an internal writing on a wide variety of sustainability topics, from energy use to behavior-based program participation. Grades can be improved not just through participation in efficiency programs, but also through better occupant engagement and conservation. The first version of the report card is expected to go live in 2015.

Working together with academic entities, the office looks forward to providing additional opportunities for practical training and education to the Stanford community. Plans for 2014-15 include expanding Sustainable Stanford training modules for staff and providing a second year of actionable, results-driven internship opportunities for students through the Sustainable Stanford Internship Program.

**Related Snapshot Stories:**

- New Students Learn about a Sustainable Stanford
- Cardinal Green Buildings Campaign Launches with Improved Process and Results
- Homecoming Weekend Features Sustainability Tour
- Office of Sustainability Launches Sustainable Office Spaces Training Course
- Stanford Reports Its Greenhouse Gas Emissions Inventory for Seventh Consecutive Year
- Green Fund Announces Funding for Student Conservation and Outreach Projects
- Building Level Sustainability Program Sees Record Participation
- Energy and Water Wars Encourage Conservation Through Friendly Competition
- Keys to Sustainability Connects Students with Opportunities
- Stanford Further Reduces Waste During the RecycleMania Competition
- Stanford Celebrates Sustainability on Earth Day
- Stanford Enacts Water Reduction Plan; Water Wise Launches
- Sustainable Stanford Interns Make an Impact on Campus
- Give & Go Campaign Diverts Tons of Reusables and Recyclables from Landfill

- Sustainable Stanford Offers Strong Presence at California Higher Education Sustainability Conference
- Stanford Renews Gold Rating, Gets Highest Marks
- Plug Load Equipment Inventory Data Collection Wraps Up
- Princeton Review Awards Stanford Highest Green Rating
- Stanford Ranks Among Sierra’s Top 10 “Cool Schools” for Fifth Consecutive Year

**More Information:**

- http://sustainable.stanford.edu
- http://sustainablestanford.stanford.edu/governance
- http://sustainable.stanford.edu/swg_agendas
RECOGNITION AND AWARDS
Stanford’s achievements in sustainability-focused operations and academic research have been recognized by regional, national, and international organizations. The wide spectrum of Stanford’s awards and commendations highlights the multifaceted nature of sustainability. Presented below is a selection of the most significant formal recognitions of campus sustainability initiatives in 2013-14.

Third-Party Evaluations of Sustainable Stanford

2015 Green Honor Roll, Princeton Review. Stanford was named as one of the most environmentally friendly schools in the nation for the second consecutive year, earning 99 points (the maximum possible) in the survey of 861 schools.

Top 10 ranking, “Cool Schools,” Sierra magazine, for the fifth consecutive year.

Gold rating, Association for the Advancement of Sustainability in Higher Education (AASHE). Stanford earned a Gold rating under AASHE’s latest version (2.0) of its Sustainability Tracking, Assessment & Rating System (STARS). Stanford’s score of 74.6% became the highest earned by any institution within the new framework, as of the date of its submission. A total of 314 colleges and universities report into various versions of STARS.

Operations

Silver Award of Distinction, Annual Reports (Educational Institutions), 20th Annual Communicator Awards, for the collaborative annual sustainability report, Sustainability at Stanford: A Year in Review.

Gold Award, Best Workplaces for Commuters, for Transportation Demand Management program. Stanford was one of 23 employers and 12 universities nationwide recognized in the Best Workplaces Race to Excellence.

Platinum-Level Bicycle-Friendly University, League of American Bicyclists. This is the organization’s highest designation.
LEED for Existing Buildings: Operations & Maintenance Platinum certification, for Jerry Yang and Akiko Yamazaki Environment and Energy Building (Y2E2). The first large-scale high-performance building at Stanford, Y2E2 received the highest rating awarded by the U.S. Green Building Council.

Effective and Innovative Practices Award, APPA, for the Stanford Energy System Innovations (SESI) program. APPA, the largest international association of educational institutions and their facilities and physical plant departments, recognized SESI for the innovative design of the new heat recovery system and Central Energy Facility.

Finalist, Green Enterprise IT Awards, Uptime Institute, for a case study of server consolidation at Clark Center, one of the top five energy-consuming buildings on campus. The Clark Center IT group relocated servers from Clark, where research space is at a premium, to a new centralized data center, where servers can operate at much higher efficiencies.

Top 20 rating, RecycleMania, in six of the eight categories: Gorilla (6th), corrugated cardboard (9th), bottles and cans (11th), paper (13th), food service organics (16th), and per capita classic (20th).

Research & Academic

“Leading Global Thinkers of 2013,” Foreign Policy, David Lobell, for his breakthrough work in the emerging field of crop informatics to help farmers increase crop production, while mitigating long-term environmental damage

“Leading Global Thinkers of 2013,” Foreign Policy, Xiaolin Zheng, for an innovative and groundbreaking engineering feat: development of the “solar sticker,” a small photovoltaic cell that could transform the global commercial landscape of solar technology. This flexible, decal-like solar panel can stick to any surface and be peeled off like a Band-Aid.

2014 Emerging Explorers, National Geographic, Xiaolin Zheng, for leading the research team that created the “solar sticker”

2013 MacArthur Fellowship, David Lobell, for his research on the impact of climate change on crop production and food security, with emphasis on adaptation to climate change

2014 Frontiers of Knowledge Award, climate change category, Banco Bilbao Vizcaya Argentaria (BBVA) Foundation, Chris Field, for his “visionary research on the global carbon cycle” and his role in “discovering the importance of ecosystems and their effective management in the battle against climate change”

2013 Atmospheric Sciences Ascent Award, American Geophysical Union, Mark Jacobson, for his “dominating role in the development of models to identify the role of black carbon in climate change”

Cox Medal, Stanford University, Stacey Bent, for her record of excellence directing undergraduate research over a number of years and providing mentorship that exemplifies the ideals of undergraduate research. Stacey directs the TomKat Center for Sustainable Energy.

2014 Readers’ Choice Award and Lectureship, Energy & Environmental Science, Thomas F. Jaramillo, for his article “New insights into the electrochemical reduction of carbon dioxide on metallic copper surfaces”

2014 Resonate Award, Thomas F. Jaramillo, for his breakthrough achievements in energy science and sustainability. His work led to the discovery of stable earth-abundant catalysts that drive chemical reactions for renewable hydrogen production from water and sustainable conversion of carbon dioxide into fuels and chemicals.

Fellowship of the Royal Society, Steven Chu

2014 Lifetime Achievement Award, American Association for Public Opinion Research, Jon Krosnick, in recognition of his outstanding contributions to public opinion research, which have produced “essential insights into questionnaire design and survey research methods.” Jon studies Americans’ perceptions of climate change

Professor of the Year award, Stanford Society of Women Engineers, Margot Gerritsen, in recognition of teaching excellence in computational and mathematical engineering and excellence in mentoring young women engineers

Presidential Early Career Award for Scientists and Engineers, Jennifer A. Dionne, for her pioneering contributions to the control of light-matter interactions on deeply sub-wavelength scales; innovative work on nanoscale physical, chemical, and biological phenomena; and exemplary leadership and service

Membership, National Academy of Engineering, Stephen P. Boyd, for his contributions in applying the methodology of convex optimization to machine learning, signal processing, circuit design, and other energy applications

2014 Joseph A. Burton Forum Award, American Physical Society, Michael May, for his significant and sustained contributions on technical and policy issues pertaining to nuclear weapons, nuclear terrorism, and energy and environmental impact, and for mentoring generations of students, colleagues, and the public on these issues
2014 Bayer Distinguished Lectureship, University of Pittsburgh, Jens Nørskov, for his influential work in molecular modeling of catalysis, leading to the design of new catalytic materials for energy conversion and storage

Fellowship, American Association for the Advancement of Science (AAAS), Kenneth Goodson, for his distinguished contributions in the thermal sciences, particularly the advancement of heat transfer research in electronic nanostructures and packaging

2014 Heat Transfer Memorial Award in Science, American Society of Mechanical Engineers, Kenneth Goodson, for his pioneering work in phonon free path measurements using silicon nanolayers and his highly cited papers on diamond, carbon nanotubes, phase change memory, and two-phase microfluidics

2014 Frontiers of Knowledge Award, ecology and conservation biology category, BBVA Foundation, Paul Ehrlich, for his contributions to “key conceptual advances in the science of ecology and conservation biology” and his “long-standing influence in other academic disciplines”

2013 Policy Design Award, Global Green USA, Mark Jacobson, for his work on envisioning a future powered by renewable energy

2013 Max Planck Research Prize, Chris Field, named co-recipient of the prestigious German award to finance research and fund cooperation with other scientists

Fifth place, Solar Decathlon, Department of Energy. Stanford’s first-ever entry finished first among California-based competitors and among the top five in six of the 10 judging categories.

Fourth place, Bridgestone World Solar Challenge. Stanford was the first American team to the finish line and notched its best result in decades.

2013 MacArthur Fellowship, Kevin Boyce, for establishing links between ancient plant remains and present-day ecosystems through a pioneering and integrative approach to evolutionary plant biology

Fellowship, American Geophysical Union, Page Chamberlain, for his research and teaching in climate change

Selection as What We Know Campaign Co-Creator, AAAS, Noah Diffenbaugh. The AAAS convened 13 leading climate scientists to create a campaign aimed at communicating the three Rs of climate change—reality, risk, and response—to the public.

Reappointment as chair, U.S. Nuclear Waste Technical Review Board, Rod Ewing, who recently led a delegation of the board to China’s proposed nuclear waste site

2013 Soil Science Research Award, Soil Science Society of America, Scott Fendorf, for outstanding contributions to soil science through education, national and international service, and research

Roger Revell Medal for 2014, American Geophysical Union, Chris Field, for outstanding contributions to physiological ecology, ecosystem ecology, biogeochemistry, and climate science

Recognition as Thomson Reuters Highly Cited Researchers, Chris Field, Rob Jackson, Eric Lambin, and David Lobell, who were among the top 1% of scientists whose publications were cited in the past year

Board membership, U.S. Department of Agriculture’s Foundation for Food and Agriculture Research, Pam Matson. The foundation will work to increase the scientific and technological research, innovation, and partnerships critical to boosting America’s agricultural economy.

Honorary degree, Arizona State University, Pam Matson, for her pioneering work in sustainable agriculture

Appointment as Undersecretary for Science, U.S. Department of Energy, Lynn Orr. Orr will be responsible for overseeing all of the energy and science research programs of the Department of Energy, including the majority of the national laboratories.

2013 Nicholas P. Fofonoff Award, American Meteorological Society, Leif Thomas, for groundbreaking work on the impact of strongly stratified oceanfronts on near-surface “mixing” forced by air-sea buoyancy and momentum exchange

2013 Louis Neel Medal, European Geosciences Union, Mark Zoback, for his outstanding and seminal contributions to rock physics and geomechanics, in particular for applying geomechanics to solve a wide range of problems of scientific, engineering, and economic importance

Best Proposal Award, Department of Energy’s 2014 Better Buildings Case Competition, Stanford’s Team Millennial Makers, for their work in the Welcome Home to Savings: Distributed Generation in Multifamily Housing case study
SNAPSHOTS
2013-2014
The chronological snapshot stories that follow not only provide details on many of the featured topics, they also underscore the steady pulse of sustainability on campus. Some initiatives are bold and ambitious, while others are grassroots. Some programs are intended for longterm implementation, while others concluded this year. However, all are strategic and collaborative parts of Stanford’s integrated and flourishing culture of sustainability.
A Renovated Florence Moore Dining Hall Highlights Sustainability

The Florence Moore Dining Hall was completely renovated in summer 2013. Residential & Dining Enterprises (R&DE) Stanford Dining took sustainability into account in all aspects of the new dining hall design and operations. The renovation takes advantage of the natural light in Florence Moore to conserve energy. Energy-efficient LED lighting, motion sensors, and nighttime setbacks contribute further to efficiency in lighting. The kitchen was outfitted with Energy Star–rated equipment that reduces energy use. The refrigerator uses up to 36% less energy than non–Energy Star models. The variable-speed exhaust hoods save energy by only running when needed. The gas fryer is Energy Star rated and uses 29% less gas than standard models; it is also designed to filter and save oil, thus using 40% less oil.

