2015-2020

Strategic Plan for SUSTAINABLE OPERATIONS

Washington University in St. Louis

Climate change and environmental degradation are among the greatest challenges humanity faces in the 21st century.

Global efforts must be multi-faceted and include rapid reduction of carbon emissions, restoration of damaged ecosystems, and adaptation to a changing climate. The challenge is especially great in light of a rapidly growing global population and the need to lift an estimated 2 billion to 3 billion people out of poverty.

This truly is a complex problem that requires leadership and collaboration from all sectors. Institutions of higher education have a crucial role to play, and Washington University is fully committed to being part of the solution. Our faculty conduct research that helps us understand these complex issues and develop innovative strategies. Our students gain knowledge and leadership skills that prepare them to play important roles in shaping future solutions. Our staff members work to create and implement new systems that allow our campuses to operate more sustainably.

Washington University in St. Louis is engaged in a multi-decade process to transform our traditional business operations into truly sustainable operations. While we have made a great deal of progress in the last five years, we continue to set loftier goals for ourselves and work toward a more sustainable future. The following plan outlines these goals and defines Washington University's institutional commitment to sustainability.

Henry S. Webber
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Washington University in St. Louis

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Washington University in St. Louis

Cover image: Hillman Hall, completed summer 2015, has achieved LEED Platinum certification. Additional information on Hillman Hall is included in a project profile on page 22.

In 2010, a collaboration between students, faculty, staff, and the Office of Sustainability culminated in Washington University in St. Louis' first strategic plan for sustainable operations. This 2015 plan highlights progress made since 2010 and outlines our updated vision and commitment for the next five years.

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EXECUTIVE SUMMARY

Washington University in St. Louis has a history of responsibly investing resources to increase the efficiency of our operations and decrease our impact on the environment. The university has been investing in sustainability-related initiatives for years and created its first institutional strategic plan for sustainability in 2010.

The 2010 Strategic Plan for Sustainable Operations set forth an overarching goal to reduce the university's greenhouse gas emissions to 1990 levels by 2020 without purchasing carbon offsets. The plan highlighted seven key areas through which this goal would be achieved: energy reduction, green building, alternative transportation, food systems, landscape, waste, and culture. The full plan can be found online at sustainability.wustl.edu.

The process of developing the 2015 strategic plan has allowed us to revisit our original 2010 goals, gauge our progress toward success, and set even more ambitious goals.

Major Achievements to Date

Washington University has seen great success so far in its sustainability initiatives, particularly in reducing energy use across our campuses. Since 1990, the Danforth Campus and the Medical Campus have added 4,943,410 new square feet, nearly doubling in size, while holding energy use flat. From 2010 to 2015, the university's carbon emissions decreased by 17,199 metric tons of CO_2, the equivalent of permanently removing 3,600 cars from the roads, despite the addition of more than 585,000 square feet of new space for teaching, research, and patient care. These reductions have been achieved due to a set of ongoing investments in each of the seven key areas outlined in the 2010 strategic plan. A few of the major achievements in these areas are highlighted below.

In 2010, the university adopted two standards for new construction and major renovations: a LEED Silver minimum and the requirement that projects perform 30 percent better than the ASHRAE 90.1-2007 energy efficiency standard. Since 2010, the university has developed 1.4 million square feet of new buildings and major renovations. Ninety-five percent of that space has exceeded our LEED Silver building minimum — 22 percent is certified LEED Platinum and 73 percent is LEED Gold.

The Danforth and Medical campuses recently completed the installation of energy meters in all buildings. This building-level metering system allows us to quickly flag and correct inefficiencies, identify unusually inefficient buildings to target for energy conservation projects, and support incentive programs to drive user engagement in energy conservation.

Community engagement efforts have rapidly expanded since 2010. In that time, a myriad of new initiatives, resources, and major accomplishments have come to pass. These include a wide variety of student-run organizations, staff-driven programs, and new interdisciplinary courses focusing on broader issues of sustainability, including energy issues, ecology, public health, and urban design.

As a result of our many efforts to reduce waste, including donating unused food, composting initiatives, and converting fryer oil to biodiesel, Washington University Dining Services was awarded the 2014 National Association of College and University Food Services Sustainability Gold Award for Excellence in Waste Management.

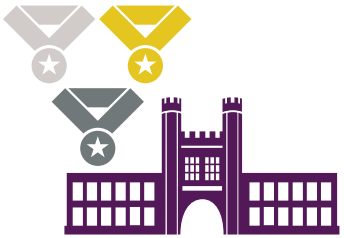
The university has invested in a variety of alternative transportation initiatives, which have led to a 12.2 percent decrease in the number of single-occupancy vehicles commuting to the Danforth Campus when adjusted for growth of the campus population. These investments include a subsidized CarShare program; free unlimited public transportation access for all full-time staff, faculty, and students; and a new full-time Alternative Transportation Coordinator.

2015–2020 Goals

The 2015-2020 Strategic Plan for Sustainable Operations lays out in detail Washington University's sustainability goals for the next five years. These goals fit into the same seven key areas as the 2010 strategic plan, although we have added water as an eighth focus area. Each focus area has several goals; specific top-priority goals from each focus area are listed below.

Energy & Emissions

Reduce greenhouse gas emissions to 1990 levels by 2020, including all Danforth and Medical campus growth (a reduction of 51,300 metric tons of CO_2-equivalent over five years). By including campus growth, the new goal nearly doubles the reduction required by the previous goal.



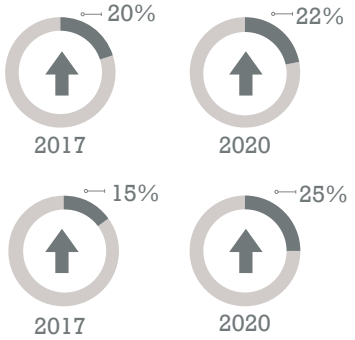
Buildings

Achieve a minimum of LEED Silver certification for all new construction and major renovations while seeking LEED Gold or Platinum where feasible and integrating principles from the Living Building Challenge.

Community

Institutionalize sustainability as a core priority that runs through all aspects of the university by expanding outreach during student, faculty, and staff orientation programs; integrate sustainable practices into existing campus activities and events;

and expand the Green Office Program to 100 offices by 2017.



Food

Spend 20% of food costs locally by 2017 and 22% by 2020.

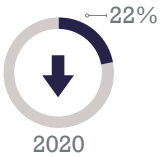
Spend 15% of food costs on environmentally preferable, humane, and fair food by 2017 and 25% by 2020.

Landscape

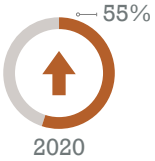
Create an institutional focus on the environmental performance of landscape by evaluating all new landscape construction projects under the Sustainable SITES design standard.

Transportation

Reduce the number of single occupancy vehicles coming to campus by an additional 10% by 2017 from a 2013 baseline, normalized for population growth.

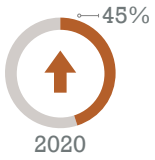


Decrease emissions from the campus fleet by 22% by 2020.

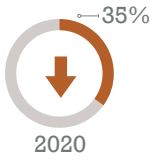


Waste

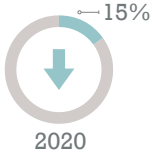
Achieve a 55% waste diversion rate on the Danforth Campus



and a 45% diversion rate at the School of Medicine by 2020, excluding construction and demolition waste.



Reduce consumer waste tonnage per capita by 35% by 2020, relative to a 2010 baseline.



Water

Decrease campus potable water use by 15% by 2020, relative to a 2010 baseline.

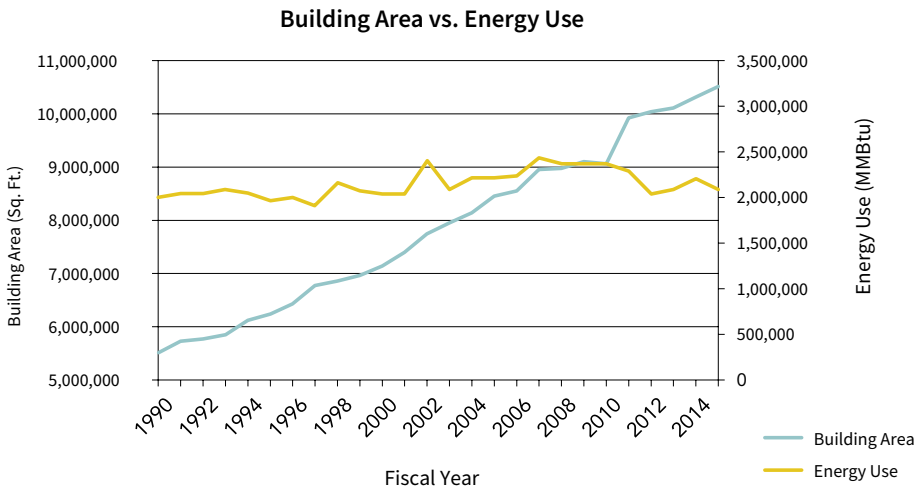
ENERGY AND EMISSIONS

ENERGY & EMISSIONS

Climate change is one of the most pressing issues facing humanity, global ecology, and economic stability. The Intergovernmental Panel on Climate Change released its Fifth Assessment Report in 2013, concluding that "it is extremely likely (95-100 percent confidence) that human influence has been the dominant cause of the observed warming since the mid-20th century" and that "the effects of climate change are already occurring on all continents and across the oceans." The United Nations Refugee Agency reports that displacement due to climate change is already occurring, driven by drought, resource scarcity, extreme weather events, and conditions that enable the spread of disease, and that "the consequences of climate change are enormous."

The imperative for action requires all nations, all sectors, and all individuals to work to mitigate the potentially devastating impacts of climate change through an array of aggressive strategies that reduce greenhouse gas emissions. International climate negotiations and partnerships have been slow since the 1992 signing of the primary international climate treaty — the United Nations Framework Convention on Climate Change. However, in 2014, the United States and China made a historic joint announcement of plans to cooperate on greenhouse gas reduction and clean energy. In June of 2014, the EPA released a draft Clean Power Plan, a cornerstone of the U.S. commitment. The plan seeks to reduce emissions from the U.S. electricity sector by an estimated 30 percent below 2005 levels by 2030. Many private sector companies and institutions have also adopted their own targets for emissions reduction through energy efficiency and renewable energy.

Renewable energy production in the United States, particularly from wind and solar, has grown significantly in recent years. Over the last 10 years, wind energy has increased from less than 0.5 percent of total U.S. electricity to more than 4.5 percent. Solar energy generation has grown even more rapidly as the cost for installed systems has dropped by more than half since 2010 before factoring in federal or state incentives.



In 2010, Washington University committed to reduce its scope 1 and scope 2 greenhouse gas emissions to 1990 levels by 2020 without carbon offsets, excluding growth from 2010-2020. The university committed to building highly efficient buildings beyond 2010.

Scope 1: All direct GHG emissions. Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam. Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in scope 2, outsourced activities, waste disposal, etc.

PROGRESS

Washington University has a long legacy of increasing the efficiency of our operations. Since 1990, the Danforth and Medical campuses have nearly doubled in square footage while holding energy use flat, as shown in the graph below and left. Another way to convey this is that our Energy Use Intensity (EUI), measured in kBtu/sq.ft./yr, has steadily decreased from 361 in 1990 to 204 in 2015.

From 2010 to 2015, our carbon emissions decreased by 17,199 metric tons of CO_2 despite the addition of more than 585,000 square feet of new space for teaching, research, and patient care. This progress is the outcome of major investments in NPV-positive energy conservation and carbon reduction strategies, some of which are profiled on the following pages.

Our energy and carbon reduction has been driven by upgrades to the utility systems that heat and cool our buildings, investments in higher efficiency systems within our buildings such as lighting, optimization of existing heating and cooling systems, improved energy management through investments in metering infrastructure and controls, and awareness programs that engage our campus community in energy conservation. In spring 2014, we undertook our first major set of renewable energy projects, consisting of over half a megawatt of solar photovoltaics and solar thermal.