The scrap food waste collector uses 15 times less water than traditional pre-rinse models by recirculating water. In addition, the low-flow pre-rinse dishwashing sprayers and sink aerators reduce hot water use by as much as 75%.

Florence Moore Dining Hall serves nearly 5,500 students each week. R&DE Stanford Dining will continue to ensure that energy and water efficient equipment is the standard for all future renovations.

More Information:

https://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/florence-moore-dining
Incoming Graduate Students Participate in Energy Research and Education Across Campus

Incoming graduate students ranging in disciplines from mechanical engineering to music—but with academic interests in sustainable energy—participated in the annual Energy@Stanford & SLAC conference. Held before fall classes began, the weeklong event introduced 125 students to the range of energy research and education opportunities on campus and at SLAC National Accelerator Laboratory. Dozens of Stanford’s leading researchers in energy fields ranging from fuel cells to cleantech finance discussed the state of their disciplines broadly, as well as their specific research projects and classes. Several speakers from off campus also participated, notably Tesla Motors’ co-founder and chief technology officer, J. B. Straubel, ’98, MS ’00. Students also visited cleantech companies, SLAC, and Jasper Ridge Biological Preserve, and they formulated solutions to limit climate change in a strategy competition.

As in previous years, students created continuing friendships and academic collaborations. The conference is sponsored by the Precourt Institute for Energy, the Stanford Institute for Materials & Energy Sciences, the Global Climate and Energy Project, the vice provost for graduate education, SLAC National Accelerator Laboratory, and the National Renewable Energy Laboratory.

More Information:
http://energy.stanford.edu/energystanford-slac

R&DE Continues Commitment to Sustainable Foods

Each year, Residential & Dining Enterprises (R&DE) Stanford Dining expands its sustainable food commitments. In the beginning of this academic year, R&DE Stanford Dining added five new sustainable food items, listed below. Local, organic, and fair food now makes up 40% of R&DE’s total food purchases.

100% organic and local milk from Straus Family Creamery: Straus Family Creamery is an organic dairy producer located in Marshall, 84 miles north of Stanford.

Organic and local swiss chard from Coke Farm: Coke Farm is located in San Juan Bautista and has been producing organically grown produce for over 30 years.

Organic and local herbs from Jacobs Farm: Jacobs Farm is an organic farm located in Pescadero, 30 miles west of Stanford. Five of R&DE Stanford Dining’s purchased herbs (basil, Thai basil, mint, rosemary, and thyme) come exclusively from Jacobs Farm.

Sustainable, pole-caught tuna fish from American Tuna: American Tuna catches tuna fish by pole and line, the most sustainable method possible. R&DE Stanford Dining switched to American Tuna after analyzing its seafood purchases and committing to buy only Monterey Bay Aquarium Seafood Watch–approved seafood.

Organic and local chopped romaine from Earthbound Farms: R&DE Stanford Dining now buys all of its chopped romaine and spring mix from Earthbound, a local organic farm.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/sustainable-food-program
Scientists Discover the Power of “Wired Microbes” to Generate Electricity from Sewage

Engineers at Stanford University devised a new way to generate electricity from sewage using naturally occurring “wired microbes” as mini power plants, producing electricity as they digest plant and animal waste. In a paper published in the *Proceedings of the National Academy of Sciences*, co-authors Yi Cui, Craig Criddle, and Xing Xie call their invention a microbial battery. A simple yet efficient design puts these exoelectrogenic bacteria to work. The Stanford engineers estimate that the microbial battery can extract about 30% of the potential energy locked in wastewater. That is roughly the same efficiency at which the best commercially available solar cells convert sunlight into electricity.

One day, the researchers hope, their microbial battery will be used in places such as sewage treatment plants, or to break down organic pollutants in the “dead zones” of lakes and coastal waters, where fertilizer runoff and other organic waste can deplete oxygen levels and suffocate marine life. Looking ahead, the Stanford engineers say their biggest challenge will be finding a cheap but efficient material for the positive node.

More Information:

SPOT Farming Program Introduces New Students to Food and Farming

Stanford Pre-Orientation Trips (SPOT) are five-day wilderness or service-learning experiences for incoming freshmen during the week before New Student Orientation. The trips allow students to make new friends and transition into college life. Four years ago, motivated by student interest, SPOT began offering sustainable-farming trips, during which students spend five days living, working, and learning at local educational farms. Activities include harvesting, weeding, cooking, tending livestock, and hiking. In 2013 SPOT held two trips for approximately 20 freshmen and 9 student leaders to Pie Ranch (Pescadero) and Hidden Villa (Los Altos Hills). The program exposes students to problems and solutions within our food systems and allows students from urban and suburban areas to experience where their food comes from, often for the first time.

More Information:
http://outdoored.stanford.edu/spot/farming/
New Students Learn About a Sustainable Stanford

Sustainable Stanford collectively welcomed the Class of 2017 to campus with a strong presence at multiple New Student Orientation events, including the zero-waste lunch. Sustainability staff from the Office of Sustainability, Residential & Dining Enterprises, and Peninsula Sanitary Service, Inc./Stanford Recycling introduced new students to Stanford’s culture and practices of sustainability by serving a sustainable meal in compostable containers and demonstrating how to properly sort waste. Copies of publications such as *Sustainability at Stanford: A Year in Review* and *The Tree’s Pocket Guide to a Sustainable Stanford* were available for interested students.

All incoming students were also emailed digital copies of the *Student’s Guide to Sustainability on the Farm* before their arrival, along with a letter about Stanford’s commitment to sustainability. Sustainable Stanford continues to maintain and strengthen the bond with incoming students every year and improve the availability of resources to them.

More Information:

https://undergrad.stanford.edu/advising/freshman/new-student-orientation-nso

Undergraduate Program Engages Students in Sustainability Issues

Since 1995, the Sophomore College (SoCo) program has offered rising sophomores the opportunity to study a topic intensively in the weeks before the start of fall quarter in an immersive environment. Many SoCo courses involve field trips and opportunities for hands-on learning. This year’s SoCo included a number of courses on environmental and sustainability topics. In *Natural History, Marine Biology, and Research*, students traveled to the Monterey Bay to focus on issues of conservation, sanctuary, and stewardship of the oceans and coastal lands. In *Environmental and Geological Field Studies in the Rocky Mountains*, students explored the geologic history of the Rocky Mountain region and tackled environmental challenges posed by climate change and land use patterns. These courses give students the opportunity to investigate environmental topics in depth without the distractions of the regular academic year. With their soaring popularity, SoCo courses will be offered for years to come.

More Information:

soco.stanford.edu
Professors Boyce and Lobell Receive MacArthur “Genius” Awards

David Lobell, associate professor of environmental Earth system science, and Kevin Boyce, associate professor of geological and environmental sciences, were named 2013 MacArthur fellows.

Lobell was cited “for unearthing richly informative, but often underutilized sources of data to investigate the impact of climate change on crop production and global food security.”

The MacArthur Foundation recognized Boyce “for establishing links between ancient plant remains and present-day ecosystems through a pioneering and integrative approach to evolutionary plant biology.” Boyce joined Stanford’s geobiology program from the University of Chicago in July 2013.

According to the John D. and Catherine T. MacArthur Foundation, fellowships are awarded to talented individuals in a variety of fields in recognition of originality, creativity, self-direction, and capacity to contribute importantly to society through their work. The fellows receive a $625,000 “no-strings-attached” grant over five years to use in any way they see fit.

More Information:

Bing Concert Hall Earns Savings By Design Certificate of Recognition

Stanford’s Bing Concert Hall, which opened to the public in January 2013, received a certificate of recognition from the Pacific Gas & Electric (PG&E) Savings By Design program. This statewide program encourages high-performance design and construction of nonresidential buildings, and participants receive financial incentives and technical assistance from PG&E.

Bing Concert Hall is the first of many new buildings that will constitute Stanford’s new arts district. Given the location of the arts district at the university’s Palm Drive entrance, the concert hall’s exterior appeal was an important factor in its design, in addition to interior functionality and energy efficiency. While the capstones of the new concert hall are superior acoustics and an intimate feel, this state-of-the-art building also encompasses many sustainability measures. One example is the use of low-CO2 concrete, which minimized the carbon footprint associated with the building’s construction. Bing Concert Hall has continued to receive acclaim since its opening. And in January 2014, music Professor Stephen Sano crafted twin ukuleles from scraps of Alaskan yellow cedar that he salvaged from the Bing Concert Hall construction site.

More Information:
Continuing Studies and Earth Sciences Launch Earth Matters Lecture Series

Stanford’s School of Earth Sciences and Continuing Studies program partnered to create a quarterly lecture series that addresses some of the most pressing resource, climate, and sustainability issues of the 21st century. The lectures are open to the public free of charge and are available subsequently via StanfordEarth on YouTube.

In this new program, international thought leaders from the School of Earth Sciences address topics ranging from the global realities of shale gas (“fracking”) to feeding the rapidly growing global population to what Antarctica can tell us about the warming world. The professors discuss facts and myths, explain potential solutions based on the latest research, and engage the local community in lively discussion.

The mission of Stanford Continuing Studies is to share the rich educational resources of Stanford University with adult students by nurturing a vibrant learning community. The quarterly Earth Matters lecture is an important addition to its diverse program offerings.

More Information:
https://continuingstudies.stanford.edu/events/event-details/2014-10-01

Center for Ocean Solutions Celebrates Five Years of Linking Science to Policy

Considering that oceans cover more than 70% of the planet, it’s hard to believe that until the late 1980s there was little funding for ocean research, and even less evidence of science being linked to ocean policy. But that has changed, and in 2008, Stanford, the Monterey Bay Aquarium, and the Monterey Bay Aquarium Research Institute joined forces to create the Center for Ocean Solutions, a unique collaboration among scientists, engineers, and lawyers. Since then, the center has been making measurable impacts, ranging from rapid pathogen-detecting technology that promises safer swimming to novel legal analyses that show policy makers how to increase coastal ecosystem resiliency. To celebrate its fifth anniversary, the center held a roundtable discussion about the challenges facing the mysterious and valuable ecosystems that cover most of the Earth. Julie Packard, the executive director of the Monterey Bay Aquarium and a trustee of the David & Lucile Packard Foundation, which helped establish the center with a major grant in 2007, moderated the discussion.

More Information:
Research Programs Award Funding for 11 New Projects in Sustainable Energy

The Precourt Institute for Energy (PIE), the Precourt Energy Efficiency Center (PEEC), and the TomKat Center for Sustainable Energy awarded 11 seed grants totaling $2.2 million for new research in clean technology and energy efficiency. The seed funding supports early work on ideas that could significantly alter energy production and use. Through a competitive process, committees of faculty and senior staff chose Stanford researchers from a broad range of disciplines, including engineering, physics, economics, business, communication, and education.

One winning PIE project will test whether graphene can reduce the amount of expensive platinum needed in fuel cells. Another will examine the potential for market manipulation in California’s electricity and CO2 permit markets by developing a simulation game in which the scenario includes significant amounts of renewable energy. The PEEC-funded projects focus on hybrid cars, natural ventilation systems, and financial incentives to get people to use electricity more efficiently. The TomKat Center projects aim to boost the output of wind farms, invent a new kind of solar cell, and use carbon dioxide to store electricity.

More Information:
http://energy.stanford.edu/news/stanford-faculty-awarded-22-million-innovative-energy-research-
https://peec.stanford.edu/
https://tomkat.stanford.edu/

Student-Built Home Ranks Fifth in Green Building Competition

Stanford’s first-ever entry in the Department of Energy’s prestigious green building competition finished fifth in a field of 19 selected finalists. The Solar Decathlon challenges collegiate teams to design, build, and operate solar-powered houses that are cost effective, energy efficient, and attractive. Each house is judged on criteria such as engineering, energy balance, and affordability. The Stanford students’ home was built around a core unit that includes most of its electrical, plumbing, and mechanical systems to boost energy efficiency. Its modular design could enable assembly-line production of affordable sustainable homes, which earned Stanford first place in the affordability portion of the competition. The home is also human-centric, with elements designed to guide homeowners toward making energy-efficient decisions, rather than automating everything.

“We set out with a couple of major goals, and we didn’t want to build an impossible vision of the future, but a very practical, feasible direction for the industry,” said team leader Derek Ouyang, ’13. The house is now installed permanently at Stanford’s Jasper Ridge as a home for the family of the preserve’s ranger.