Due to the progress made since 2010, Executive Vice Chancellor Hank Webber charged a leadership team in fall 2014 with identifying further energy and emissions reduction opportunities and establishing a more aggressive 2020 emissions reduction goal. The team updated the university's financial modeling guidelines and worked with consultants to identify nearly $30 million of additional net-present-value (NPV)-positive energy and emissions reduction strategies to be implemented prior to 2020. The updated 2020 goal is highlighted later in this section.

PROJECT PROFILES

LIGHTING RETROFITS

Tens of thousands of lighting fixtures throughout the university have been upgraded since 2010, including interior lighting, parking garage lighting, and exterior site lighting. Approximately 5 million square feet of office and lab space at the School of Medicine and Danforth campuses have been upgraded from 34-watt T12 fluorescent lights to 21-watt T8 lights with high efficiency electronic ballasts. Approximately 400 exterior light fixtures on the Danforth Campus were converted from 175-watt metal halide bulbs to 50-watt LED bulbs designed to minimize light pollution in 2010. In summer 2014, four Danforth Campus parking garages were retrofitted with more than 700 LED fixtures, saving energy, reducing maintenance costs, and improving safety. The lighting retrofit projects undertaken since 2010 are estimated to annually save $600,000 and 7,300 metric tons of CO_2.

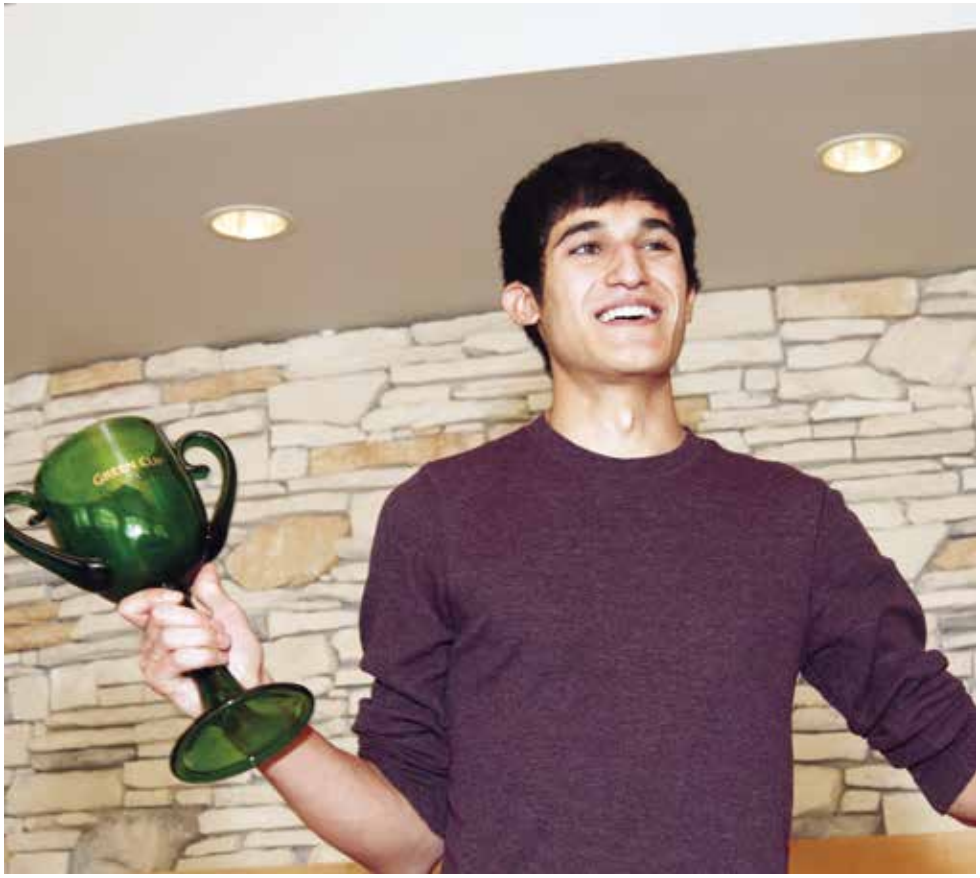
RENEWABLE ENERGY PROJECTS

In 2014 and 2015, Washington University added 548 kilowatts (kw) of solar photovoltaics to university-owned property, including the Danforth, Medical, West, North, and Tyson campuses. The new arrays represent our first major investment in renewable energy. The investment will pay off by producing enough emission-free energy to power the electrical usage of 65 average U.S. homes and save the university more than $100,000 over the first 10 years alone. The installations include roof-mounted systems, ground-mounted arrays, and a solar carport that engineering students plan to link to an electric vehicle charging station. The university also installed solar thermal panels for heating domestic hot water on the LEED Platinum Lofts student housing, shown above, and the Brown School's Hillman Hall.

PROJECT PROFILES

ENERGY METERING

The utilities teams at the School of Medicine and the Danforth campuses recently completed a major multi-year project to meter the energy use of all buildings. The meters measure usage of electricity, natural gas, hot water for heating, and cold water for cooling. The project, consisting of 500 meters on the Danforth Campus and 230 meters at the School of Medicine, is complete and in its first year of operation. It includes a usage reporting system and instantaneous building energy intensity monitoring used by our facilities engineers at each campus. These systems enable us to: quickly flag and correct inefficiencies; establish EUI benchmarks based on space type and identify outlier buildings to target for energy conservation; and support incentive programs to drive user engagement in energy conservation. Data from the metering systems will allow us to significantly reduce emissions and costs.



GREEN CUP ENERGY REDUCTION COMPETITION

In 2010, Washington University undergraduate students led the charge to develop an annual student energy reduction competition, the Green Cup, in the South 40 residential houses. The competition has grown every year since and now includes all Danforth Campus residential housing, the School of Medicine's Olin Residence Hall, and Farrell Learning and Teaching Center. During February each year, student residential colleges compete to see who can reduce their electricity usage the most. In 2014, students reduced their electricity usage by more than 100,000 kwh in one month, equivalent to the annual usage of 10 U.S. homes. The Green Cup is driven by leadership from the CS40 Eco Reps, Greek Life, Residential Life staff, and the Medical Student Sustainability Committee.

VISION AND COMMITMENT

GOAL: CHART A PATH TOWARD CARBON NEUTRALITY WITHOUT PURCHASING RENEWABLE ENERGY CREDITS.

Reduce Greenhouse Gas Emissions to 1990 Levels by 2020, Including All Growth

The next page outlines the updated 2020 goal in-depth.

Begin Developing a Robust Scope 3 Inventory

Our greenhouse gas (GHG) reduction goal is focused on scope 1 and 2 emissions reduction. Other strategies in this plan, including those in the transportation and food sections, focus on reducing scope 3 emissions; however, the university does not currently have a robust scope 3 inventory or regular process for tracking these more complicated sources. As a result, we will begin developing a more robust scope 3 inventory, planning to include scope 3 reductions in the next plan update.

Annually Update Financial Modeling Guidelines, Including Cost of Carbon

The 2014 energy and emissions working group developed a new set of life-cycle financial modeling guidelines that require analyses to be done with and without the social cost of carbon as an important decision-making tool. The guidelines will be updated and published at least annually.

Use-Based Billing for Danforth Campus

With building-level metering complete, the Danforth Campus already has moved toward a use-based billing model for electricity. Danforth will adopt use-based billing for natural gas, heating energy, and cooling energy by 2017. The School of Medicine will review opportunities for utility-based incentive programs by 2017.

Democratize Energy Data

Both campuses will develop an online energy dashboard in tandem with the shift toward use-based billing and an incentive program to empower departments and schools with information.

Plan for Renewable Energy

As the cost of renewable energy continues to fall and the cost of traditional utilities rise, it is important that we design buildings and building systems anticipating near-term deployment of additional on-site renewable energy.

Updating the 2020 Emissions Goal

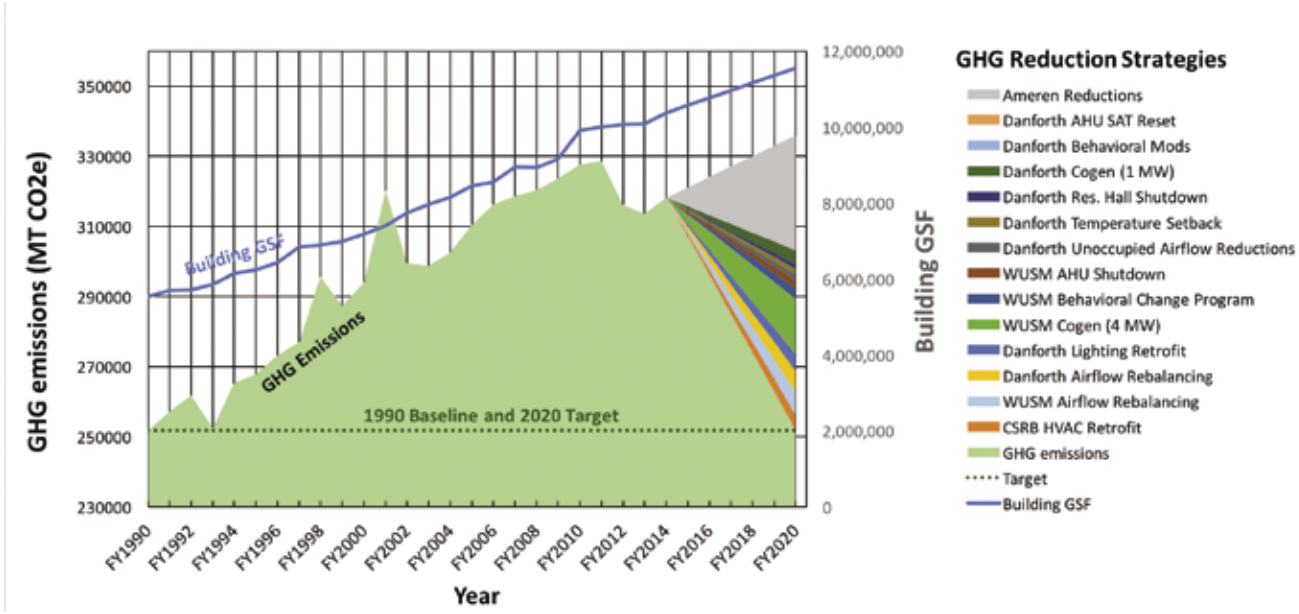
A broad team of Washington University leaders convened in fall 2014 to review our greenhouse gas (GHG) reduction goal and strategies. Due to extensive energy conservation efforts from 2010 to 2014, they found that the GHG goal established in 2010 was within reach, only requiring a reduction of 26,400 metric tons of CO_2 equivalent over the next five years. Executive Vice Chancellor Hank Webber charged a team of university leaders from Facilities, Financial Planning, Sustainability, and the Office of the Provost with establishing a new more aggressive goal. The working group embarked on a four-month process of updating the university's scope 1 and 2 GHG inventory and identified a broad range of carbon reduction and cost savings strategies. The working group developed new financial modeling guidelines to ensure the most accurate picture of life-cycle costs, as well as the impact of valuing carbon. The result is a broader array of projects totaling an estimated $27.5 million of investment and $18.4 million NPV-positive, with a 7.4 year payback. The projects are identified in the graph on the right as a series of colored wedges — the size of each wedge represents the amount of GHG reduction expected from the strategy.

The working group proposed three important changes to the university's GHG goal: 1) adjust the 2020 target lower by more than 10,000 metric tons of CO_2 based on more accurate 1990 data, 2) focus on the Danforth and School of Medicine campuses, and 3) include all growth from 1990–2020 on those campuses.

The end result is a new goal that will challenge us with reducing emissions by 51,300 metric tons of CO_2 over the next five years, nearly doubling the reduction required by the previous goal.

Note: Both the original and new goals focus on scope 1 and 2 emissions and assume the electrical utility will comply with its renewable portfolio standard, resulting in an additional ~32,000 metric ton reduction shown as the large gray wedge in the graph. Additional details about the new 2020 goal, the strategies required to reach the goal, and the analysis behind the selected strategies are available online in the 2014 Energy and Emissions Study.

Updated Goal and Strategies



CASE STUDIES

Tyson Research Center: 33% Renewable Energy

Tyson Research Center is the university's 2,000-acre ecological field station, located 30 minutes west of the Danforth Campus. The largely forested campus includes dozens of buildings and site lighting that draw electricity from the grid. With the 2014 addition of a 50 kilowatt ground-mounted solar array, the entire Tyson campus is one-third of the way to being net-zero energy, earning recognition by the EPA's Green Power Partnership. Tyson has a long track record of excellence in sustainable operations, with the first Living Building Challenge-certified building in the world, the university's only geothermal system, and a new 20,000-gallon rain water harvesting system added in 2014. The new solar array brings the Tyson campus's total to 73 kw of solar PV.

$30,000,000 Energy Conservation Investment

In April 2013, Washington University hosted the Clinton Global Initiative University, pledging to invest $30 million in energy conservation and carbon reduction projects in the next seven years. Since that time, the university has invested:

$10.4 million

With an annual savings of:

$2.5 million

26,515 MT CO_2

GOAL: CHART A PATH TOWARD CARBON NEUTRALITY WITHOUT PURCHASING RENEWABLE ENERGY CREDITS.

OBJECTIVE: Reduce greenhouse gas emissions to 1990 levels (253,000 metric tons of CO_2 equivalent) by 2020, including all growth on the Danforth and School of Medicine campuses.

OVERALL STRATEGIES

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Establish EUI (Energy Use Intensity) targets for various space types for new construction, major renovations, and ongoing building operations.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	EUI targets developed and published.
Develop a robust scope 3 greenhouse gas inventory.	2018	Office of Sustainability lead, coordinating with many university departments	University's scope 3 inventory updated using a recognized tool such as Clean Air Cool Planet.
Conduct life-cycle cost analyses for all energy and emissions projects, including up to 30 years of operations and maintenance.	Ongoing	Danforth Facilities, WUSM Facilities, Financial Planning	Life-cycle cost analysis performed and used as basis for decision-making.
Publish and annually update a financial modeling guideline, including guidance on life-cycle cost analyses, utility escalators, and the social cost of carbon.	Annually	Danforth Facilities, WUSM Facilities, Office of Sustainability, Financial Planning	Guidelines developed, published, and updated at least annually.
Prioritize projects that yield larger carbon reduction over projects that yield larger Btu reduction when evaluating projects with similar NPVs.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability, Financial Planning	Carbon-reducing projects given priority. Emissions reduced.
Convene a cross-campus energy conservation team that meets no less than bi-monthly.	2015	Office of Sustainability, WUSM Facilities, Danforth Facilities	Bi-monthly coordinating meetings and quarterly progress updates.
Partner with Information Services and Technology to identify and implement opportunities for energy conservation within IT infrastructure and through end-point energy conservation.	2016	IS&T, Danforth Facilities, WUSM Facilities, Office of Sustainability	IT sustainability action plan developed and implementation progress tracked.
Participate in national and regional energy benchmarking programs by reporting building energy use to Energy Star Portfolio Manager at least annually.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Building energy data reported to Portfolio Manager at least annually.
Participate in the Department of Energy's Better Buildings Challenge.	2016	Office of Sustainability, WUSM Facilities, Danforth Facilities	Requirements of Better Building Challenge achieved.
Conduct third-party energy audits to benchmark against peer group at least biennially.	Ongoing	Danforth Facilities	Consultant engaged to benchmark peer energy data.

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IMPROVE EFFICIENCY OF EXISTING BUILDINGS

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Retro-commission existing buildings, giving priority to buildings with the highest EUIs.	Ongoing	Danforth Facilities, WUSM Facilities	Completed retro-commissioning projects and documented energy savings.
Continue to increase the efficiency of utility infrastructure through a range of projects including installing heat recovery chillers and replacing air handling units.	Ongoing	Danforth Facilities, WUSM Facilities	Projects completed and savings tracked.
Continue to upgrade lighting throughout the university with long-lasting, high-efficiency fixtures, installing occupancy and daylight sensors where applicable.	Ongoing	Danforth Facilities, WUSM Facilities	Projects completed and savings tracked.
Develop and implement thermostatic set point guidelines, including night and weekend temperature where applicable.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Set point policy developed, communicated, and implemented.
Identify opportunities to reduce outside air use in university buildings during unoccupied mode and during nights and weekends.	Ongoing	Danforth Facilities, WUSM Facilities	Air change rates reduced and savings tracked.
Reduce summer residential building energy demand through coordinated space planning for summer conferences and construction projects. Shut down unoccupied buildings.	2016	Danforth Facilities, Summer Conferences	Coordinating meetings held and plans implemented. Energy saved.
Improve dining facility energy conservation during evening/ weekend/summer shut-downs by developing a set of protocols and training staff.	2016	Danforth Facilities, Office of Sustainability, Dining Services, Food Service Partners	Protocols developed and implemented, staff trained.

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BUILD HIGHLY EFFICIENT NEW CONSTRUCTION AND MAJOR RENOVATION PROJECTS

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Ensure that all new construction is at least 30% better and all major renovation is at least 20% better than ASHRAE 90.1-2010 energy efficiency.	Ongoing	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability, design team	Project energy models.
Build into project plan and architect-engineer contract an 11 month Facilities Condition Assessment and performance audit against design. Measure project performance and identify any warranty items prior to the end of the 1 year warranty period.	2017	Danforth Facilities, WUSM Facilities, Office of General Counsel	Measurements and verifications written into project scopes of work and building performance.
Include lighting occupancy and daylight sensors in new projects, when context appropriate and financially justified.	2015	Danforth Facilities, WUSM Facilities	Lighting controls included in projects.
Employ design strategies that actively engage occupants in energy management.	Ongoing	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability, design team	Sustainable design charrettes discuss strategies to design occupant energy engagement into projects.
Include plug-load analysis and planning during the design process to reduce energy use from equipment.	2016	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability, design team	Analysis performed and adjustments made to minimize plug loads.

CONTINUE TO ENHANCE STAFF KNOWLEDGE AND SKILLS FOR ENERGY MANAGEMENT

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Incorporate sustainability goals within professional development plans for key energy management staff.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Completed plans.
Offer opportunities for staff to gain green credentials, including AEE Certified Energy Manager, IFMA Sustainability Facility Professional, LEED Accredited Professional.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability	Number of staff accredited.
Support staff to attend and present at sustainability-related conferences.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability	List of staff who attended and presented at conference.
Identify staff representatives to actively participate in regional sustainability organizations, such as USGBC.	2015	Danforth Facilities, WUSM Facilities, Office of Sustainability	List of staff point people.

GOAL: CHART A PATH TOWARD CARBON NEUTRALITY WITHOUT PURCHASING RENEWABLE ENERGY CREDITS.

OBJECTIVE: Reduce greenhouse gas emissions to 1990 levels (253,000 metric tons of CO_2 equivalent) by 2020, including all growth on the Danforth and School of Medicine campuses. (Continued)

FOSTER A CULTURE OF ENERGY AWARENESS AND CONSERVATION

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Continue to host annual Green Cup energy reduction competition within all campus residential units.	Each February	Office of Sustainability, Residential Life, CS40, Facilities	100% participation in Green Cup among campus residential halls.
Launch an institution-wide Green Labs program to teach and encourage students, faculty, and staff involved in research to conserve resources through lab practices.	2017	Office of Sustainability	Green Labs website updated, program re-launched.
Expand the energy components of the Less Is More outreach/ education campaign.	2017	Office of Sustainability	Campaign updated with new materials and promoted through the university.
Integrate new energy outreach/education efforts into existing initiatives, including the Green Office Program.	2017	Office of Sustainability	Initiatives updated.
Transition the Danforth Campus to use-based billing and review opportunities for a utility-based incentive program at the School of Medicine.	2017	Financial Planning, Danforth Facilities, WUSM Facilities, Office of Sustainability	Use-based billing in place at Danforth and incentive structure in place at WUSM.
Democratize access to energy data to empower the university community to monitor and manage energy use through web-based portal.	2017	Danforth Facilities, WUSM Facilities, Office of Sustainability	Web-based energy portal created.
Develop and send quarterly energy use reports to schools/ departments.	2016	Financial Planning, Danforth Facilities, Office of Sustainability	Energy reports developed and sent to schools/departments on a quarterly basis.

EXPLORE NEXT GENERATION AND LOW CARBON CAMPUS ENERGY SYSTEMS

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Study the viability of low-carbon district energy systems as part of the enhancements to the east end of the Danforth Campus.	2015	Danforth Facilities, Office of Sustainability	Study completed and appropriate follow-up steps taken.
Study the viability of combined heat and power systems at the School of Medicine and Danforth Campuses.	2016	WUSM Facilities, Office of Sustainability	Study completed and next steps evaluated.

GOAL: CHART A PATH TOWARD CARBON NEUTRALITY WITHOUT PURCHASING RENEWABLE ENERGY CREDITS.

OBJECTIVE: Reduce greenhouse gas emissions to 1990 levels (253,000 metric tons of CO_2 equivalent) by 2020, including all growth on the Danforth and School of Medicine campuses. (Continued)

PURSUE RENEWABLE ENERGY

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Plan for on-site renewable energy in new construction and renovations. Develop guidelines such as maximizing open roof area, minimizing shading, and including chases for easy installation if renewables are not pursued during initial construction.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed.
Explore partnerships with utility and others to develop off-site renewable energy.	Ongoing	Office of Sustainability	Opportunities for off-site renewable energy identified.
Collaborate with WashU faculty and McDonnell Academy Global Energy and Environment Partnership (MAGEEP) partner institutions to develop a solar energy and energy storage test facility that is part of an international network of such facilities.	2017	Office of Sustainability, MAGEEP SEES Faculty Leaders	Test facility built.
Refine and implement a hybrid research/deployment solar energy and energy storage project as part of the MAGEEP WATTS program (World Access To The Sun).	2018	Office of Sustainability, MAGEEP SEES Faculty Leaders	WATTS concept refined and implemented.


BUILDINGS

BUILDINGS

In 2010, Washington University adopted two standards for new construction and major renovations: a LEED Silver minimum and a goal of 30 percent more efficient than the ASHRAE 90.1-2007 energy efficiency standard. Project teams are charged with surpassing both whenever possible.

21 LEED Certified Projects

2 LEED Platinum
9 LEED Gold
7 LEED Silver
3 LEED Certified

Research by the United States Green Building Council (USGBC) shows that buildings in the United States account for 12 percent of all water use, 30 percent of all greenhouse gas emissions, 65 percent of all waste, and 70 percent of electricity consumption. With approximately 12 million square feet of space, Washington University's buildings — and the activities that take place within them — are the university's primary consumer of resources. This section focuses on the construction, renovation, and operations and maintenance of university buildings. We address energy and emissions, waste, and water in greater detail in dedicated sections within the plan. The planning and design of our environments has a significant impact not only on natural resources used but also on the health, wellness, and experience of its users and can positively impact time spent occupying and using these indoor and outdoor places.

Over the last two decades, "green building" has grown from a little known concept to an evolving set of principles that continue to be integrated into disciplines including architecture, engineering, material manufacturing, maintenance, and construction. The USGBC's Leadership in Energy & Environmental Design (LEED) certification is now an internationally recognized rating system that ensures buildings meet specific standards. LEED focuses on five areas: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. In recent years, the Living Building Challenge and the 2030 Challenge, as well as advances in building efficiency and renewable energy, have increased the focus on performance-based goals and expanded the purview of the traditional green building paradigm. Examples include net-zero energy, net-zero water, and zero-waste goals, as well as new certification categories related to health, happiness, beauty, and equity.