More Information:
http://solardecathlon.stanford.edu/
**Students’ Solar-Powered Car Places Fourth in Race Across the Australian Outback**

After five grueling days and 2,000 miles on the road, students jumped for joy as Luminos, their handmade solar racecar, rolled to the finish line of the Bridgestone World Solar Challenge in Adelaide, Australia. Luminos finished fourth in the contest, designed to encourage innovation in solar-powered car design, and it was the first American finisher. “We’re very happy for the car. We’re happy for the team,” said Wesley Ford, leader of the student-run Stanford Solar Car Project. The team crossed the finish line late on the fifth day of the competition, which began in Darwin. Luminos reached the end with half an hour to go before the day’s mandatory 5 p.m. stop time. As the team reached Adelaide, the temperature had dropped significantly, and it had rained much of the afternoon. If the car had failed to reach the finish by 5 p.m., the team would have been forced to camp along the roadside, as they had the previous four nights in the outback.

More Information:
http://solarcar.stanford.edu/

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**Office of Sustainability Launches Sustainable Office Spaces Training Course**

Sustainable Stanford kicked off its 2013-14 staff training series with SST 1000, Sustainable Office Spaces. SST 1000 reviews the Building Level Sustainability Program and actions that support the Cardinal Green Buildings campaign. During the October session, staff members convened for hands-on lessons on smart power strips, timers, and light meters. Many class participants subsequently completed audits of their buildings and are working to implement identified efficiency measures.

Delivering formal training to the Stanford community in conjunction with conservation campaigns is a main objective of the Office of Sustainability. In the spring, the office partnered with Peninsula Sanitary Service, Inc./Stanford Recycling Center to offer a best-practices training in waste reduction. This hands-on course ran concurrent to the RecycleMania conservation campaign and offered tips for reducing waste impact and being a leader in the workplace. All training courses can also earn faculty and staff a “Berry” under BeWell, Stanford’s health and wellness initiative. The Office of Sustainability looks forward to expanding its training programs next year.

More Information:
http://sustainable.stanford.edu/be_cardinal_green
Homecoming Weekend Features Sustainability Tour

Sustainable Stanford had a visible presence at Reunion Homecoming weekend in 2013 and brought back its popular sustainability tour. Aboard one of the new electric Marguerite shuttles, alumni listened to guest speakers on topics such as green buildings, transportation, landscaping, water conservation, waste management, and campus dining systems. Tour destinations included Arrillaga Family Dining Commons and its organic garden, the Jerry Yang and Akiko Yamazaki Environment and Energy Building, and Stanford’s recycled-water plant. Alumni were encouraged to learn about the culture of sustainability that has developed on campus, and shared tales of the sustainability systems in place during their times on the Farm. The tour’s continued popularity has made it a staple of major campus events, and a self-guided version is available on the Sustainable Stanford website.

More Information:
http://sustainable.stanford.edu/tours

Cardinal Green Buildings Launches with Improved Process and Results

The new and improved Cardinal Green Buildings campaign launched in October 2013, merging two existing campaign opportunities—the Building Level Sustainability Program and the annual Winter Closure. This combination allowed building managers and administrative deans to conserve resources more effectively through the synergy between existing building-focused and user-driven conservation programs. The Office of Sustainability created an online form tied to a database that allows building champions to participate in one or multiple programs. Incentives were aligned with user feedback from building managers and administrative deans. This campaign is a collaboration among the Office of Sustainability, Facilities Energy Management, and Zone Management. A total of 33 buildings enrolled in the Building Level Sustainability Program, and Winter Closure included 177 buildings, 23 more than last year. Through Winter Closure, the campus avoided 838 metric tons of CO2 emissions (about 0.5% of annual campus emissions) and $247,000 in utility costs. Campus savings since 2001 through the winter curtailment program total $2.96 million!

More Information:
http://sustainable.stanford.edu/CardinalGreenBuildings
Interdisciplinary Team Hosts Fourth Annual Food Summit

Stanford School of Medicine built on the previous three years’ successes to produce the fourth annual Stanford Food Summit. The summit is a gathering of experts on food-related issues and a catalyst for generating solutions to some of the nation’s and the planet’s most challenging and important crises. One focus for 2013 was pathways to careers in food systems. This was in response to substantial input from Stanford students who wanted to learn more about the types of jobs and careers that are emerging in this dynamic area. More than two dozen speakers, many of them Stanford alumni, discussed their jobs and careers in farming, food production, cooking, food procurement, food entrepreneurship/startups, food policy/social justice, and food and health. This engaging event consisted of morning presentations, an afternoon of interactive discussions between panelists and attendees, and an evening film screening of A Place at the Table, followed by a panel discussion. Keynote speeches were delivered by Arlin Wasserman, principal and founder, Changing Tastes, and Michiel Bakker, director of global food services, Google.

More Information:

http://foodsummit.stanford.edu/

GCEP Researchers Outline Progress at Annual Symposium and Welcome New Sponsor

At the Global Climate and Energy Project’s annual symposium, researchers from Stanford and around the world described developments in their GCEP-funded research projects. This year’s symposium focused on creating energy solutions for the developing world. Keynote speakers included Gro Brundtland, deputy chair of The Elders and former prime minister of Norway, and Richard Swanson, founder of SunPower and a consulting professor at Stanford. Topic areas included solar energy, bioenergy, energy storage, and greater sustainability in carbon-based energy technologies. Researchers who spoke came from the University of Texas, the University College Dublin, the Reliance Foundation in India, and Stanford. Researchers from dozens of other universities with GCEP funding reported on their progress in poster sessions.

GCEP’s director, Sally Benson, announced the project’s newest sponsor at the meeting: Bank of America. The bank will bring commercial and finance expertise to the management committee of GCEP, which funds scientific and engineering research to underpin a new generation of energy technologies. The other sponsors are ExxonMobil, General Electric, Schlumberger, and DuPont.

More Information:

http://gcep.stanford.edu/events/symposium2013/
Stanford Announces Inaugural Recipient of Bright Award

Tasso Azevedo, a forestry manager and socio-environmental entrepreneur dedicated to preserving the Amazon rainforest in Brazil, was selected as the inaugural recipient of the Bright Award at Stanford University. The prize is given annually to an unheralded individual who has made significant contributions to global sustainability. It is Stanford’s top environmental award. Azevedo founded the Brazilian nongovernmental organization Imaflora to create alternatives to deforestation and was the first chief and director general of the Brazilian Forest Service. In the past 18 years, his groundbreaking forestry management techniques have reduced the rate of deforestation in the Amazon by 80% and Brazil’s greenhouse gas emissions by 35%. His efforts serve as a model for others around the world. The Bright Award, issued by Stanford Law School in collaboration with the Stanford Woods Institute for the Environment, recognizes significant achievements in conservation in different regions of the world. The prize was made possible by a gift to Stanford Law School from alumnus Ray Bright. Azevedo visited Stanford in December to receive the award and to deliver a lecture on his work.

More Information:

SLAC Implements Successful Water Conservation Measures

SLAC National Accelerator Laboratory uses about 70 million gallons of potable water each year, with irrigation accounting for about 20% of that. To reduce its environmental impact, SLAC has been aggressively reducing irrigation water usage over the last two years. In November 2013, SLAC demonstrated its commitment to water conservation by shutting off almost all irrigation on its campus. This measure saved about 400,000 gallons of potable water, a 60% savings in irrigation water when compared to the 2011-12 baseline.

SLAC has also partnered with the Menlo Park Water Department to implement the Lawn-Be-Gone program. By April 2014, grassy areas around several buildings had been replaced with a combination of native vegetation and mulch landscape, including a drip irrigation network. This conversion came at no cost to SLAC and is expected to save 200,000 gallons of potable water per year. SLAC plans on expanding this program into the main grassy areas at the research campus.

More Information:
http://www-group.slac.stanford.edu/esh/groups/ep/water/
**R&DE Sustainable Food Program Goes into Full Gear**

This has been a productive year for the Residential & Dining Enterprises (R&DE) Sustainable Food Program. With the help of 10 Sustainable Stanford student interns, it created many new programs and initiatives in purchasing, education, waste reduction, and energy and water conservation. Fall highlights include the following:

**Waste reduction:** R&DE Stanford Dining rolled out a digital waste-weighing system in all dining halls, partnered with two student groups who donate leftover food to homeless shelters, and collaborated with multiple classes and students to research best practices in reducing food waste.

**Seafood Watch and Sustainable Seafood Week:** R&DE Stanford Dining became a Monterey Bay Aquarium Seafood Watch business partner. It also hosted a Sustainable Seafood Week in October.

**Sustainable food newsletter:** R&DE Stanford Dining started a sustainable food newsletter that now has almost 1,000 subscribers.

**Classes:** The Sustainable Food Program ran the popular undergraduate and graduate student class *Grow It. Cook It. Eat It.* It also created five new classes for staff through BeWell and multiple cooking classes for students.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/sustainable-food-program

**Fossil Free Stanford’s Outreach Campaign Engages More than 3,000 Campus Members**

Fossil Free Stanford made major waves on campus during the 2013-14 academic year. The student organization launched its campaign in the fall, requesting that Stanford immediately freeze any new investment in fossil-fuel companies and divest within five years from direct ownership of, and any comingled funds that include, fossil-fuel public equities and corporate bonds.

In the first months of the campaign, Fossil Free Stanford reached out to over 3,000 students, alumni, faculty, and staff via marches, protests, and door-to-door outreach. As a result, the Stanford Undergraduate Senate passed a resolution in favor of fossil-fuel divestment, and in April the undergraduate student body passed a referendum in favor of divestment with 78% of the vote. The Undergraduate Senate officially recommended full divestment to President Hennessy, the Board of Trustees, and the Advisory Panel on Investment Responsibility and Licensing.

Stanford’s Board of Trustees announced Stanford’s divestment from coal companies 15 days later.

More Information:
http://www.fossilfreestanford.org/
Energy360 Event Hones In on Sustainable Transportation

The Stanford Energy Club’s first Energy360 event of the year brought together experts in the transportation field to answer the hard questions: What will future transportation look like? Can we evolve sustainably to satisfy demand for transportation?

The expert panel included Dirk Rossberg (BMW Group USA), Sven Beiker (Center for Automotive Research at Stanford), Dave Duff (Google X), and Max Baumhefner (Natural Resources Defense Council). Panelists unanimously agreed that there is no transportation solution for the future. Rather, the world will gravitate towards automation and vehicle sharing, and not without challenges around behavior change, perception of new technology, and consumer demand in a growing economy. In the increasingly globalized world, student attendees were encouraged to reflect on the interconnectedness of transportation and environmental issues.

The Stanford Energy Club is the largest student energy organization at Stanford. It brings together students, scholars, and local professionals from all disciplines to generate thought-provoking discussions and facilitate innovations that address some of the world’s most complex challenges.

More Information:
http://energyclub.stanford.edu/

White House Nominates Lynn Orr to Head DOE Energy Research

Professor Franklin “Lynn” Orr was nominated by President Obama to serve as Undersecretary for Science at the U.S. Department of Energy. Orr will be responsible for overseeing all of the Department of Energy’s energy and science research programs. To accept the appointment, he stepped down as director of the Precourt Institute for Energy, which he has led since it was established in 2009.

Orr has served the Stanford community for nearly 30 years. He became an associate professor and professor in Stanford’s Department of Energy Resources Engineering (then the Department of Petroleum Engineering) in 1985. Orr served as chairman of that department from 1991 to 1994 and as dean of the School of Earth Sciences from 1994 to 2002. He also served as the founding director of the Global Climate and Energy Project at Stanford from 2002 to 2008.

More Information:
Green Fund Announces Funding for Student Conservation and Outreach Projects

Every year the Stanford Student Green Fund provides up to $30,000 for student-led projects that improve campus sustainability. This program supports student leadership by providing not only funding but guidance, hands-on experience, and networking opportunities. In 2013-14:

» **Graduate School of Business (GSB) students** received a grant for their Climate Act @ GSB initiative, which aimed to identify GSB students’ understanding of climate change, then increase it through outreach events and guest speakers.

» **Students for a Sustainable Stanford Water Group** received funding to pilot an environmentally friendly cleaning system in residence halls and install a rainwater-harvesting system at Synergy House.