PROGRESS

Washington University received its first LEED project certification in 2004. Since then, we have completed a total of 21 LEED certified projects, with an additional three pending projects as of fall 2015. Eleven of the 21 projects have exceeded LEED Silver, including nine Gold and two Platinum, for a total of 1.95 million square feet of LEED certified space. Fifteen percent of university-owned space is now LEED certified. Since we adopted the LEED Silver standard, only one project, the first using the LEED Commercial Interiors system, was short of LEED Silver, achieving the Certified level.

Another significant achievement is the Living Learning Center, one of the first buildings in the world to receive Living Building Challenge certification, the most stringent green building rating system. A net-zero energy and net-zero water building, the Living Learning Center is part of our ecological field station, Tyson Research Center, located 30 minutes west of the Danforth Campus.

Since 2010, seven projects have met or surpassed our energy efficiency goal of 30 percent more efficient than ASHRAE 90.1-2007. Two of these projects, Hillman Hall and the Lofts of Washington University, achieved 41 percent and 46 percent greater efficiency respectively, significantly surpassing the goal. Although three additional projects did not reach the 30 percent goal, they all achieved greater than 20 percent more efficient than the ASHRAE standard.

PROJECT PROFILES

LOFTS OF WASHINGTON UNIVERSITY — LEED PLATINUM

Located in the vibrant Delmar Loop, Phase 1 of the Lofts consists of four off-campus student housing buildings, featuring ground-floor retail — an international grocer, a 24-hour diner, and a retail space.

Sustainable design features

- Designed to be 46 percent more efficient than a conventional building
- Solar photovoltaic panels provide 10 percent of electricity use
- Solar thermal panels provide 25 percent of domestic hot water use
- South-facing sun shades; rain gardens; indoor bike storage; LED lights
- A water-harvesting cistern for irrigation
- A rooftop terrace and garden
- Transit-oriented design that supports active living

4515 MCKINLEY RESEARCH BUILDING — LEED GOLD (EXPECTED)

A research building on the School of Medicine campus dedicated to interdisciplinary research on some of the most complex problems in human biology.

Sustainable design features

- Designed to be 36 percent more efficient than a conventional building with a site EUI of 128 kBtu/sq.ft./yr
- Occupancy sensors manage airflow; energy is recovered from lab exhaust; office return air reduces lab make-up air
- A heat-recovery chiller captures waste heat to reduce energy usage
- 50 percent reduction in irrigation; 35 percent indoor water-use reduction
- More than 95 percent of construction waste recycled
- More than 30 percent of building materials made with recycled content

PROJECT PROFILES

LIVING LEARNING CENTER — LIVING BUILDING

Office, lab, and classroom building at the Tyson Research Center. One of the first buildings in the world to achieve Living Building Challenge certification.

Sustainable design features

- Net-zero energy — solar panels provide 100 percent of the energy use on-site, including two solar trackers
- Net-zero water — rainwater is harvested and filtered to produce potable water
- Composting toilets manage bathroom waste on-site
- Building materials meet very stringent standards for local sourcing and exclude common materials known to be toxic

HILLMAN HALL — LEED PLATINUM

An expansion of the top-ranked Brown School that features faculty offices, classroom space, and the dynamic Clark-Fox Forum event space.

Sustainable design features

- Designed to be 41 percent more efficient than a conventional building with a site EUI of 69 kBtu/sq.ft./yr
- 50 kilowatt rooftop solar photovoltaic array
- A design that promotes health and wellness
- A roof deck with planting beds
- A site design featuring a large rain garden and dynamic outdoor spaces that are fully integrated with alternative transportation infrastructure

VISION AND COMMITMENT

GOAL: SERVE AS A NATIONAL LEADER IN GREEN BUILDING DESIGN AND OPERATIONS

LEED Silver Minimum, Informed by Living Building Challenge

Washington University is committed to achieving a minimum of LEED Silver certification on projects more than $5 million. Our goal, which has proven to be achievable, is to reach LEED Gold or LEED Platinum through a focus on sustainable design principles in all aspects of the design and delivery of projects. Early in projects, design teams will review Living Building Challenge (LBC) criteria to identify LBC principles and approaches to enhance the project and achieve appropriate goals. We also encourage teams to explore LBC Petal certification.

Design Highly Energy Efficient Buildings

All new construction will be 30 percent more efficient than ASHRAE 90.1-2010, a nationally recognized energy standard for buildings. All major renovations will be 20 percent more efficient than ASHRAE 90.1-2010. Each component of the building should contribute to meeting this goal, including building envelope, HVAC, lighting, domestic hot water, and building equipment. Project teams should establish aggressive site energy use index (EUI) goals during the design charrette based on benchmark EUI data from our other projects and published EUI benchmark data of the same space type in comparable regions.

Life-Cycle Cost Analysis

Project design should include evaluations of options using life-cycle cost analysis, including capital costs and 30 years of operations and maintenance. The analysis will use the assumptions published in our Financial Modeling Guidelines.

Develop Comprehensive Sustainable Building Guidelines

We will develop and publish comprehensive sustainable building standards for new construction, major renovation, interiors, and operations and maintenance by year end 2016. The new standard will include guidance related to adaptation, preparedness, and resilience in the face of a changing climate.

Plan for Renewable Energy

Design teams should identify ways to maximize the potential for on-site production of renewable energy (net-zero energy ready) whether or not a project pursues renewables at the time of construction. Consideration includes maximizing flat and south-facing roof area, minimizing roof penetrations, laying out rooftop equipment to reduce shading, and including chases from the roof to mechanical rooms for ease of future installations.

Space Use Efficiency

Through integrated campus space planning, we will use existing spaces and new building design in order to minimize the addition of square footage and seek space efficiencies wherever possible. We will use innovative interior design strategies to provide multi-use spaces with short- and long-term flexibility. We also will use higher quality space in lieu of larger spaces.

Continue to Enhance Staff Capacity

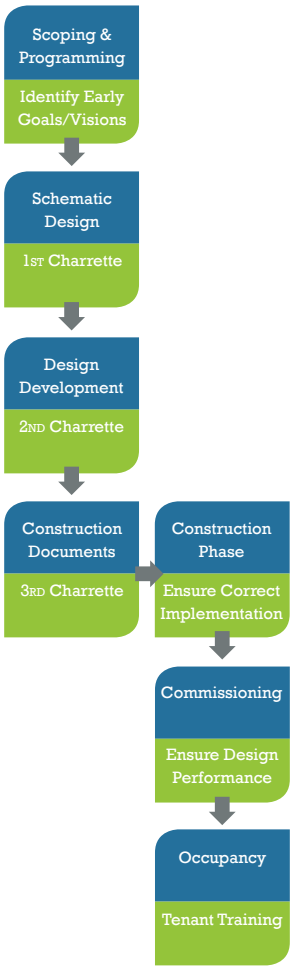
We will build on our legacy of sustainability expertise and leadership within our capital projects, operations and maintenance, and custodial and grounds teams to ensure our buildings are built and remain as low impact as possible. We will offer opportunities for staff to gain green credentials including LEED accreditation and IFMA Sustainability Facility Professional designation. We will encourage staff to attend professional meetings and conferences and offer regular educational sessions on emerging green building topics.

Integrate Sustainable Design into Off-Campus Housing

We will continue to work with Quadrangle Housing and Residential Life to integrate green building strategies into building rehabilitation, and operations and maintenance, charting a path toward net-zero energy in the rehab of multi-family apartment buildings.

Integrated Design Process, Including Three Sustainability Charrettes

Capital projects with a budget more than $5 million will host an internal meeting with key stakeholders to establish a set of project sustainability goals to include with the scope of work prior to architect selection. Once the project team has been selected, a series of integrated design charrettes will be hosted throughout the design process: the first at the project kick-off, the second during design development, and the final during the construction documents phase. Post-occupancy evaluations will compare operating results to stated goals. The design process and charrettes should play an important role in engaging and educating a range of stakeholders about the importance of sustainable design.



CASE STUDY

The Green Rehab Experiment

The Green Rehab Experiment is a multi-year, interdisciplinary research project focused on the comprehensive sustainable renovation of off-campus student housing that is owned and managed by Washington University's subsidiary, Quadrangle Housing. This applied project aims to chart a path towards net-zero energy performance for 100-year-old, multi-family buildings within current market constraints. The first phase of the experiment consists of two identical buildings, shown below, that have been rehabbed as control (standard specification) and experimental (high-performance) buildings, with a focus on energy performance. Student teams played an integral role, from concept development to design and construction management. We completed the first experimental dyad in August 2014. Faculty and students from the Sam Fox School of Design & Visual Arts, the School of Engineering & Applied Science, Arts & Sciences, and Olin Business School are involved.

GOAL: SERVE AS A LEADER IN GREEN BUILDING DESIGN AND OPERATION.

OBJECTIVE: Design and build projects that achieve leading third-party certification.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Require new buildings and major renovations to achieve a LEED Silver minimum.	Ongoing	Danforth Capital Projects, WUSM Capital Projects	Certification of completed projects.
Pursue LEED Building Operations and Maintenance certification for at least one project on each campus.	2018	Danforth Capital Projects, WUSM Facilities	Certification of completed projects.
Study the feasibility of achieving full Living Community Certification and Petal Community Certification at the Tyson Research Center.	2016	Tyson Research Center, Danforth Facilities	Feasibility study completed.

OBJECTIVE: Develop, publish, and implement WashU sustainable design, construction, operations, and maintenance guidelines by year end 2017.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Outline and implement an integrated design process from the beginning of all projects, including early sustainability goal setting and multiple charrettes.	2016	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability	Design process guidance developed and published.
Ensure that all new construction is at least 30% better and all major renovation is at least 20% better than ASHRAE 90.1-2010 energy efficiency standard.	Ongoing	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability	Project energy models.
Establish EUI (Energy Use Intensity) targets for various space types for new construction, major renovations, and ongoing building operations.	2017	Danforth Facilities, WUSM Facilities, Office of Sustainability	EUI targets developed and published.
Develop a standard LEED checklist of point categories that WashU always pursues, with WashU-specific guidance, to serve as a resource for design teams.	2016	Danforth Capital Projects, WUSM Capital Projects, Office of Sustainability	Standard checklist developed and published.
Publish and annually update a financial modeling guideline, including guidance on life-cycle cost analyses, utility escalators, and the social cost of carbon.	2015	Danforth Facilities, WUSM Facilities, Office of Sustainability, Financial Planning	Guidelines developed, published, and updated at least annually.
Develop a material red list and other material guidelines for construction and operations and maintenance.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Material guidelines developed and published.
Develop design guidance for adaptation, preparedness, and campus resilience in the face of a changing climate.	2017	Danforth Facilities, WUSM Facilities, Emergency Management, Office of Sustainability	Design guidance developed and published.
Use only cleaning products that are Green Seal Certified, biodegradable, and non-toxic where possible.	2016	Danforth Custodial, WUSM Custodial	Green Seal Certified products are used in all facilities operated by the university.
Develop measurement and verification guidelines for new construction and major renovations.	2017	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed and published.
Plan for on-site renewable energy in new construction and renovations. Develop guidelines such as maximizing open roof area, minimizing shading, and including chases for easy installation if renewables are not pursued during initial construction.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed and implemented.

GOAL: SERVE AS A LEADER IN GREEN BUILDING DESIGN AND OPERATION.