» The **Graduate Student Council** and **Students for a Sustainable Stanford Water Group** received a grant to install a water bottle filling station in Old Union.

» **Residential & Dining Enterprises Student Housing interns** received support for projects studying student attitudes and behaviors associated with residence hall heating and residential bathroom paper towel composting.

A final report on the 2013-14 projects is available on the Green Fund website.

**More Information:**
http://sustainable.stanford.edu/green_fund

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Two Dorms Win Stanford’s Bike Safety Dorm Challenge

Stanford’s fourth annual Bike Safety Dorm Challenge generated friendly competition among 25 undergraduate residences from Sept. 17 through Dec. 13, 2013. A record 1,131 Stanford undergraduates pledged to bike safely, up from just over 665 students when the challenge launched in 2010.

Stanford’s Parking & Transportation Services awarded two grand prizes: a free charter bus trip to Lake Tahoe for each of the two winning dorms. Crothers surpassed other dorms by setting a record in number of participants, with 259 students pledging. Casa Zapata, Enchanted Broccoli Forest (EBF), and Muwekma-tah-ruk all reached 100% participation. EBF was the lucky winner of a three-way-prize drawing, clinching the other trip to Lake Tahoe.

**More Information:**
http://transportation.stanford.edu/alt_transportation/dorm-challenge.shtml
Student-Led Sustainability Course Empowers Freshmen to Make a Difference

Since 2010, the Green Living Council (GLC) has inspired the next generation of student sustainability leaders through a student-led course, *Promoting Sustainability Behavior Change at Stanford*. This two-unit course is designed to guide students in behavior change intervention and the psychological, behavioral, economic, and design theory behind it. Lectures from Stanford professors are shared online, with class time dedicated to designing and implementing sustainability-themed group projects.

This year, enrolled students developed projects on a variety of sustainability topics. Projects included a “meatless meal on Mondays” campaign, a program that distributed shower timers to students, a recycling signage and educational campaign, and an initiative to bring compact compost bins into the residence halls. For each project, students conducted focus groups with their peers to diagnose and identify barriers, collected baseline data, and then encouraged behavior change through proven strategies.

The GLC uses each year’s data to make recommendations to Residential & Dining Enterprises for broader participation in and adoption of sustainable living at Stanford.

More Information:
https://glc.stanford.edu/

Mel Lane Grant Program Supports Student Sustainability Research

The Mel Lane Student Grants Program supports student-driven-and-managed environmental projects that make a measurable impact on sustainability through action or applied academic research. Through this program, the Woods Institute for the Environment distributes $20,000 every year for projects that focus on environmental sustainability within one of the following topic areas: climate, ecosystem services and conservation, food security, freshwater, oceans, public health, and sustainable development. This year’s projects included:

» Using 3-D printing to create low-cost water disinfection devices for slums in Dhaka, Bangladesh;
» Developing a remote monitoring system for micro-hydropower plants in Indonesia;
» Designing a solar irrigation system for small share farmers in India; and
» Exploring the impact of a growing tourism industry on the Kingdom of Tonga.

More information on each of these projects is available on the program website.

More Information:
https://woods.stanford.edu/educating-leaders/education/mel-lane-student-grants-program/mel-lane-funded-projects
**Climate & Energy**

Stanford Reports Its Greenhouse Gas Emissions Inventory for Seventh Consecutive Year

For the seventh consecutive year, Stanford received third-party verification of its greenhouse gas (GHG) emissions inventory. The 2012 emissions were verified through the Climate Registry. Scope I and Scope II carbon dioxide–equivalent GHG emissions from the main campus totaled approximately 187,500 metric tons, 5% less than in the previous year. The 2013 inventory has already been calculated to be 181,700 metric tons of carbon dioxide–equivalent GHG emissions, which is to be verified and reported in December 2014. Stanford has completed an emissions inventory each year since 2006, and it continues to be a valuable tool for Stanford’s climate action planning. The signature project for emissions reduction - Stanford Energy System Innovations (SESI) - is expected to reduce campus GHG emissions by 50% from 1990 levels in 2015.

More Information:
http://sustainable.stanford.edu/emissions_inventory

**WATER CONSERVATION**

Stanford Studies Drought

On Jan. 17, 2014, Governor Brown issued a declaration of emergency for the state of California due to drought and severe water shortage conditions in various parts of the state. The governor asked for a voluntary 20% temporary reduction in water use. Stanford responded to the call to action immediately and worked with local authorities and the campus community to determine next steps. While Stanford had already voluntarily achieved great reductions, it embarked upon a detailed analysis to comprehensively review its various water uses and compile measures to reduce them even further. The analysis teams used existing monthly water meter consumption data from 2013 and estimated current efficiency (e.g., whether the building had been retrofitted or featured new fixtures and equipment) and additional potential for savings for each metered area.

Stanford has reduced potable water use by over 20% over the last decade—despite campus growth—through an innovative, award-winning water conservation program and the commitment of the campus community. The new Stanford Energy System Innovations project currently under construction will reduce potable water use by an additional 15% starting in 2015.

More Information:
http://sustainable.stanford.edu/water
Scientists Explain How “Ridiculously Resilient Ridge” Is Causing California Drought

Professor Noah Diffenbaugh and graduate student Daniel Swain are leading efforts to study the relationship between the California drought and climate change.

Swain coined the term “ridiculously resilient ridge” to highlight the unusually persistent nature of the offshore region of high pressure that prevented winter storms from reaching California. He first used it in a posting on his California Weather Blog. It was quickly picked up worldwide by the popular media.

While scientists understand how the blocking ridge is causing drought conditions, why it is so persistent is less clear. Swain and Diffenbaugh are investigating the extent to which climate change has influenced the formation of the ridge and whether continued global warming will make extreme droughts such as this one more likely. The pair is combining data from a variety of sources, including real-world measurements of temperature, rain, snowfall, and atmospheric circulation, with computer simulations of the climate. They expect to publish findings in fall 2014.

More Information:

Undergraduate Trio Makes “30 Under 30” List for Energy Innovation

Forbes magazine included a team of three engineering undergraduates on its annual “30 Under 30” list in the Energy and Industry category for developing a device that can significantly improve the efficiency and reliability of large-scale solar installations. Darren Hau, ’15 (electrical engineering), Daniel Maren, ’16 (computer science), and Andrew Ponec, ’15 (materials science and engineering) founded Dragonfly Systems and are working to commercialize their invention. Dragonfly’s device recaptures electricity lost due to photovoltaic module mismatch in new or existing solar power plants. The basic idea came to them when they were classmates in the introductory seminar Green Electronics taught by Bill Dally, a professor (research) in the School of Engineering, who remains an adviser to the startup. Their research project was funded by an Undergraduate Advising and Research small grant, and they later won a TomKat Innovation Transfer award. The students say that TomKat’s executive director of innovation transfer, Brian Bartholomeusz, has helped connect them to various people in the solar industry. The team also earned third place and $20,000 at the Department of Energy’s 2013 competition for student cleantech business plans.

More Information:
http://tomkat.stanford.edu/innovation/innovation_awardee_dragonfly.php
Building Level Sustainability Program Sees Record Participation

The Building Level Sustainability Program (BLSP) addresses the measurable impact of individual actions on efficient resource consumption. The program currently engages 71 campus buildings, with repeated participation by many buildings, illustrating not only the eagerness of participants to continually improve, but also the ability of BLSP to engage buildings over the long term. The program also partnered with Peninsula Sanitary Service, Inc./Stanford Recycling this year to promote the new campus deskside recycling program, which began rollout in summer 2014. With these and other measures, such as use of CFL lightbulbs, computer power management, and voluntary composting, building occupants across campus are working together to create a more sustainable community. BLSP has continually improved to better serve the Stanford community. In addition to step-by-step How-to Guides, the ERP Express rebates, and formalized training for staff, BLSP this year provided a wider array of aerators to install at no cost to help with water conservation, explored VendingMiser installations, and created display boards to help occupants understand which materials to put in each type of waste bin. The BLSP Resource Center, an online collection of materials, will be available to the campus community beginning in fiscal year 2015.

More Information:
http://sustainable.stanford.edu/BuildingLevelSustainability

Stanford Wins Best Workplaces for Commuters Gold Award

Best Workplaces for Commuters awarded Stanford’s Transportation Demand Management program its Gold award in the university category. Stanford was one of 31 employers nationwide recognized in the organization’s Race to Excellence. Best Workplaces for Commuters works to encourage sustainable transportation innovation. The awards recognize organizations that have taken exemplary steps, such as offering vanpool and transit benefits, to facilitate transportation alternatives for their employees.

“The annual Race to Excellence provides national recognition for employers, supporting agencies, sites and Universities who offer high-level commuter benefits,” said Julie Bond, the National Center for Transit Research’s national program manager for Best Workplaces for Commuters. “Offering commuter benefits is a win-win situation for employees who change their commuting habits to save time, money and stress, and for employers who gain a competitive edge in employee recruitment and retention.”

More Information:
http://www.bestworkplaces.org/race-to-excellence-2/2010-race-winners
Provost Approves Solar Panel Installation

Provost John Etchemendy approved an initiative to install solar panels on a parking structure and 12 other buildings across campus as a companion project to the Stanford Energy System Innovations (SESI) initiative. The new panels will up the percentage of energy derived from photovoltaic cells from under 1% to about 10% of the campus’s overall energy consumption. SESI features an electricity-based power plant that will open up options to transition from fossil-fuel-based to open-source technology. The solar panels’ installation will supplement the system by expanding its range of clean energy sources. Student groups like the Stanford Solar and Wind Energy Project and Students for a Sustainable Stanford have assisted in developing the panel project. SESI is scheduled to finish construction and come online in April 2015, and the panels will be installed shortly after that.

More Information:
http://sustainable.stanford.edu/energy_initiatives

Energy and Water Wars Encourage Conservation Through Friendly Competition

During spring quarter, the Green Living Council (GLC), in concert with Residential & Dining Enterprises (R&DE) Student Housing and the Office of Sustainability, organized Stanford’s third annual participation in Campus Conservation Nationals, a nationwide college and university competition to conserve electricity and water.

Select undergraduate residences participated in two monthlong competitions. Energy Wars pitted the Wilbur and Stern complexes against each other in conserving electricity. Meanwhile, Water Wars focused on water conservation in Florence Moore, with East and West FloMo competing for the title of “biggest loser.” Both competitions used real-time dashboards to inform and engage residents while providing metrics. A concerted outreach campaign included emails, kick-off parties, online pledges, and related events. The competitions were a success, saving 4,500 kilowatt-hours of energy and 11,000 gallons of water. The GLC is already planning for next year’s competitions with ideas to make them even bigger and better.

More Information:
http://sustainable.stanford.edu/energyandwaterwars
Keys to Sustainability Connects Students with Opportunities

The Office of Sustainability partnered with more than 20 academic departments and student organizations to host the third annual Keys to Sustainability engagement fair in Tresidder Union. The event aims to inspire student exploration of environmental sustainability issues by featuring engagement opportunities available through academic pursuits and campus action. Students were provided information on relevant student groups, majors, courses, off-campus programs, and funding opportunities. Keynote speaker Richard Neve, deputy director of the Earth Systems Program, encouraged students to find ways to explore their passion for sustainability in whatever department or program they chose.

This annual event will continue to equip students with the resources and tools to enjoy and actively participate in the growing sustainability scene at Stanford. It also serves as an opportunity for the many sustainability groups and programs on campus to converge, share knowledge, and celebrate the thriving culture of sustainability at Stanford.

More Information:
http://sustainable.stanford.edu/welcome_reception

America’s Natural Gas System Is Leaky and in Need of a Fix

The first thorough comparison of evidence for natural gas system leaks, led by energy resources engineering Assistant Professor Adam Brandt, confirms that organizations including the Environmental Protection Agency (EPA) have underestimated U.S. methane emissions generally, as well as those from the natural gas industry specifically.

Natural gas consists predominantly of methane. Even small leaks are important because methane is a potent greenhouse gas—about 30 times more potent than carbon dioxide. A study, “Methane Leakage from North American Natural Gas Systems,” published in the journal Science, synthesizes diverse findings from more than 200 studies ranging in scope from local gas-processing plants to total emissions from the United States and Canada.

“People who go out and actually measure methane pretty consistently find more emissions than we expect,” said Brandt. “Atmospheric tests covering the entire country indicate emissions around 50% more than EPA estimates. And that’s a moderate estimate.”

More Information:
Water Conservation Is a Top Priority in R&DE Student Housing

In response to the drought emergency announced by Governor Brown in January, Residential & Dining Enterprises (R&DE) Student Housing launched an awareness campaign calling on students to reduce their water consumption by 15 million gallons, 10% of last year’s consumption. Students were encouraged to do this by reducing shower times to five minutes or less, washing only full loads of laundry, turning off faucets unless needed when brushing their teeth or washing dishes, and reporting water leaks immediately. This campaign was later incorporated into the Water Wise campaign organized through the Office of Sustainability, which urged many of the same behavior changes throughout the greater campus community. Additionally, R&DE Student Housing, in partnership with a professor from the Woods Institute and a graduate student from the School of Education, initiated an experiment to measure the effectiveness of water reduction messaging. This study focuses on laundry rooms in two graduate residences, with two similar residences constituting a control group. If found to be successful, the messaging developed during this campaign will be used throughout R&DE Student Housing.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/housing/living/sustainable-living

Arbor Day Foundation Honors Stanford as a 2013 Tree Campus USA School

The Arbor Day Foundation named Stanford University a 2013 Tree Campus USA school. To obtain this distinction, Stanford had to meet five core standards for effective campus forest management: a tree advisory committee, a campus tree care plan, dedicated annual expenditures for the campus tree program, an Arbor Day observance, and a student service-learning project.

At Stanford, trees and their canopies play a significant role in campus sustainability. The University Architect/Campus Planning and Design office and the Buildings and Grounds Maintenance department work together to manage and maintain the thousands of trees on Stanford’s grounds. Since 1996, Stanford’s tree transplant program has moved and transplanted more than 1,000 campus trees, including oaks, olives, redwoods, pines, and cedars. Rather than demolishing trees at campus construction sites, Stanford boxes them, moves them to temporary homes, and returns them to the sites once construction is complete, with an 85% survival rate. The trees provide shade for people, habitats for birds and squirrels, and landscapes that help new buildings “settle into” their environs.

More Information:
http://www.arborday.org/programs/treeCampusUSA/index.cfm
Stanford Team Leads IPCC Climate Report

Led by Stanford professor Chris Field, a working group of hundreds of international scientists, including Stanford professors Terry Root, David Lobell, and Noah Diffenbaugh, finalized a 2,000-page report as part of the massive, three-part United Nations Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report. The document, nearly five years in the making, details a consensus view on the current state and fate of the world’s climate. Field led a federally funded office on campus, with five scientists and four technical staffers. The university also provided library research privileges for IPCC authors from developing countries. The report was intended to serve as a foundation for international negotiations aimed at making ambitious emissions cuts as part of a legal agreement to be signed in early 2015. Stanford faculty have also been key contributors to the IPCC’s previous four assessment reports. Another IPCC working group report, released in April 2014, had three writers and editors from Stanford: Charles Kolstad, Lawrence Goulder, and John Weyant.

More Information:

Stanford Further Reduces Waste During RecycleMania Competition

Reducing its waste footprint is a priority at Stanford; while the campus diverts an impressive 64% of waste, more than half of the rest could also be reused, recycled, or composted. This year, in conjunction with the national RecycleMania competition, Stanford challenged all campus members to make pledges, attend RecycleMania events, become sustainability leaders in the workplace, and learn more about Stanford’s waste reduction, reuse, recycling, and composting program. As a result, Stanford was able to improve upon its overall waste benchmarking numbers, achieving its best ranking in all eight RecycleMania categories. Stanford scored in the top 20 in six of the eight and beat Cal in all but one.

Students and staff joined together to reduce Stanford’s waste footprint by pledging online to waste less and recycle and compost more. They also participated in several events, including Caught Green Handed, recycling and composting facility tours, and the RecycleMania Women’s Basketball Night, which included a trivia contest and a half-time contest. Peninsula Sanitary Service, Inc. (PSSI)/Stanford Recycling produced a video, “Recycling at Stanford,” to increase campus awareness of the university’s waste minimization programs. The Office of Sustainability partnered with Buildings and Grounds Management and PSSI/Stanford Recycling to offer two staff trainings (SST 2000, Best Practices in Waste Reduction). These training courses provide tools and resources to help Stanford employees act as sustainable-workplace leaders.

More Information:
http://sustainable.stanford.edu/recyclemania
SES1 Implementation Forges Ahead

The drought in California had one silver lining: unanticipated headway on the Stanford Energy System Innovations (SESI) pipe installation project. The installation of 22 miles of underground pipes was 85% complete in March 2014, significantly ahead of schedule. This advanced progress allowed Lands, Buildings & Real Estate to complete by early fall 2014. This piping installation is part of the greater SESI project. Once SESI comes online in spring 2015, this revolutionary energy system will reduce Stanford’s carbon emissions by 50% and water consumption by 15%. The SESI website has a webcam and construction schedule with up-to-date progress reports for anyone interested in the status of the project.

More Information:
http://sesi.stanford.edu

Vail Global Energy Forum Discusses a Model for U.S. Oil and Gas Development

The Vail Global Energy Forum is organized by Stanford’s Precourt Institute for Energy and Precourt Energy Efficiency Center, in conjunction with the Vail Valley Foundation. This year the conference discussed how Colorado’s collaborative approach to its tough new rules to cut air pollution from oil and gas operations could be a model for the rest of the country. The state involved three large gas companies in developing the regulations, overcoming the skepticism of some other energy companies and environmentalists. Top executives of the three companies described the process in a panel discussion with the president of the Environmental Defense Fund, which also helped write the rules, and Governor John Hickenlooper. The new requirements—the strictest in the nation—should keep 93,500 tons per day of volatile organic compounds and 65,000 tons per year of methane from escaping into the atmosphere. The conference also featured talks by George Shultz; Jim Sweeney, director of the Precourt Energy Efficiency Center; Mark Zoback, a Stanford expert on hydraulic fracturing; the Department of Mechanical Engineering’s Arun Majumdar; and Alan Murray, president of the Pew Research Group.

More Information:
New Center for Wastewater Recovery Research Breaks Ground on Campus

Craig Criddle and Richard Luthy, professors of civil and environmental engineering, broke ground on the William and Cloy Codiga Resource Recovery Center. The center, named after the Stanford alumnus and his wife who committed funding that will allow the project to move forward, will test innovative technologies for the recovery of clean water, energy, and valuable materials from wastewater. The goal is to accelerate commercial development of promising ideas for resource recovery by testing and optimizing new wastewater treatment processes at a scale that is credible for investment. The center, which represents the culmination of years of study and planning by university faculty, is due to begin operation in 2015. Initially, it will demonstrate that nonpotable water (suitable for watering grounds and washing vehicles) can be recovered from wastewater using systems that are essentially self-powered from materials in the wastewater. After additional testing and optimization, the system could become a key component of a recycled-water plant serving the Stanford campus.

Criddle and Luthy, both senior fellows at the Stanford Woods Institute for the Environment, were instrumental to the project. Both have received funding for related research through the Environmental Venture Projects program and have discussed their work at the Woods-sponsored Uncommon Dialogues.

More Information:

Dr. Jennifer A. Dionne Receives Presidential Early Career Award

Stanford’s Dr. Jennifer A. Dionne was one of 102 scientists and engineers honored by President Barack Obama at the White House on April 14.

Dionne received the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers. She was given this award for her pioneering contributions to the control of light-matter interactions on deeply sub-wavelength scales; innovative work on nanoscale physical, chemical, and biological phenomena; and enthusiastic leadership and service.

Dionne and her research team have been working to better control how sunlight interacts with various materials. Her goal is to develop new materials that can convert infrared sunlight rays to different frequencies so that conventional photovoltaic (PV) or solar fuel systems can absorb and convert the rays into energy. This advancement has the potential to greatly boost solar efficiency, in some cases more than doubling it.

More Information:

Electrical engineering Professor Shanhui Fan has helped create a device from very sustainable materials to boost the output of solar cells by converting waste heat into additional electricity. Thermophotovoltaic devices have two main parts: an absorber for capturing the heat normally wasted by pure photovoltaic cells, and an emitter for converting that heat into infrared light, which is beamed back to the photovoltaic cell. Earlier emitter prototypes fell apart at the very high temperatures required for their operation. The new one does not. Fan, working with a materials scientist at the University of Illinois and a chemical engineer at North Carolina State University, coated their tungsten emitter with an ultrathin layer of a ceramic called hafnium dioxide. Both tungsten and hafnium are abundant and inexpensive. The efficiency gain could reduce the materials required for new solar installations and help solar power compete economically with electricity generated by fossil fuels.

More Information:
http://web.stanford.edu/group/fan/

Standing Room Only for Fracking Demystified Panel

Natural gas and hydraulic fracturing (fracking) have had a significant impact on the U.S. economy and will undoubtedly play a large role in future energy policy. On April 14, the Climate and Energy Subgroup of Students for a Sustainable Stanford brought together over 300 campus and community members for an interdisciplinary panel on fracking. Fracking Demystified explored the opportunities, challenges, and potential future role of hydraulic fracturing in America’s energy economy. Pam Matson, dean of the School of Earth Sciences, moderated the panel of faculty members representing the geophysics, civil and environmental engineering, Earth sciences, energy resources engineering, and energy and environmental law disciplines. Each panelist offered a unique perspective on whether natural gas should or should not serve as the bridge fuel between today’s and tomorrow’s energy resources.

Fracking Demystified was Stanford’s first interdisciplinary event focused on hydraulic fracturing. “Fracking has become such a big issue in terms of energy, environmental justice, and local sustainability. Lots of faculty are conducting research on the topic, but we wanted to see this issue develop into more of a conversation on campus,” said Emma Fisher, Climate and Energy Subgroup co-leader.

More Information:
http://studentsforasustainablestanford.weebly.com/
Stanford Enacts Water Reduction Plan; Water Wise Launches

As part of its response to California’s ongoing drought, Stanford announced a water reduction plan above and beyond its existing water efficiency and conservation efforts following a detailed analysis of campus water use. The goal of the plan is to reduce water use an additional 5%. To reach that goal, Stanford identified water-saving measures such as shutting off campus fountains, addressing leaks, calibrating water fixtures, optimizing irrigation systems, retrofitting high-use fixtures, and installing smart, weather-based irrigation controllers.

Stanford has begun implementing many of these steps, including turning off and draining its 18 fountains. It has also asked campus community members to chip in. The Office of Sustainability rolled out a campus-wide campaign called Water Wise to encourage water conservation on an individual level. The office tabled about water conservation at six campus events and distributed over 350 shower timers. In less than eight weeks, over 650 faculty, staff, and students pledged to take shorter showers, use smarter laundry practices, reduce irrigation, and report leaks.

More Information:
http://sustainable.stanford.edu/waterwise

President Hennessy Focuses Campus Attention on Sustainability Progress

Sustainability progress—both academic and operational—was a major focus of Stanford President John Hennessy’s annual address to the Academic Council on April 17, 2014. Leaders of academic, operational, and programmatic sustainability efforts joined Hennessy in a panel discussion of this progress. The panel included Fahmida Ahmed, director of the Office of Sustainability; Joseph Stagner, executive director of Sustainability and Energy Management; Shirley Everett, senior associate vice provost of Residential and Dining Enterprises; and Pamela Matson, dean of the School of Earth Sciences. Panelists discussed the curricular growth related to sustainability theory and practice in Stanford’s schools and institutes; operational milestones in reducing the campus’s carbon, water, and transit footprint despite growth; sustainability programs implemented via student living and dining experiences; and sustainability assessment in relation to trends in higher education and industry. In his concluding remarks, Hennessy stated, “For this university to operate in the most sustainable way possible depends on the action of all of us as individuals. We want to be a model.”

More Information:
Climate Week Highlights Urgency and Opportunity of Climate Change in Business World

Students in Stanford’s Graduate School of Business (GSB) hosted the first-ever Climate Week on April 14-18. During the days leading up to Stanford’s observance of Earth Day, 11 separate events highlighted the urgency and opportunity of climate change and engaged students in thinking about solutions. Through a mix of speakers (including George Shultz, Gro Brundtland, and Cathy Zoi) and events, student organizers taught their classmates about this global concern and enabled them to take immediate action by offsetting their carbon emissions.