OBJECTIVE: Minimize the addition of square footage and seek space efficiencies wherever possible through integrated campus-space planning, use of existing spaces, and new building design.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Use innovative interior design strategies to provide multi-use and flexible spaces.	Ongoing	Danforth Capital Projects, WUSM Capital Projects	List of projects that employed this strategy.
Renovate existing spaces rather than constructing new spaces when possible.	Ongoing	Danforth Capital Projects, WUSM Capital Projects	List of projects that employed this strategy.
Prioritize higher quality finishes in lieu of larger spaces.	Ongoing	Danforth Capital Projects, WUSM Capital Projects	List of projects that employed this strategy.

OBJECTIVE: Continue to enhance staff sustainability knowledge and skills in capital projects, operations and maintenance, and custodial and grounds teams.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Create sustainability professional development plan for members of facilities management and capital projects.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Initial metrics will include development of plan and applicable 12-month deliverables.
Offer opportunities for staff to gain green credentials, including LEED Green Associate, LEED Accredited Professional, and IFMA Sustainability Facility Professional.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability	Provide annual training opportunities.
Support staff to attend and present at sustainability-related conferences.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability	List of staff who attended and presented at conference.
Identify staff representatives to actively participate in regional sustainability organizations, such as USGBC.	2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	List of staff point people.

GOAL: SERVE AS A LEADER IN GREEN BUILDING DESIGN AND OPERATION.

OBJECTIVE: Integrate sustainable design and construction practices into off-campus housing stock.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Host annual courses/studios to design future phases of the Green Rehab Experiment.	Ongoing	Sam Fox School, Engineering School, Quadrangle Housing, Office of Sustainability	List of courses hosted.
Refine and build at least one student-informed design in each rehab phase.	Ongoing	Quadrangle Housing	List of buildings built based on student work.
Monitor the performance of experimental buildings to understand key opportunity areas for further refinement.	Ongoing	Quadrangle Housing and Office of Sustainability working with faculty and students from Sam Fox School and Engineering School	Data analyzed and published with key lessons-learned.
Incorporate lessons-learned from experimental buildings into standard Quadrangle Housing specification.	Ongoing	Quadrangle Housing	Annually update specification.
Develop sustainable design and construction guidelines for Quadrangle Housing projects.	2016	Quadrangle Housing and Office of Sustainability working with faculty and students from Sam Fox School and Engineering School	Published guideline.
Achieve net-zero energy in a Quadrangle Housing building.	2020	Quadrangle Housing and Office of Sustainability working with faculty and students from Sam Fox School and Engineering School	On-site energy production exceeds energy use.
Disseminate project outcomes through publications, national conferences, and regional speaking engagements.	Ongoing	Office of Sustainability, Sam Fox School, Engineering School, Quadrangle Housing	List of dissemination outlets.

COMMUNITY

COMMUNITY

Washington University's students, faculty, and staff are the bedrock of our institutional sustainability initiatives. Their knowledge, passion, and action are behind every aspect of our work to steward resources wisely and to minimize potentially adverse environmental and public health impacts from university operations. As an institution of teaching and research, it is perhaps most important that our efforts ignite life-long commitments to tackle the world's most pressing problems. Our goal is for Washington University's sustainability efforts to create broad ripple effects as the talented members of the university community carry our efforts to their communities, from the St. Louis region to every corner of the globe.

With over 27,000 members of the Washington University community, a constant flow of students, and a strong network of international partner institutions, our potential for collective impact is tremendous. The university's community initiatives engage students, faculty, staff, and regional partners through a variety of educational, behavioral, and volunteer initiatives. We aim to use the university as a living laboratory to test new and emerging strategies, thereby supporting and strengthening our core research and education missions. We have cultivated interdisciplinary partnerships across all levels and departments to engage the entire university community to work toward this goal.

In 2010, Washington University set a goal for the campus community to foster a culture of responsible use of natural resources and environmental sustainability among staff, faculty, and students.

PROGRESS

The Washington University community's engagement in sustainability efforts has rapidly expanded in the last five years. A myriad of new initiatives, new resources, and major accomplishments have come to pass since 2010. Here are a few highlights:

- **Students now run more than 20 sustainability-focused organizations, have created dozens of new sustainability leadership positions in long-standing organizations, and have advocated for change locally and internationally.**
- **Staff have championed a broad range of efforts, including creating zero-waste events, promoting the Green Office Program, and driving much of the progress highlighted throughout the eight sections of this plan.**
- **The Green Ambassador program launched in 2013 with 33 students. They introduced 1,700 incoming freshmen to campus sustainability practices and played a pivotal role creating a cultural shift on the Danforth Campus.**
- **The School of Medicine Sustainability Action Team (SAT) meets quarterly to learn about and then disseminate new initiatives and publishes a monthly newsletter.**
- **The Office of Sustainability developed a student intern program, including 12 student workers during the academic year and three to five over the summer.**
- **Residential Life's Congress of the South 40 developed an Eco Rep program, which is integral in the Green Cup energy reduction competition.**
- **Faculty members have created new interdisciplinary sustainability courses, including Earth's Future: Causes and Consequences of Global Climate Change, sustainable design-focused architecture studios, the experiential Sustainability Exchange, and Urban Ecosystem Principles Integration.**

PROJECT PROFILES

GREEN OFFICE PROGRAM

The Green Office Program provides a framework and set of resources that empower office teams to reduce their impact and costs. The program features a self-assessment checklist with seven categories that offices use to evaluate their current practices, set goals, and track their progress. As offices reach certain milestones, they become a "certified green office" at Bronze, Silver, Gold, and Platinum levels. As of Fall 2015, 47 offices located across the university's two academic and two administration campuses have been certified as green offices — 24 are certified at the Bronze level, 15 at the Silver level, six at the Gold level, and two at the Platinum level.

SUSTAINABLE LAND LAB

The Sustainable Land Lab is a partnership between Washington University and the City of St. Louis that explores creative interim and long-term strategies for transforming vacant land into assets that advance triple bottom line sustainability. Initiated through a public competition in 2012, five winning teams were awarded a land lease and $5,000 of seed money to test their ideas. Two years later, multiple formerly vacant lots are abuzz with activity: the Sunflower+ Project has grown tens of thousands of sunflowers on city lots, a permanent Chess Pocket Park is a platform for education and community building, and the Mighty Mississippians have hosted dozens of community events and cultivated native plants and a food forest.

PROJECT PROFILES

STUDENT SUSTAINABILITY FUND

The Student Sustainability Fund (SSF) is a small grants program run by students that provides funding for graduate and undergraduate students' sustainability projects. The SSF supports projects that benefit the student body and promote an ethos of sustainability and stewardship of the environment. To date, 37 projects have been successfully funded through the SSF, including the full-scale launch of the Eco To-Go reusable to-go container program in campus dining facilities, summer camps where youth learn about farming and food at the on-campus Burning Kumquat micro-farm (shown above), and the installation of rain barrels at the Catholic Student Center. The SSF is supported by the Student Union and the Office of Sustainability.

SUSTAINABLE CITIES CONFERENCE

Washington University hosted the three-day Sustainable Cities Conference in fall 2012 to explore the critical role that cities must play in mitigating global environmental and public health issues. The conference featured addresses by Bill McKibben, author and activist; Ron Sims, deputy secretary of the U.S. Department of Housing and Urban Development; Jason McLennan, founder of the Living Building Challenge; and food activist Anna Lappe. More than 1,000 people attended. The conference was closely coordinated with the 50th anniversary symposium for the urban design program: Urbanism(s): Sustainable Cities for One Planet. The conference served as a catalyst for a number of projects and on-going discussions, including the Sustainable Land Lab.

VISION AND COMMITMENT

GOAL: FOSTER A UNIVERSITY CULTURE IN WHICH SUSTAINABILITY IS A DEFINING ELEMENT

Communicate Sustainability as a University Priority

Washington University will institutionalize sustainability as a core priority that runs through all aspects of the university. We will share our sustainability vision and commitment with new students, staff, and faculty through orientation programs; provide ongoing engagement through newsletters, the Record, social media, and events; and integrate sustainable practices into existing campus activities and events.

Foster a Highly Collaborative Environment

The university will serve as a convener and facilitator to foster an environment in which university partners feel a sense of ownership and actively collaborate to advance our sustainability goals. We will maintain strong relationships with student groups and provide leadership and resources for sustainability projects and initiatives. We will provide opportunities for staff and faculty to engage in sustainability issues through committees like the School of Medicine Sustainability Action Team.

Foster a Diverse and Inclusive Sustainability Movement

The university will recruit, hire, and support a diverse student intern and staff team in the Office of Sustainability. We will host an annual speaker who addresses the intersection of social justice, public health, and sustainability. We will host an intern position focused on environmental justice, as well as host a staff/intern training at least annually on diversity and inclusion. The university will partner with existing college prep and youth mentorship programs to expose traditionally underrepresented students to the broad range of sustainability fields and career opportunities.

Increase Student, Faculty, and Staff Engagement

The university will expand the reach and impact of existing initiatives. We will achieve 100 certified Green Offices by 2017, launch an updated Green Labs initiative, align and expand existing student sustainability peer-to-peer education programs, and develop new initiatives, as needed.

Prepare Students for Careers in Sustainability

The university will provide highly motivated students the opportunity to work on campus sustainability projects in a professional setting through a well-established internship program. We will focus on professional development opportunities for students to gain skills and knowledge to prepare for their careers ahead.

Collaborate to Advance Sustainability in the Region and State

The university will leverage our assets and role as an anchor institution to support regional and state efforts to advance sustainability. We will participate in and develop initiatives such as 100 Resilient Cities and the Sustainable Land Lab, host important community dialogues and inspiring speakers at the university, and provide leadership in the St. Louis Higher Education Sustainability Consortium.

CASE STUDIES

60
Student EcoReps since 2010

Eco Rep Program

The Eco Rep peer educator program was founded by Residential Life in 2010 to weave sustainability into the undergraduate residential experience. Each year 12 Eco Reps assume leadership roles in their Residential Colleges, working as a team to foster lifelong behaviors and consciousness.

The Eco Reps coordinate monthly sustainability-related programming and promote lower-impact practices amongst the first-year students. Their goal is to educate freshmen and set behaviors early that will be carried through their time at Washington University and beyond. The Eco Reps play a major role during the annual Green Cup energy reduction competition in February. Their outreach efforts have saved hundreds of thousands of pounds of coal from being burned.

Less is More Campaign

The Less Is More campaign encourages every member of the Washington University community to take personal steps to lower our carbon emissions and preserve natural resources. These steps are as simple as turning off lights and computers when not in use, recycling properly, using fewer disposable products, and drinking from the tap rather than bottled water. The Office of Sustainability provides a toolkit with prompts of simple, everyday actions we can take to reduce our impact on the environment.

less IS more

THE GREENEST THING YOU CAN DO IS
CONSUME LESS

SWAP: Sharing With A Purpose

Sharing With A Purpose (SWAP) is a student-owned non-profit that facilitates the open exchange of materials and resources among members of Washington University and the broader St. Louis community.

The mission of SWAP is to bridge the gap between social justice and sustainability by empowering people to share resources. They promote collaborative consumption such as free markets, borrowing and barter networks, skill shares, and other efforts that reduce waste by making existing resources available for new use.

SWAP runs the Trading Post, a free thrift store located in the South 40 residential area. Everything in the Trading Post is free, including clothing, housewares, books, and music. SWAP simply asks that you participate in freecycling by donating items to the store when you no longer want or need them.

SWAP supports the Trading Post by collecting unwanted items during the Share Our Stuff move-out drive and reselling the items the following fall on Freshman move-in day. In short, SWAP supports freecycling through recycling. It is an exciting social entrepreneurial model.

95%
Staff introduced to sustainability at orientation

Staff Championing Sustainability

The sustainability movement is a change movement, and people are our greatest asset. We believe that every department, office, lab, and dorm has sustainability champions who are ready and excited to be part of the movement. We simply need to empower, align, and support them to advance the university's goals. We have built a champion-based approach that invites passionate staff to take on the roles that fit their interests and act as catalysts in their departments and within their peer groups.