Climate Week was truly an example of cross-campus collaboration. It was funded by the Stanford Green Fund and the Emmett Interdisciplinary Program on Environment and Resources (E-IPER) and benefited from partnerships with the Steyer-Taylor Center for Energy Policy and Finance, the Precourt Institute for Energy, the Stanford Energy Seminar, the Office of Sustainability, the Center for Social Innovation, E-IPER, the Sustainable Business Club, the GSB Energy Club, the Stanford Energy Club, the GSB Food & Agribusiness Club, and the MBA Student Association Athletic Committee.

More Information:
http://gsbclimateweek.weebly.com/

Students Increase Sustainability Awareness Through Campus Carnival

To increase awareness about Stanford’s upcoming Earth Week activities, Students for a Sustainable Stanford (SSS) hosted a full day of festivities for the campus community. During the afternoon, the free SolPlay Field Day at Wilbur Field attracted nearly 300 attendees with games reminiscent of childhood. Guests learned about environmental issues while playing with bubbles, giant parachutes, and potato sacks. Along with the traditional games and competitions from yesteryear, SolPlay Field Day featured environmentally themed educational game booths, the Stanford Solar Car, and sustainable food from local food trucks. In the evening, students gathered at Columbae House, where two student bands helped the first annual SolPlay conclude with a bang.

SSS organized SolPlay Field Day and Concert Night to attract new participants to Stanford’s sustainability movement. While guests enjoyed the activities, SSS members announced their partner organizations’ upcoming environmental events and shared information on the different ways students can get involved in sustainability on campus.

More Information:
http://studentsforasustainablestanford.weebly.com/
Study Reveals Trends and Best Practices in Ultrathin Solar Cells

Researchers around the world are designing ultrathin solar cells to cut material costs and improve efficiency. How do they maximize the collisions between photons and electrons in the thinnest possible layers of photovoltaic materials? One trick is to create photovoltaic nanostructures that behave like a molecular hall of mirrors. “We want to make sure light spends more quality time inside a solar cell,” said Mark Brongersma, a professor of materials science and engineering.

Brongersma and two co-authors from Stanford surveyed 109 recent scientific papers on a basic theme: how to increase efficiency within a solar cell’s photovoltaic crystals, where light meets matter to make energy. The resulting article in *Nature Materials* provided a high-level view of how scientists are trying to design structures to facilitate interactions between the infinitesimal instigators of solar current, the photons and the electrons.

“A lot of the excitement now is about using the principles of photonics to manage light waves in the most efficient way,” Associate Professor Shanhui Fan said. “There are perhaps hundreds of groups in the world working on this.”

More Information:

First Annual Water Efficiency & Innovation Film Competition Honors Tale of Hydro Warrior

On Earth Day 2014, Spenser Linney won the first annual Water Efficiency & Innovation Film Competition. His film, “The Tale of a Hydro Warrior,” spotlighted current attitudes toward water consumption. The competition, organized by Stanford Utilities Division Water Conservation staff, challenged students to create imaginative and/or humorous videos communicating the need for water efficiency.

In the film, Hydro Warrior fights to conserve water by observing the daily activities of those around him. His peers reject his attempts to provide insightful help. Torn and broken by their ignorance, he allows the consequences of overconsumption to unfold. Aside from the silly banter, the video forces the observer to consider: What kind of extreme conditions are we waiting for before we take action and respect the water resources so basic to our lives?

Stanford Utilities Division’s Water Efficiency website provides the latest news about water efficiency (specifically in California and on campus), detailed statistics about campus-wide efficiency efforts, and information about available rebates.

More Information:
http://lbre.stanford.edu/sem/Water_Efficiency
https://www.youtube.com/watch?v=CiDrsOpyey8&feature=youtu.be
Stanford Celebrates Sustainability on Earth Day

On Earth Day—Tuesday, April 22—faculty, staff, and students came together at the Science and Engineering Quad to celebrate and learn about sustainability at Stanford. More than 45 campus departments, groups, and entities; 60+ presenters; and 20+ volunteers hosted over 1,200 people at the four-hour Celebrating Sustainability festival. Guests enjoyed food, live music, games, displays, giveaways, and plenty of fun! Activities were grouped around the topics of water, energy, waste, food, transportation, and green living. In particular, the event highlighted green events and water conservation practices at Stanford.

More Information:
http://ssu.stanford.edu/celebrate-2014

Former EPA Secretary Discusses Her Sustainability Journey from Public Sector to Silicon Valley

The private sector can and should innovate and unleash a wide range of environmental solutions. That was the message Lisa Jackson, former administrator of the U.S. Environmental Protection Agency (EPA), brought to Stanford on April 22 for the second annual Stephen H. Schneider Memorial Lecture in honor of the Stanford professor, Stanford Woods Institute senior fellow, and world-renowned climate scientist who died in 2010.

“Policy solutions should always follow the technology solutions,” Jackson told a large audience in Stanford’s Memorial Auditorium, including former Deputy Secretary of the Interior David Hayes and former Secretary of Energy Steven Chu, both currently professors at Stanford. “California is a great example. The solutions are there. The policy needs to follow.”

Jackson, a public servant for 26 years, joined Apple last June as vice president of environmental initiatives. She devoted much of her talk to describing Apple’s efforts to live up to one of its mantras: “We want to leave the world better than we found it.”

More Information:
R&DE Hosts Earth Day Dinner and Food Revolution Day

Arrillaga Family Dining Commons hosted the second annual Earth Day dinner on April 22. The dinner was a great success, with over 1,000 students, staff, and faculty attending. The dining hall was decorated with potted plants and fruit trees—later planted in the organic dining hall gardens—to resemble a farmers’ market. The menu featured delicious sustainable options, such as wild Alaskan halibut, local mustard greens tart, and local sweet potato bisque with honey-orange croutons. Eleven sustainable vendors for Residential & Dining Enterprises (R&DE) plus one student group hosted tables to meet students and answer questions. R&DE Stanford Dining’s garden managers hosted an herb seed planting table.

On May 16, for the second year in a row, R&DE Stanford Dining participated in Jamie Oliver’s Food Revolution Day, a global day of action to encourage people to learn to cook healthy, sustainable food. This year, Food Revolution Day coincided with R&DE Stanford Dining’s Spring Faire, which included a food truck with a green roof. Chef David Lott gave healthy, vegetarian cooking demonstrations and samples to the Stanford community to get them excited about healthy, sustainable food and cooking.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/sustainable-food-program

ASSU Creates Energy and Environment Committee

During the 2014 election season, Associated Students of Stanford University (ASSU) recruited student members to be part of a new Energy and Environment Action Committee. This committee was established to serve as a resource to student groups and to evaluate and develop energy and environmental initiatives on campus.

The Energy and Environment Action Committee will have three primary duties. First, it will act as a liaison between student groups and university administration and leadership. Second, it will facilitate communication between energy and sustainability groups on campus. Third, it will produce documents that clearly and concisely explain energy and environmental issues on campus.

The committee will have a website, which it hopes will serve as the student reference on all campus energy and environmental issues (be they divestment, Stanford Energy System Innovations, or building efficiency numbers). It also hopes to serve as the primary source for related information.

More Information:
http://assu.stanford.edu/wordpress/
RD&E’s Sustainable Food Program Launches Seed Library

The Residential & Dining Enterprises (R&DE) Stanford Dining Sustainable Food Program launched Stanford’s first seed library in spring 2014. The library was created and run by Sustainable Stanford interns Adrienne Pollack, Cassie Montoya, and Julia Tsai. Adrienne researched other seed libraries and created a draft proposal as a final project for her sustainable-agriculture class with Patrick Archie. She then worked with Dara Silverstein, R&DE’s Sustainable Food Program manager, to bring the project to life. The seed library was an immediate success, with over 80 staff, students, and faculty joining.

The seed library gave out 10 varieties of heirloom seeds for free—from ‘Cherokee Purple’ tomatoes to ‘Bloody Butcher’ corn. Many of the seeds were harvested from plants in R&DE Stanford Dining’s organic dining hall gardens. The students also created handouts for each type of seed, instructing gardeners on how to plant, take care of, and harvest their plants.

Membership in the seed library is free, but members are asked to let a few of their plants go to seed, save the seeds, and return them to the library, to ensure it does not become depleted.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/dining/sustainable-food-program

Students Make Reuse Fashionable

On May 8, student-run fashion magazine MINT partnered with Students for a Sustainable Stanford (SSS) to host the Thrifted Fashion Show on Wilbur Field. Over 100 attendees watched Stanford students walk the runway in clothes that were purchased from thrift stores and styled into high-fashion outfits. By showing how fashionable secondhand clothing can be, SSS and MINT hope to reduce the amount of new clothing purchased by students.

Leading up to the show, MINT drew attention to the connections between fashion and sustainability through its online marketing. Facts like “It takes 400 gallons of water to grow the cotton for a single t-shirt” were featured on the event’s Facebook page. The Thrifted Fashion Show clearly demonstrated that with a little creativity, sustainable fashion does not need to be expensive or inaccessible to college students.

More Information:
mintmag.stanford.edu
https://www.facebook.com/events/771993612833812/
R&DE Hosts Fifth Consecutive Healthy Taste of Stanford

Residential & Dining Enterprises (R&DE) Stanford Hospitality and Auxiliaries (SHA) and BeWell proudly hosted the fifth annual Healthy Taste of Stanford. The event focuses on healthy, organic, and sustainable food options at Stanford. This year, the size of the fair was doubled to 55 tables, and SHA added a farmers’ market and educational tables featuring Stanford groups such as BeWell and the Stanford Food Project.

Guests were able to sample healthy and sustainable food options from vendors such as Pie Ranch, a local, organic farm that focuses on education, and Marianne’s Ice Cream, a Santa Cruz–based, family-owned company whose ice cream will be served at the Stanford Stadium.

The new farmers’ market featured Cache Creek lavender products, Wings of Nature honey products, and organic produce from local farms.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/hospitality/

Stanford’s Research Computing Center Saves Energy While Increasing Computing Potential

Sustainable technology meets cutting-edge computing at the new Stanford Research Computing Center (SRCC). The SRCC expands Stanford’s computational resources, supporting university researchers’ growing computational needs. It also saves energy and furthers Stanford’s leadership in sustainability.

The SRCC serves as the campus’s central computing center. Located at SLAC National Accelerator Laboratory, it can house up to 180 refrigerator-sized racks of servers. It uses an entirely air-driven cooling system estimated to save $1 million in annual energy costs. The system uses outside air, fans, and cold-water pipes to cool the room of sensitive, heat-producing servers. Outside air comes in through the roof, then passes through industrial-sized fans and into the server room. Back-to-back rows of servers optimized for efficient air flow take the cool air in, then send heated air out into a sealed alleyway between rows.

More Information:
Inaugural Stanford Event Highlights Business as Powerful Force for Sustainability

U.S. Secretary of the Interior Sally Jewell gave the keynote address at the inaugural Stanford Woods Institute for the Environment Business of Sustainability Summit. The summit, an initiative to engage business on sustainability issues, brought together leaders from 47 companies, including CEOs and heads of research and development, engineering, global manufacturing, product development, innovation, finance, technology, public policy, and government relations. Through a moderated CEO roundtable, brief presentations by corporate sustainability officers and business unit heads, and various other opportunities for dialogue, participants discussed their visions of how to make sustainability integral to corporate mission, values, and strategy. They also had the opportunity to hear from Woods-affiliated faculty about innovative environmental research findings, and to meet with more than 80 student leaders with an environmental focus—postdoctoral, graduate, and undergraduate scholars from all seven Stanford schools. The event represented a new chapter in the institute’s work to share ideas and perspectives on how organizations can advance sustainability on their own, with academic partners, and by collaborating across sectors.

More Information:

New Energy Research Website Showcases Work Across Campus

As a leading research institution in science and technology, Stanford is tackling one of the most prominent concerns of our generation—energy. Stanford’s vast network of world-class researchers includes more than 200 faculty in 22 academic departments and more than two dozen independent labs and programs working to solve our greatest energy concerns. A new website showcases this research, highlighting examples of the most recent advancements in one convenient location.

For ease of use, the site divides Stanford’s energy research into four focus areas: Making New Energy, Real-World Solutions, Influencing Energy Policies, and Clean Energy Starts at Home. Links lead to more information on projects within each area.