Beginning with new employee orientation, nearly every new staff member learns about Washington University's sustainability commitment and goals. From there, staff can join working groups like the Sustainability Action Team (SAT) at the School of Medicine, participate in the Green Office Program, volunteer at events, and more.

A major accomplishment in spring 2015 was the training and accreditation of approximately 45 staff members as Sustainability Facility Professionals (SFP) through the International Facility Management Association (IFMA). Staff members with a broad range of responsibilities participated in the intensive five-day training and had to pass three test modules to receive their accreditation. The new team of SFPs have been charged with applying their new knowledge to advance the goals outlined in this plan.

Students Leading Change on Campus

1,125
Student Green Ambassador hours since 2013

23
Student green groups on campus in 2015

50
Sustainability student interns since 2010

Student Sustainability Interns

The Office of Sustainability manages a team of 12 part-time, paid student interns during the school year and up to five full-time interns over the summer to support the university's efforts to be a sustainability leader. Fifty students have held internships since the program's inception in 2012.

Interns work in teams across a number of domains, including alternative transportation, waste diversion, renewable energy, sustainable food, environmental justice, green offices, and communications and marketing. Their leadership and hard work significantly expands the Office of Sustainability's reach and impact at the university. The internship provides the students with professional growth opportunities and exposure that enhances their effectiveness and well positions them for a range of careers.

Students interns from upper left to lower right:
Helen Pierson, Class of 2015, Architecture; Adeline Shen, Class of 2016, Business; Marisa Vasquez, Class of 2016, Environmental Earth Science; Qianwei Dai, Class of 2016, Economics and Math; Libby Mohr, Class of 2015, Chemical Engineering and Environmental Earth Science; Armaan Shah, Class of 2017, Architecture; Emma Searson, Class of 2016, Environmental Earth Science; Sarah McDowell, Class of 2015, Mechanical Engineering and Physics; Danica Yu, Class of 2015, Environmental Policy and Anthropology; and Matt Lawder, PhD student, Energy, Environmental and Chemical Engineering.








GOAL: FOSTER A UNIVERSITY CULTURE IN WHICH SUSTAINABILITY IS A DEFINING ELEMENT OF INSTITUTIONAL IDENTITY AND DAILY PRACTICE.

OBJECTIVE: Increase student, staff, and faculty engagement in campus sustainability efforts.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Align and expand student peer-to-peer education programs, including Green Ambassadors orientation program, Eco Reps residential program, and Greek Life sustainability.	2016	Office of Sustainability, Residential Life, Student Life	Increased number of students and volunteer hours leveraged annually, aligned structure and content of the programs.
Conduct a bi-annual, institution-wide sustainability literacy assessment.	2017	Office of Sustainability	Sustainability literacy increases by 20% from a 2015 baseline.
Expose the entire university community to the Less is More resource conservation campaign.	2017	Office of Sustainability, WUSM Facilities, WUSM Sustainability Action Team	Increased percentage of campus community aware of Less is More campaign, measured through literacy assessment.
Continue to host annual Green Cup energy reduction competition within all campus residential units.	Each February	Office of Sustainability, Residential Life, CS40, Danforth Facilities, WUSM Facilities	100% participation in Green Cup among campus residential halls.
Increase scope of and participation in Earth Week events.	April 2016	Office of Sustainability, WUSM Sustainability Action Team	Increased number of student groups, departments, and schools that participate, and number of attendees at events.
Host Campus Sustainability Day or similar event on Danforth and School of Medicine campuses each October.	October 2016	Office of Sustainability, WUSM Sustainability Action Team	Increased number of student groups, departments, and schools that participate, along with number of events.
Continue to include sustainability training in new employee orientation on the Danforth and School of Medicine campuses.	Ongoing	Office of Sustainability, Human Resources	All new employees reached through orientation program.
Advance the profile and reach of the Student Sustainability Fund to support student-led projects.	2016	Student Sustainability Fund, Office of Sustainability, Student Union	Track number and amount of applicants, funded projects, and project outcomes annually.
Partner with Student Union executive advisor for sustainability to convene Student Green Council biannually to coordinate efforts of student green groups.	Ongoing	Office of Sustainability, Student Union	Increase attendance and number of student green groups represented at Student Green Council.
Collaborate with Student Union's Green Events Commission to institutionalize green practices into student events.	Ongoing	Green Events Commission, Office of Sustainability	Number of events adopting zero-waste and other green practices, new procedures or policies that support event greening.
Partner with the Olin Business School annually to host the Olin Sustainability Case Competition.	Ongoing	Office of Sustainability, Olin Business School	Increase awareness and participation in the competition.
Familiarize four-year advisors with sustainability-related course options.	2016	Office of Sustainability, Four Year Advisors	Four-year advisors promote sustainability-related courses to students, develop comprehensive list of courses, and publicize on website and bulletin.
Increase participation in the Green Office Program to 100 offices.	2017	Office of Sustainability, WUSM Sustainability Action Team	100 offices enrolled and certified.

GOAL: FOSTER A UNIVERSITY CULTURE IN WHICH SUSTAINABILITY IS A DEFINING ELEMENT OF INSTITUTIONAL IDENTITY AND DAILY PRACTICE.

OBJECTIVE: Increase student, staff, and faculty engagement in campus sustainability efforts. (Continued)

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Re-launch an institution-wide Green Labs program to teach and encourage students, faculty, and staff involved in research to conserve resources through lab practices.	2017	Office of Sustainability, Environmental Health and Safety, WUSM Facilities, Danforth Facilities, WUSM Sustainability Action Team	Green Labs website updated, program re-launched.
Continue to increase outreach to staff through School of Medicine Sustainability Action Team and Danforth Sustainability Action Committee, creating more formal roles for those who want to provide leadership.	Ongoing	Office of Sustainability	Convene groups quarterly, new formal roles created and staff leaders recruited.
Engage in May Professional Development Day and Director's Meetings to familiarize staff with sustainability efforts and accomplishments.	Annually beginning in 2016	Office of Sustainability, Residential Life	Participate in and present at both meetings.
Continue to release Office of Sustainability newsletter and increase subscribers by 10%.	2016	Office of Sustainability, Residential Life, CS40, Facilities	10% increase in subscribers from 2015 baseline.
Generate more momentum around sustainability through social media and Office of Sustainability website.	2016	Office of Sustainability	Increase visits to website. Reach 1200 Facebook subscribers.
Develop signage for the Lofts that conveys the LEED Platinum rating and green building features.	2016	Office of Sustainability, Facilities	Signage developed and installed in highly visible location.
Develop an RA Sustainability Toolkit highlighting key behaviors and knowledge to instill at on- and off-campus residential units.	2016	Office of Sustainability, Residential Life	Toolkit developed and distributed. Sustainability is championed by RAs and integrated into residential floor meetings.

GOAL: FOSTER A UNIVERSITY CULTURE IN WHICH SUSTAINABILITY IS A DEFINING ELEMENT OF INSTITUTIONAL IDENTITY AND DAILY PRACTICE.

OBJECTIVE: Foster a diverse and inclusive sustainability movement.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Recruit, hire, and support a diverse student intern and staff team in the Office of Sustainability.	Ongoing	Office of Sustainability	Office of Sustainability team is diverse and inclusive.
Host an annual speaker who addresses the intersection of social justice, public health, and sustainability.	Beginning in 2016	Office of Sustainability, Student Union, and other campus partners	Events hosted. Track number of attendees.
Host an intern position focused on environmental justice.	Beginning in 2016	Office of Sustainability	Environmental justice intern hired.
Host a staff/intern training at least annually on diversity and inclusion.	Beginning in 2016	Office of Sustainability	Staff training hosted. Document topic and participation.
Partner with existing WashU college prep and youth mentorship programs to expose traditionally underrepresented students to the broad range of sustainability fields and career opportunities.	Beginning in 2016	Office of Sustainability and appropriate campus partners	New partnerships developed and documented.
Encourage staff and interns to participate in campus activities, events, and dialogues on a range of diversity and inclusion topics, and promote such events through the sustainability newsletter and social media.	Beginning in 2016	Office of Sustainability	Increased participation in diversity and inclusion activities. Events cross-promoted through Office of Sustainability newsletter, social media, and other outlets.
Explore opportunities to partner and lead initiatives that expand community-based environmental justice efforts, in collaboration with the Gephardt Institute, the Office for Socially Engaged Practice, faculty, and others.	Beginning in 2015	Office of Sustainability, Gephardt Institute, Office for Socially Engaged Practice	Opportunities identified and new partnerships and/or initiatives created.

OBJECTIVE: Collaborate with a range of partners to advance sustainability in the St. Louis region and state.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Host sustainability-focused conference or major speaker on campus at least every two years.	2016	Office of Sustainability	Track attendance at conference and partnerships, initiatives, and projects developed as a result of conference.
Expand the Sustainable Land Lab partnership with the City of St. Louis to develop both interim and long-term solutions for vacant land.	2017	Office of Sustainability	Number of projects implemented, ideas generated, and policies adopted.
Actively participate in and support regional initiatives including 100 Resilient Cities, OneStL, and the Urban Vitality and Ecology Initiative.	Ongoing	Office of Sustainability and other campus partners as appropriate	Create strong collaborations that produce results.
Provide leadership in St. Louis Higher Education Sustainability Consortium.	Ongoing	Office of Sustainability	Participate in Executive Board meetings and provide support for initiatives.
Develop an Alumni Sustainability Council to advise and support the Office of Sustainability.	2017	Office of Sustainability	Hold forum to connect past and present sustainability alumni.

FOOD

In 2010, Washington University set a goal to reduce our impact on the food system by working with campus dining service partners to develop a system for measuring and purchasing more food that is produced and distributed locally, humanely, fairly, and in an ecologically sound manner.

FOOD

The global food system accounts for as much as one-third of total global greenhouse gas (GHG) emissions. According to the Intergovernmental Panel on Climate Change, an estimated 14 percent of global emissions is attributed to agricultural production, which includes soil management practices, livestock digestion, and biomass burning. The remaining emissions are due to upstream and downstream elements of the food system, including land-use changes; fertilizer production; and transportation, processing, packaging, and storage of food. GHG emissions from agriculture have been increasing for decades and are projected to continue to increase in the decades ahead unless mitigated.

Prevailing agricultural practices also have a range of other negative impacts, including loss of biodiversity as land use shifts from natural systems to monoculture production; introduction of pesticides, fertilizers, and herbicides to soils, air, and water; silt run-off to waterways; and low wages, hard working conditions, and chemical exposure for some workers.

An increasing number of stakeholders within the food system — from farmers to distributors to chefs to consumers — are stepping forward to shift the paradigm and adopt practices that reduce these impacts. Washington University is committed to working with a range of stakeholders to reduce the "foodprint" of our community. Washington University Dining Services operates more than 30 venues across all campuses with more than 350 team members serving approximately 4,760,000 meals per year. A food service network of this scale provides significant opportunities for reducing environmental and social impacts, while supporting a strong local economy.

PROGRESS

Washington University has made significant strides in the last few years working in close partnership with food service vendors Bon Appetit, Aramark, and Catering St. Louis, as well as with student groups. The text below and the case studies in this section highlight key points.

In 2014, 17 percent of the food served at Washington University was grown, processed, or prepared within 200 miles of St. Louis. Nearly all coffee served at the university meets or exceeds Fair Trade standards. The following practices apply to the vast majority of food served at the university: turkey and chicken are produced without routine use of antibiotics; hamburgers are made with grass-fed beef from cows raised without antibiotics or hormones; milk and yogurt are produced by cows never given artificial bovine growth hormones; precracked (liquid) eggs are produced from hens living in cage-free farms rather than hens confined in battery cages; and seafood purchases follow the Monterey Bay Aquarium Seafood Watch guidelines.

As a result of our many efforts to reduce waste — including donating unused food, composting initiatives, and converting fryer oil to biodiesel — Washington University Dining Services was awarded the 2014 NACUFS (National Association of College and University Food Services) Sustainability Gold Award for Excellence in Waste Management.

Student leaders play an important role advancing sustainable agriculture. They created the on-campus Burning Kumquat organic farm in 2007 and the Bee School beekeeping club in 2012. The Bee School recognizes the vital role that honeybees play in keeping our food system pollinated and maintains two hives on the Danforth Campus. Students have also been integral in launching a range of education and outreach campaigns, including Green Monday, Food Day, the PB & Joy food drive, and various lectures and film screenings.

PROJECT PROFILES

BURNING KUMQUAT FARM

The Burning Kumquat is a student-run micro farm located on the Danforth Campus that provides students and community members hands-on experience with organic food production. The farm serves as a hub for food knowledge, hosting classes, work days, and community potlucks. Past classes have covered making maple syrup, growing a salad garden, and making yogurt. The farm sells its produce on the Danforth Campus and at the North City Farmers' Market, located in a food desert. In summertime, the Burning Kumquat hosts Camp Kumquat, which brings dozens of St. Louis elementary and middle school students to the farm to explore food, nutrition, and gardening.

LOCAL FARMERS

Washington University partners with many local farms like nearby Windcrest Dairy, a family-owned dairy farm in Trenton, Illinois. Windcrest provides all the yogurt for the Danforth Campus. In the photo above, Washington University students and staff from Bon Appetit tour the farm with the owners Kurt and Steve. The students learned about the process of producing yogurt, from field to market. Local farmers also visit the university throughout the year to showcase their products, talk about their work, and meet members of the university community. Local farmer engagement is an important part of highlighting the names, faces, and stories behind the campus dining experience.

PROJECT PROFILES

FOOD DAY CELEBRATION

Washington University celebrates Food Day around October 24 each year with a variety of food-focused events and activities. Food Day 2014 was a celebration of the individuals across America who are re-inventing our food system. It featured a screening of the movie *Fresh* followed by a panel discussion with local growers, a demonstration on harvesting and cooking acorns led by a faculty member, a food drive to support people who are food insecure, and a harvest festival to celebrate the end of the growing season.

FARMER'S MARKET

Washington University's School of Medicine sponsors a weekly farmer's market throughout the year. Vendors sell fresh fruits and vegetables, eggs, meat, and value-added products such as bread, cheese, and jam. Staff, faculty, and students can subscribe to a CSA (Community Supported Agriculture) program and pick up their weekly "share" of the harvest at the market. The market is one of many important overlaps between Washington University's sustainability efforts and health and wellness efforts.

VISION AND COMMITMENT

GOAL: FOSTER A FOOD SYSTEM THAT ADVANCES ENVIRONMENTAL AND PUBLIC HEALTH WHILE SUPPORTING A STRONG LOCAL ECONOMY

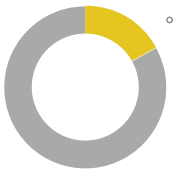
Support Local Farmers

Food sourcing can have significant impacts on carbon emissions, food quality, biodiversity, and nutritional content of food. We aim to source 20 percent locally grown or processed food from within 200 miles of campus by 2017 and 22 percent by 2020 by dollars spent.

Purchase Fair, Humane, and Ecologically Sound Food

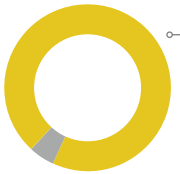
By procuring food that meets or exceeds standards such as Fair Trade, Monterey Bay Aquarium Seafood Watch guidelines, grass-fed beef, and cage-free farming, we will help ensure that our producers are using responsible practices. We aim to purchase 15 percent environmentally preferable, humane, and fair food by 2017, and 25 percent by 2020 by dollars spent. In an effort to advance the availability of such products in the local market, we aim to purchase 10 percent of our food that is both local and environmentally preferable by 2017 and 12 percent by 2020 by dollars spent.

Dining Impact on Sustainability-FY2015



17%

of food is locally grown or produced within 200 miles



95%

of seafood follows Monterey Bay standards

Increase Access to Healthy Food

We will partner with Washington University Dining Services and a university dietitian on a range of strategies to provide the WashU community with fresh and healthy food options, including improved options at dining facilities and the development of a CSA drop-off location at the Danforth Campus.

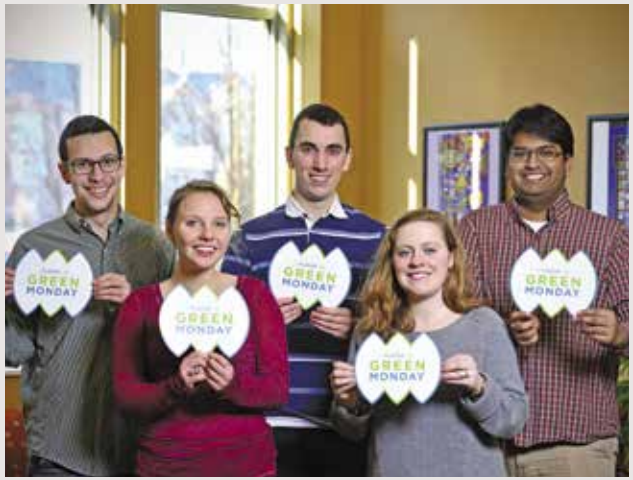
Implement Programs That Enhance Awareness of Sustainable Food Practices

We will collaborate with the campus community to reduce our university foodprint, promote health, and contribute to a thriving local food economy through programs such as Green Monday and Food Week.

Enhance Transparency and Accountability in the University Food System

We will continue to develop a system with all dining partners for continued tracking of strategic plan metrics, and we will collect and report progress biannually.

CASE STUDIES



Green Monday Campaign

Green Monday is a growing global movement to educate consumers about the public health and environmental impacts of their food choices and to increase access to lower-impact choices. Washington University launched the initiative in January 2015 to grow the knowledge and awareness necessary to reduce the university's "foodprint."

Sponsored by the Office of Sustainability, Dining Services, and food service partners Bon Appetit and Aramark, the program asks students, faculty, and staff to pledge to eat vegetarian, low-carbon meals at least one day a week. If everyone in our community were to eat vegetarian one additional day per week, we would collectively reduce our carbon emissions by as much as 5,000 metric tons annually — equivalent to taking 1,053 cars off the road.

Green Monday began in Hong Kong, where it has seen incredible success. The Green Monday team is expanding to a global market and invited Washington University to be one of the first U.S. universities to launch the program.

On Monday, January 26, 2015, Green Monday's co-founder, David Yeung, visited Washington University to help launch the program. He was joined by more than 30 student and staff Green Monday ambassadors who promoted the campaign at various dining venues across campus. In the first week alone, more than 500 people pledged to participate, and the number continues to grow weekly.

Each Monday, the campaign features weekly messages around food, including agriculture's role in global warming, water consumption, waste generation, and global hunger. Weekly messages also highlight the university's many efforts.

In addition to the regular daily vegetarian/vegan meals, Dining Services features vegetarian/vegan specials across campus every Monday, and Green Monday ambassadors encourage people to take the pledge.

Food Trucks

The popularity of food trucks has grown considerably over the years, and the Washington University School of Medicine has fully embraced this trend. On any given day, a half dozen food trucks line the main campus corridor, providing the School of Medicine community with a variety of food options.

By welcoming the food trucks onto campus, Washington University is supporting local entrepreneurs that depend on partnerships such as these to thrive.

Kaldi's at Farrell: A Vegetarian Cafe

In 1994, Kaldi's Coffee first opened its doors in St. Louis, and today it is the primary coffee vendor across our campuses. Kaldi's specializes in sustainably sourcing and roasting the finest coffees in the world.

The Kaldi's Cafe located in the Farrell Learning & Teaching Center on Washington University's School of Medicine campus is a completely vegetarian establishment. The vegetarian fare caters to medical professionals looking for healthy food options, and it has been a popular addition to the School of Medicine campus.

Kaldi's Relationship Coffees offer consumers the opportunity to take a proactive and global approach to their coffee purchasing decisions. Building on the success and wisdom of Fair Trade Certified, Relationship Coffees provide even greater transparency into the otherwise complex coffee transaction chain — from coffee grower to coffee lover. Kaldi's coffee buyers are committed to working with partners at origin, improving the lives of coffee farmers. They seek relationships with farmers whose agricultural practices preserve the soil and protect the insects, birds, and wildlife that inhabit the ecosystem. Additionally, Kaldi's Relationship Coffees are purchased for at least 15 percent above Fair Trade minimum price, ensuring that farmers make a living wage.

GOAL: SUPPORT A FOOD SYSTEM THAT ADVANCES ENVIRONMENTAL AND PUBLIC HEALTH WHILE SUPPORTING A STRONG LOCAL ECONOMY.

OBJECTIVE: Purchase 20 percent locally grown or processed food from within 200 miles of campus by 2017 and 22 percent by 2020 by dollars spent.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Purchase produce from local farms.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of produce from local farms.
Purchase meat, fish, dairy, and animal products from local farms.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of meat, fish, dairy, and animal products from local farms.
Purchase locally prepared and locally processed foods (coffee, yogurt, bread, etc.).	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of locally prepared and locally processed foods.
Expand relationships with local producers through programs such as Guaranteed Cash Guaranteed Crops and no interest loan programs.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased number of local vendors and/or increased capacity of local vendors to meet university food needs.

OBJECTIVE: Purchase 15 percent environmentally preferable, humane, and fair food by 2017, and 25 percent by 2020 by dollars spent.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Purchase seafood that is Monterey Bay recommended or Marine Stewardship Council (MSC) certified.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of seafood that is Monterey Bay recommended or Marine Stewardship Council (MSC) certified.
Purchase beef that is grass-fed.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of beef that is grass-fed.
Purchase cage-free eggs.	2016	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of cage-free eggs.
Purchase milk that is organically produced.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of milk that is organically produced.
Purchase produce that is organically grown.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of organically grown produce.
Purchase produce that is non-GMO.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of produce that is non-GMO.
Purchase coffee that meets or exceeds Fair Trade or Rainforest Alliance Certification.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of coffee that meets or exceeds Fair Trade or Rainforest Alliance Certification.
Explore the feasibility of transitioning to fair trade bananas, tea, and chocolate.	2017	Danforth and WUSM Dining Services, Food Service Partners	Analyze and report on challenges, benefits, and feasibility of transitioning to fair trade bananas, tea, and chocolate.
Purchase meat, eggs, and dairy products that are from added hormone-free animals.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of meat, eggs, and dairy products that are from added hormone-free animals.
Purchase meat and animal products that are Certified Humane.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of meat and animal products that are Certified Humane.

GOAL: SUPPORT A FOOD SYSTEM THAT ADVANCES ENVIRONMENTAL AND PUBLIC HEALTH WHILE SUPPORTING A STRONG LOCAL ECONOMY.

OBJECTIVE: Purchase food that is both local and environmentally preferable. Achieve 10 percent by 2017 and 12 percent by 2020 by dollars spent.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Prioritize products that are both local and environmentally preferable.	2017	Danforth and WUSM Dining Services, Food Service Partners	Increased percentage of products that are both local and environmentally preferable.

OBJECTIVE: Continue to improve transparency and accountability in the university food system.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Improve systems for tracking local and environmentally preferable food purchases.	2016	Danforth and WUSM Dining Services, Food Service Partners, Office of Sustainability	Tracking system updated and adopted by all dining partners.
Review sustainability metrics quarterly.	Beginning in 2016	Danforth and WUSM Dining Services, Food Service Partners, Office of Sustainability	Quarterly reports created and reviewed at quarterly meeting.
Publicly report progress on an annual basis.	Beginning in 2016	Danforth and WUSM Dining Services, Food Service Partners, Office of Sustainability	Progress report published.