More Information:
http://news.stanford.edu/features/energy/
Stanford Divests from Coal Companies

Acting on a recommendation of Stanford’s Advisory Panel on Investment Responsibility and Licensing, the Board of Trustees announced in May that Stanford will not make direct investments in coal-mining companies. The move reflects the availability of alternate energy sources with lower greenhouse gas emissions than coal and is in line with Stanford’s Statement on Investment Responsibility. “The university’s review has concluded that coal is one of the most carbon-intensive methods of energy generation and that other sources can be readily substituted for it,” said Stanford President John Hennessy. “Moving away from coal in the investment context is a small, but constructive, step while work continues, at Stanford and elsewhere, to develop broadly viable sustainable energy solutions for the future.”

More Information:

Energy Showcase Brings Global Perspective to Campus Community

At the Stanford Energy Club’s third annual Spring Energy Showcase, a three-part interactive speaker series focused on different facets of energy access in the developing world. Finance Night, Policy Night, and Technology Night each featured a speaker panel, followed by a reception where students could network with professionals in these fields.

The interdisciplinary scope of this year’s showcase attracted well over 100 students and professionals to learn about the challenges and opportunities in energy access. A recurring theme was the importance of understanding local culture on an individual and institutional level. From handling informal contracts to understanding the ergonomics of cookstoves to balancing economic development and environmental degradation, the speakers agreed that user empathy is key. Speakers presented an optimistic outlook on the future of energy access, citing the rise of enabling technologies such as mobile money, the steady decrease in costs for photovoltaic systems, and the growing interest from technically qualified students.

More Information:
http://energyclub.stanford.edu/spring-recap-energy-showcase-finance-night/
Stanford Women Leaders in Sustainability Launch Special Event

One hundred and fifty Stanford women who are current or emerging leaders in sustainability gathered to honor and be inspired by Gro Harlem Brundtland, deputy chair of The Elders, former prime minister of Norway, and former head of the World Health Organization. Eighteen Stanford centers and programs—covering energy, Earth systems, food, global health, sustainable development, poverty, inequality, innovation, oceans, rural education, natural capital, and the environment—participated in the event, which was organized to explore the attributes of a transformative leader. Dr. Brundtland, in conversation with Dean Pamela Matson and Professor Sally Benson, shared her perspective on what has allowed her to be so successful, as well as what attributes other women will need to make significant contributions to a sustainable future.

Dr. Brundtland served as the Mimi and Peter E. Haas Distinguished Visitor for spring 2014 at Stanford. She is also a medical doctor who champions health as a human right. Dr. Brundtland put sustainable development on the international agenda through her leadership of the Brundtland Commission and the publication of “Our Common Future.”

More Information:
https://energy.stanford.edu/

Obama Administration’s Environmental Policy Leader Speaks at Silicon Valley Energy Summit at Stanford

The Obama administration’s moves to curb U.S. emissions of greenhouse gases (GHGs) will provide credibility as it pursues international agreement on the issue, the acting chair of the White House Council on Environmental Quality, Michael Boots, said at the Silicon Valley Energy Summit. “The president feels very, very strongly that we need to do as much as we can on the domestic front to send a strong signal before we ask others to do the same,” Boots said. The administration is working toward a leading role at the UN Climate Change Conference in Paris in 2015. Simultaneously, it is holding bilateral conversations with China, India, Brazil, and a few other major GHG-emitting countries that have not taken strong climate action. Three weeks after Boots’s Stanford talk, the United States and China announced eight partnership pacts to cut GHGs. The Precourt Energy Efficiency Center’s annual conference also featured sustainable-energy leaders from academia, government, finance, startups, and large companies such as Microsoft, Google, eBay, Oracle, and AT&T.

More Information:
http://peec.stanford.edu/events/2014/sves/
Breakthrough Provides Picture of Underground Water

In a development that could revolutionize the management of precious groundwater around the world, Stanford researchers have pioneered the use of satellites to accurately measure levels of water stored hundreds of feet below ground. Their findings were published in *Water Resources Research*.

Groundwater provides 25% to 40% of all drinking water worldwide and is the primary source of freshwater in many arid countries, according to the National Groundwater Association. About 60% of all withdrawn groundwater goes to crop irrigation. In the United States, the number is closer to 70%. In much of the world, however, underground reservoirs, or aquifers, are poorly managed and rapidly depleted due to a lack of water-level data. Developing useful groundwater models, availability predictions, and water budgets is very challenging.

The lead author is Jessica Reeves, a postdoctoral scholar in geophysics. Rosemary Knight, a professor in the School of Earth Sciences and senior fellow, by courtesy, at the Stanford Woods Institute for the Environment, is co-author.

More Information:
https://pangea.stanford.edu/news/breakthrough-provides-picture-underground-water

Give & Go Campaign Diverts Tons of Reusables and Recyclables from Landfill

Residential & Dining Enterprises (R&DE) Student Housing organized the second annual Give & Go Move-Out Campaign this year, encouraging students to divert their unwanted reusable items from the landfill by donating to those in need through the campus partnership with Goodwill, Inc. Students simply placed their items in 200 barrels conveniently located near residences and laundry rooms throughout R&DE Student Housing. This year “Give & Go zones” were added to enable the recycling and donation of large, bulky items such as mattresses, mini-fridges, and futons in screened-in locations. Additionally, R&DE formed partnerships with the Black Staff Alliance, Stanford Parking & Transportation Services, and Better World Books to co-promote their donation drives, which occurred simultaneously with Give & Go.

Thanks to the hard work of the students and staff working on Give & Go, over 52.5 metric tons of materials, including clothing, shoes, books, appliances, furniture, and bikes, were diverted from the landfill and placed for reuse. This equates to about 31% of the extra waste generated in June. It is estimated that the campaign also saved R&DE over $5,000 in landfill costs and over $19,000 in labor costs.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/housing/give-go
Sustainable Stanford Interns Make an Impact on Campus

Nearly 25 students participated in the inaugural year of the Sustainable Stanford Internship Program. This centrally coordinated program provides graduate and undergraduate students paid opportunities to gain hands-on experience implementing programs that influence on-campus sustainability. Working directly with campus sustainability staff, interns conduct research, implement projects, and/or reach out to their peers on a diverse set of sustainability topics. In addition to gaining experience in sustainability project design and implementation, interns also gain exposure to sustainability careers.

This year’s projects included identifying successful student marketing techniques, organizing sustainable cooking classes, developing a seed library, tending organic gardens, auditing waste in the dining halls, developing waste signage for dining locations, collecting and donating used goods during campus move-out, identifying energy consumption trends in aging residence halls, and piloting a paper towel composting program in dorm bathrooms.

More Information:
http://sustainable.stanford.edu/internships

George Shultz Co-Authors Book About Energy R&D at Stanford and MIT

George Shultz, head of the Stanford Hoover Institution’s Task Force on Energy Policy, and Robert Armstrong, director of the MIT Energy Initiative, published a book about five research and development efforts from U.S. universities that offer a cleaner, less expensive, and more secure national energy system. *Game Changers: Energy on the Move* draws from the efforts of Stanford, MIT, and other research universities to describe some of the innovations that are transforming our energy landscape: solar photovoltaics, grid-scale electricity storage, natural gas from shale, electric cars, and LED lighting. For each innovation, the book details the benefits of individual research and development projects, benefits that are available today, near at hand, or on the horizon. The book also surveys potentially game-changing energy technologies being used by the U.S. Army, Navy, Marine Corps, and Air Force on bases and in forward deployments. Contributing authors include the Task Force on Energy Policy’s director of research, Jeremy Carl; research analyst David Fedor; and member David Slayton, as well as MIT’s Francis O’Sullivan and Rebecca Marshall-Howarth.

More Information:
http://www.hooverpress.org/productdetails.cfm?PC=1614
http://www.energygamechangers.org/
Stanford Offers Pilot Go Pass Programs for Graduate Students and Postdocs

In June 2014, Stanford announced two Go Pass pilot programs, one for eligible off-campus graduate students and one for eligible off-campus postdoctoral scholars. Go Passes allow unlimited travel on Caltrain between all zones and provide a substantial savings compared with daily or monthly tickets.

The prorated cost for the 2014 pass, valid from Sept. 1 through Dec. 31, will be $55. The cost for the 2015 annual pass, valid from Jan. 1 through Dec. 31, will be $180. Both pilot programs are approved through December 2016. Those eligible for the Caltrain Go Pass also could receive up to $300 per year in Clean Air Cash by joining the Stanford Commute Club, which would more than offset the out-of-pocket expense for many students and postdocs.

The Go Pass continues to be available for free to all eligible university and hospital employees.

More Information:
http://transportation.stanford.edu/alt_transportation/EcoPass.shtml

Compost Collection Expands to All Student Residences, Doubling Collection Points

Residential & Dining Enterprises (R&DE) Student Housing, working with Peninsula Sanitary Service, Inc. (PSSI) / Stanford Recycling, placed compost carts in all graduate housing waste corrals and expanded compost collection to all kitchens in undergraduate housing. All student residences with kitchens now have convenient access to composting food scraps, an increase of 80% over last year!

Challenges remain for collecting food scraps in other common areas and student rooms. Only small amounts of compostable food waste are generated in dormitory-style undergraduate residences. Additionally, compost bins in student rooms could become a pest control issue. Fortunately, paper towels from bathrooms make up the highest volume of compostable materials generated in common spaces. Two sustainability interns working with R&DE Student Housing conducted a highly successful pilot project this year to compost these towels. R&DE Student Housing plans to expand paper towel composting in the upcoming year.

In addition, partnering with Buildings and Grounds Maintenance, PSSI/Stanford Recycling added 10 food waste collection bins to academic buildings and cafés, and participation increased 29%. Stanford collected 88.46 tons more food waste this year than last year.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/housing/living/sustainable-living
Sustainable Stanford offers strong presence at California Higher Education Sustainability Conference

Stanford representatives led by example at this year’s California Higher Education Sustainability Conference (CHESC), delivering a series of presentations that emphasized the university’s sustainability successes. CHESC attendees filled rooms to learn more about Stanford’s energy efficiency, transportation, wellness, outreach, and student leadership programs. Presentation topics included the Whole Building Energy Retrofit Program, energy modeling for new construction, alternative transportation as the nexus between sustainability and health improvement programs, metrics collection in transportation demand management initiatives, occupant-focused conservation campaigns, clinical recycling programs at Stanford Hospital, turning students into stakeholders, and the benefits of strategic partnerships for outreach campaigns.

CHESC is an annual conference that highlights cutting-edge research as well as case studies of proven successes in curriculum development, operational programs, and community partnerships. Stanford looks forward to sharing its successes and learning from others at this event for years to come.

More Information:
http://cahigheredusustainability.org/default.php

Climate Scientist and Nobel Prize Winner Stephen H. Schneider Inducted into California Hall of Fame

Celebrated Stanford climate scientist Stephen H. Schneider was inducted into the California Hall of Fame on Oct. 1, 2014.

At the time of his death in 2010, Schneider was a senior fellow at the Stanford Woods Institute and the Melvin and Joan Lane Professor for Interdisciplinary Environmental Studies at Stanford. Schneider was celebrated for his support of science communication and was considered a world expert on interdisciplinary climate science. Schneider’s work was well respected in Washington, where he consulted with federal agencies and/or White House staff in every U.S. presidential administration since Nixon’s.

Schneider first notified the world about climate change in 1972. He helped establish the Intergovernmental Panel on Climate Change (IPCC) and was one of the IPCC authors who shared the Nobel Peace Prize in 2007. Schneider also founded the interdisciplinary journal *Climatic Change* and served as its editor in chief till his passing.

In addition to the ceremony, Schneider was commemorated at the California Museum with an exhibit of personal artifacts calling attention to his life and achievements.

More Information:
Research Indicates Biomass Playing Bigger-Than-Expected Role in Climate Change

It has long been known that biomass burning affects both climate change and public health. But until the release of a study by Stanford University civil and environmental engineering Professor Mark Z. Jacobson, these effects had never been comprehensively quantified. Jacobson conducted a three-dimensional computer model simulation of the impacts of biomass burning, including everything from coal-fired power plants to automobile emissions, concrete factories to cattle feedlots.

Jacobson’s research indicates that the 8.5 billion tons of carbon dioxide emitted every year from biomass have profound effects. “We calculate that 5 to 10 percent of worldwide air pollution mortalities are due to biomass burning,” Jacobson said. “That means that it causes the premature deaths of about 250,000 people each year.” Exposure to particles from biomass burning is strongly associated with cardiovascular disease, respiratory illness, lung cancer, asthma, and low birth weights.

“The bottom line is that biomass burning is neither clean nor climate neutral,” Jacobson said. “If you’re serious about addressing global warming, you have to deal with biomass burning as well.”

More Information:

Stanford-Led Team Develops More Efficient Self-Cooling Solar Cells

Scientists may have overcome one of the major hurdles in developing high-efficiency, long-lasting solar cells—keeping them cool, even in the blistering heat of the noonday sun. By adding a specially patterned layer of silica glass to the surface of ordinary solar cells, a team of researchers led by Stanford Professor Shanhui Fan has found a way for the cells to shed unwanted thermal radiation.

Under normal operating conditions, solar cells can easily reach temperatures of 130 degrees Fahrenheit (55 degrees Celsius) or more. These harsh conditions quickly sap efficiency and can markedly shorten the lifespan of a solar cell. The newly proposed design avoids these problems by taking an elegant, passive approach to cooling. Tiny pyramid- and cone-shaped structures embedded on an incredibly thin layer of silica glass redirect unwanted heat, in the form of infrared radiation, from the surface of the solar cell, through the atmosphere, and back into space.

The researchers describe their innovative design in the premier issue of the Optical Society’s new open-access journal, Optica.

More Information:
Precourt Institute and KQED Launch an E-book Series on Energy

Energy is one of the most important, yet least understood, challenges facing humanity. As part of its ongoing effort to promote energy literacy, the Precourt Institute for Energy and KQED, public media for Northern California, have created a two-part e-book series on energy for iPads and Mac computers. Primarily targeted at grades 8 to 13, the interactive iBooks Textbooks are designed to give readers a broad introduction to the subject of energy. The two-volume series can be downloaded free of charge from the iBooks Store at itunes.apple.com. Volume one, *Energy: The Basics*, investigates the nature of energy and energy resources. The 55-page book is divided into two chapters, “The Science of Energy” and “Energy Resources.” Volume two, *Energy: Use and Efficiency*, explores how people use energy, from generating electricity to developing energy-efficient technologies. The 40-page book is divided into three chapters: “Human Energy Use,” “Electricity,” and “The Grid and Energy Efficiency.” A companion iTunes U course can also be downloaded for classroom or informal educational use.

More Information:
Energy.Stanford.edu/ebook

Pam Matson Named to New U.S. Food and Agriculture Research Foundation Board

Stanford School of Earth Sciences Dean Pamela Matson was appointed to the board of the new Foundation for Food and Agriculture Research, created by the U.S. Department of Agriculture to increase the scientific and technological research, innovation, and partnerships critical to boosting America’s agricultural economy. U.S. Agriculture Secretary Tom Vilsack announced the foundation and its 15-member board, which was selected from lists of nominees provided by the National Academy of Sciences and by industry.

Matson is recognized internationally for her work with multidisciplinary teams of researchers, managers, and decision makers to develop agricultural approaches that reduce environmental impacts while maintaining livelihoods and human well-being. She is a fellow of the National Academy of Sciences, the American Academy of Arts and Science, and the American Association for the Advancement of Science.

Congress authorized the Foundation for Food and Agriculture Research and provided it with funding of $200 million as part of the 2014 Farm Bill. The government funding is to be matched by nonfederal funds.

More Information:
Green Building Standards Are High in R&DE Student Housing

Residential & Dining Enterprises (R&DE) Student Housing completed construction on the Kennedy Graduate Residences, located in Escondido Village, in summer 2014. Four new residences will house 436 additional students over 250,000 square feet. The new residences have LED energy-efficient lighting, low-flow water fixtures, and low-VOC paints. Common areas are equipped with recycling stations, and students have the opportunity to divert compostables from their kitchens. The furniture is component-part repairable and made of either solid wood that can be sanded and refurbished or stain-resistant, easily cleaned materials. R&DE has adopted these and other green building features for all of its new facilities and major renovation projects.

More Information:
http://web.stanford.edu/dept/rde/cgi-bin/drupal/housing/living/sustainable-living

Stanford Renews Gold Rating, Gets Highest Marks

Stanford’s overall sustainability performance earned a renewed Gold rating from the Association for the Advancement of Sustainability in Higher Education (AASHE). Data from operations, academic, and institutional programs representing over 30 departments and organizations were collated and submitted to AASHE’s Sustainability Tracking, Assessment & Rating System (STARS). This year AASHE employed its new 2.0 framework, created to toughen the rating criteria and more truly reflect campus sustainability. Despite this increased rigor, Stanford’s submission earned 6 percentage points more than its previous (2012) submission, scoring 74.6% overall and establishing Stanford as a leader among Gold-rated institutions. The Gold rating is the highest achieved by any institution to date.

Highlights of Stanford’s 2014 STARS submission include perfect scores in the three Research categories, Sustainability Coordination, and Sustainability Planning, as well as substantial increases from 2012 in Academic Courses, Water Use, and Sustainable Investment. Continued emphasis on sustainability in teaching and research, operational efficiency programs, and Stanford’s divestment from coal are all examples of efforts that led to the Gold rating. The full report detailing Stanford’s accomplishments in sustainability is available online.

More Information:
Stanford Announces New Water Reduction Requirements as Drought Persists

Stanford further reduced and regulated water consumption this month. In accordance with new emergency state regulations, Stanford asked all Faculty Staff Housing residents to water lawns or turf no more than twice a week. Effective Aug. 1, the campus specified weekday watering allowed for even- and odd-numbered addresses and restricted watering to between 7 p.m. and 7 a.m. Other campus units using potable water for irrigation have also been advised of the regulations.

Since the San Francisco Public Utilities Commission’s call for a 10% voluntary reduction goal earlier this year, Stanford has reduced its domestic (potable) water use about 6% from 2013 levels (comparing February-September), with Grounds leading the pace at 36%. But more efforts are needed, Provost John Etchemendy wrote in a letter to faculty and staff residents. The new reductions come on top of the 23% reduction Stanford has already achieved since 2001 and the further 15% reduction expected when the Stanford Energy System Innovations project is completed in 2015.

Stanford has also drained fountains and reduced irrigation and will be reducing irrigation further on many parts of campus. Its other steps to conserve water include addressing leaks, calibrating water fixtures, optimizing irrigation systems, retrofitting high-use fixtures, and installing smart, weather-based irrigation controllers.

More Information:

Synergy House Installs Cistern to Reduce Water Consumption During Drought

Students for a Sustainable Stanford and residents of Synergy House partnered to purchase and install a rainwater catchment system for Synergy’s extensive fruit and vegetable gardens. The new system will collect rainwater from the residence’s rooftop in a 1,500-gallon cistern during the rainy season and distribute it via an installed drip irrigation system during the dry season. This project received funding from the Office of Sustainability’s Green Fund grant program.

The new rainwater catchment system will reduce on-site water consumption by improving the efficiency of the drip irrigation system, and will improve the storm water and landscape erosion management features currently available at Synergy. In light of the present drought in California, the system will also provide an educational example of water conservation for the house and the greater Stanford community.

More Information:
http://sustainablestanford.stanford.edu/green_fund
Plug Load Equipment Inventory Data Collection Wraps Up

In spring 2014, Stanford began its Plug Load Equipment Inventory, a pioneering effort to collect data on standard electricity-consuming equipment across campus. In addition to quantifying plug loads, the inventory will help operations staff determine the most impactful conservation opportunities. After conducting pilot projects in several types of buildings, the Office of Sustainability launched the inventory in April with the help of four student interns. Additional interns worked full time throughout the summer to collect data in all main campus buildings except private residences, dining halls, and buildings under construction or temporarily vacant. The inventory progressed smoothly with the support of building managers and occupants, who helped coordinate the effort.

Student interns observed the equipment in each room and recorded it using a web application developed internally by Land Buildings & Real Estate IT. Interns were able to securely access Stanford’s floor plans on their smartphones or tablets and enter each piece of equipment and its key attributes into the appropriate room in a matter of minutes, enabling a thorough and accurate inventory in all 225 buildings by the end of August. Next, Office of Sustainability staff will analyze the inventory data, which will ultimately allow the campus community to better understand Stanford’s electricity consumption patterns and how to contain them.

More Information:
http://sustainable.stanford.edu/plug-load

Stanford Recognized for Sustainability in Athletics

In recognition of the sustainability initiatives of Stanford Athletics, SaveOnEnergy.com rated Stanford second in sustainability among the NCAA football teams ranked in the top 25 for the 2014 season. Participating universities were rated according to their stadium sustainability efforts, number of active green organizations, waste diversion rate, percentage of budget spent on locally grown or organic foods, and level of environmental studies degrees offered.

Stanford established its Stadium Recycling program in 2004 to collect and recycle bottles, cans, and cardboard at the stadium, contributing to Stanford’s 64% waste diversion rate. Stadium Recycling is promoted through container labels, ads in the football program, radio announcements, videos on the scoreboard, and on-field promotion. Stanford is also a member of the Green Sports Alliance, a coalition of 230 university and professional sports organizations striving to help sports teams, venues, and leagues enhance their environmental performance.

More Information:
https://www.saveonenergy.com/green-energy/top-25/
Stanford Wins Marketing Award for Commute Club Campaign

The Association for Commuter Transportation (ACT) recognized Stanford for innovative concepts, creative solutions, and professional achievement in transportation demand management.

Stanford was recognized for its Commute Club marketing campaign, which included these elements:

» 10-year celebration marketing plan
» “Tell Us Your Story” and “Tell-A-Friend” promotions
» Events, including 10-year celebration and Bike to Work Day
» Online access to membership information
» Gifts recognizing 10-year-plus members
» “Every trip counts” mug for all members
» “Commute Hero” magnet for current and former members, with a “We Want You Back” promotion for former members
» Increased Clean Air Cash/Carpool Credit and vanpool subsidy
» New posters, banners, and targeted transit and rideshare outreach

ACT is an international trade association and leading advocate for commuter transportation and transportation demand management.

More Information:

Princeton Review Awards Stanford Highest Green Rating

The Princeton Review named Stanford to its 2015 Green Honor Roll as one of the 24 most environmentally friendly colleges and universities in the nation. Stanford received the highest possible score—99. This year, the seventh in which it has conducted the project, the educational services company tallied green rating scores for 861 colleges.

The scores are based on data obtained from colleges either in response to a 2013-14 institutional survey or via the Association for the Advancement of Sustainability in Higher Education’s Sustainability Tracking, Assessment & Rating System. The Princeton Review publishes the scores in its primary college guidebooks. Noting a study showing that 61% of students factor sustainability into their college decisions, the Princeton Review applauds the institutions, like Stanford, with the highest marks: “The schools in our ‘Green Rating’ Honor Roll demonstrated truly exceptional commitments to sustainability across key issues we looked at from course offerings and recycling programs to plans for reducing greenhouse gas emissions. We salute their administrators, faculty, and students for their collective efforts to protect and preserve our environment.” In April, the Princeton Review also released its annual “Guide to 332 Green Colleges: 2014 Edition,” a free online guide, which also recognizes Stanford’s leading sustainability efforts.

More Information:
Stanford Ranks Among Sierr’s Top 10 “Cool Schools” for Fifth Consecutive Year

For the fifth year in a row, Stanford was recognized in Sierra magazine’s annual “Cool Schools” sustainability ranking, earning a spot among the top 10 schools of 2014. The ranking salutes U.S. colleges and universities that are helping to solve climate problems and are making significant efforts to operate sustainably. Published in the September/October 2014 issue of Sierra, the feature story highlights Stanford’s operational, academic, and student initiatives on sustainability. This year’s ranking showcases Stanford’s divestment from coal, among many other measures. Together, Stanford’s sustainability efforts earned the university sixth place out of the 173 institutions that submitted survey data. Sierra states, “Each of the universities ranked in the top 10 have displayed a deep and thorough commitment to protecting the environment, addressing climate issues, and encouraging environmental responsibility.” As illustrated by its perpetually high ranking, Stanford consistently pursues excellence in the practice of sustainability in teaching, research, and campus operations, and it values its national leadership role.

More Information:

http://www.sierraclub.com/coolschools
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