OBJECTIVE: Increase direct access to fresh, local food on campus.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Promote the farmer's market at the School of Medicine.	Ongoing	Health & Wellness, Office of Sustainability	Increased sales at farmer's market.
Partner with local farms to establish a Community Supported Agriculture (CSA) drop-off point on the Danforth Campus.	Spring 2016	Health & Wellness, Office of Sustainability	Students, staff, and faculty are provided the opportunity to purchase food directly from a local farmer.
Expand food sales from the Burning Kumquat campus farm on Danforth Campus.	Ongoing	Burning Kumquat	Increased food from the Burning Kumquat offered at dining locations on Danforth Campus.

GOAL: SUPPORT A FOOD SYSTEM THAT ADVANCES ENVIRONMENTAL AND PUBLIC HEALTH WHILE SUPPORTING A STRONG LOCAL ECONOMY.

OBJECTIVE: Implement programs to increase campus awareness of sustainable and healthy food options.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Publish a guide to eating sustainably to empower students, staff, and faculty to make informed food decisions.	Fall 2016	Office of Sustainability	Sustainable dining guide published and distributed.
Host and expand participation in education and outreach campaigns including Green Monday and the Eat Local Challenge.	Ongoing	Danforth and WUSM Dining Services, Food Service Partners, Office of Sustainability	Participation in and reach of education campaigns.
Host quarterly events promoting sustainable food, including Food Day and an annual sustainable food fair.	Beginning in 2015	Danforth and WUSM Dining Services, Food Service Partners, Office of Sustainability	Events hosted, documented, and refined to increase engagement.
Continue to provide high quality vegan and vegetarian options at all locations and at all meal times.	Ongoing	Danforth and WUSM Dining Services, Food Service Partners	Availability of and consumer satisfaction with options.
Feature local and/or environmentally preferable food at dining facilities.	Spring 2016	Danforth and WUSM Dining Services, Food Service Partners	Increased signage, table tents, or menus that feature local and/or environmentally preferable food.


LANDSCAPE

LANDSCAPE

In 2010, Washington University set a goal to work toward a natural environment that recognizes the benefits of native plants and minimizes the need to use potable water, herbicides, and pesticides on our campuses.

Humans have a major influence on Earth's ecosystems and landscapes. As the global human population has grown from 1 billion in 1800 to an estimated 7.3 billion people in 2015, the planet has undergone a dramatic shift in land use largely driven by the expansion of crop and pastoral land to feed the growing global population. Biodiverse ecosystems playing important roles in the planet's natural resource flows have been replaced with increasingly monoculture croplands that dramatically limit species diversity, as well as grazelands that are heavily disturbed by domesticated animals raised for meat production.

Although urban areas constitute less than 5 percent of global land area, nowhere is humanity's impact more evident. In cities and towns throughout the world, buildings, roadways, parking lots, and turf grass cover the land. Natural hydrological systems such as rivers have been replaced with engineered sewer systems and concrete stormwater channels. Pervasive hardscapes, including black tar roofs and asphalt, cause the urban heat island effect and significantly increase the likelihood and severity of flash flooding. In the most dense cities, there is little greenery and few signs of the plant, bird, pollinator, and mammal species that once existed. The open areas that remain in cities are frequently simplified to turf grass, trees, and ornamental gardens maintained with the primary goal of providing beauty.

Cities, businesses, and institutions are beginning to shift their approach to land management, inviting nature back into human spaces and creating ecologically resilient sustainable landscapes. In addition to beauty, sustainable landscapes provide a broad range of ecosystem services, including stormwater filtration and management, air purification, carbon sequestration, habitat creation, energy conservation, and provision of more varied and natural beauty. The Sustainable SITES rating system recently launched as a guideline and recognition system and serves as a complement to the LEED green building rating system. Sustainable landscape design and maintenance is a young field ripe for experimentation, innovation, and collaboration between ecologists, engineers, hydrologists, designers, and others.

PROGRESS

Washington University has taken significant steps towards more resilient and sustainable campus landscapes that promote human and ecosystem health. In the last five years, dozens of sustainable landscape projects have been completed at the university. The Danforth Campus, which has long been known for its beautiful park-like landscapes and iconic tree allees, is integrating native and adaptive plantings throughout, significantly expanding biodiversity, and creating green infrastructure to naturally manage stormwater.

The university is now home to four large green roofs: the School of Medicine's Hope Plaza, the South 40 House back lawn, the McMillan Hall addition, and the Lofts off-campus student housing. Sections of turf grass have been replaced with native and adaptive planting beds that require little or no irrigation and reduce the need for mowing. Rain gardens and bioswales have been installed in many drainage zones to slow and filter stormwater. Pervious pavers create solid walking and bike parking surfaces while allowing water to percolate into the ground instead of draining to over-burdened sewers.

The Danforth Campus developed a Tree Framework Plan in 2013 that will guide a doubling of the campus tree canopy and expansion of tree species diversity over the next 20 years. Major progress is well under way with nearly 1,000 trees planted at the university since 2008. Students and staff have the opportunity to participate through annual planting days. As a result of these efforts and more, the Danforth Campus has been recognized as a Tree Campus USA by the Arbor Day Foundation each year since 2010.

Both the Danforth and School of Medicine campuses have partnered with greenway builder Great Rivers Greenway to plan regional bicycle and pedestrian paths through our campuses. The Centennial Greenway on the Danforth Campus is complete. The Chouteau Greenway on the Medical Campus is in the planning stage.

The university's Tyson Research Center is a 2,000 acre oak-hickory forest 30 minutes west of the Danforth Campus that serves as a landscape-scale laboratory for ecosystem sustainability. Faculty and student research at Tyson is influencing sustainable landscape approaches at the university and in the City of St. Louis through exciting interdisciplinary partnerships.

PROJECT PROFILES

HOPE PLAZA

The School of Medicine's Ellen S. Clark Hope Plaza re-creates the wild, self-sustaining habitat of a native Missouri woodland, with an infinity fountain as a serene centerpiece. With its soft curves and seasonal foliage, it is intended to provide a calming refuge for employees, patients, and other visitors to Washington University Medical Center. Maintenance is kept to a minimum to foster natural growth and evolution. Native, perennial plants self-cultivate each year and naturally crowd out weeds. Drought-resistant plants significantly reduce water use and no pesticides are used. Significant portions of Hope Plaza are actually a green roof, situated over an underground loading dock.

HILLMAN HALL LANDSCAPE

The Hillman Hall south landscape is the most extensive sustainable landscape project yet at Washington University. The plants selected for the site are largely native species and include 69 trees, 578 shrubs, and approximately 26,000 perennials, grasses, and sedges of which 70 percent are native. A large bioretention basin, seen along the building in the photo above, is designed to slow and filter sediment and pollutants from on-site storm-water runoff before percolating into native soils. Five benches onsite were made from regionally salvaged wood — four from white oak trees fallen during high winds and one from a walnut tree pulled from the Missouri river. The site also includes two bike parking nodes with pervious pavers that support active, low-carbon transportation.

PROJECT PROFILES

MCMILLAN HALL GREEN ROOF

In 2013, the university completed an addition to historic McMillan Hall that provides a 174-seat pooled Arts & Sciences classroom and three new anthropology teaching labs. The building is capped with a large green roof that provides unique research and teaching opportunities. It includes not only permanent plantings with an emphasis on native plants, but also experimental garden plots for faculty and students studying the human use of plants. Faculty and students have planted a range of plants that have historically been important to humans, including tepary beans, which are native to the southwestern United States and Mexico and have been grown there by the native peoples since pre-Columbian times. Students in the Archaeology and Early Ethnography of the Southwest class harvested and ate the beans.

BIKE PARKING NODES

The Danforth Campus has developed a series of bike parking "nodes" to accommodate significant growth in ridership. The design of the nodes advances a number of sustainable landscape outcomes: they support active transportation at the university, manage stormwater through pervious pavers and planting beds, include trees and shrubs that provide greenspace and shade, and create outdoor seating areas on the perimeter knee-walls. Seven major nodes have been built to-date, including two nodes adjacent to Olin Library, two adjacent to Hillman Hall, and a new node added in summer 2015 northeast of the Danforth University Center.

VISION AND COMMITMENT

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES

Evaluate All Landscape Projects Under a Uniform Standard of Sustainable Design

To build a common language and a common set of metrics, Washington University will begin evaluating projects under a uniform standard based largely on the SITES rating system in 2016.

Develop a Comprehensive Set of Sustainable Landscape Guidelines by 2018

Updated landscape standards will be an important tool to ensure future projects conform with the university's vision and sustainability goals for campus landscape. The new guidelines will include updated plant material guidance emphasizing native and adaptive species that support a resilient campus ecology in the face of a changing climate. The guidelines will also establish biodiversity goals and metrics for the university.

Reduce the Negative Impacts of Stormwater Runoff

We will expand the usage of Low Impact Design (LID) strategies, including rain gardens, green roofs, bioswales, pervious pavers, and cisterns. We will design stormwater management features as amenities and reduce impervious surfaces throughout the university, including the replacement of over 900 surface parking spaces with an underground garage covered with a large green roof.

Increase Tree Canopy on Danforth Campus

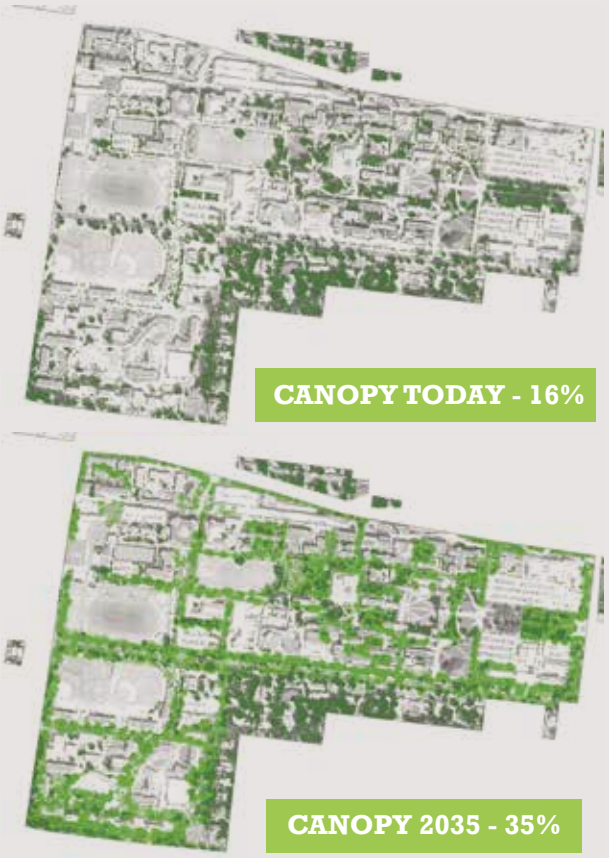
The Danforth Campus will increase tree canopy from 16 percent baseline in 2013 to 35 percent in 2035. The Danforth Campus Tree Framework Plan will be used to guide tree installation and maintenance decisions, which includes a focus on expanding tree species diversity and transforming traditional tree allees into corridors with canopy and understory trees. We seek to achieve Level I Accredited Arboretum status for the Danforth Campus by 2016 and Level II status by 2020.

Improve Soils and Biodiversity

We will replace 10 percent of turf area with native, adaptive, and performative landscape by 2020, relative to a 2010 baseline. A key objective will be to foster native plant communities that host a diversity of other native species, including birds, mammals, pollinators, lichen, and moss.

CASE STUDY

Long-Term Planning to Grow Tree Canopy



Succession Planting

Increasing overall canopy cover over time will help mitigate the heat island effect, improve building performance through shading and wind calming, provide more comfortable outdoor spaces for social interaction, and improve habitat for birds, pollinators, and mammals.

Succession planting requires planning for new trees over longer periods of time to avoid having many trees replaced at the same time.

Enhance Human Health and Well-Being Through Site Design

We seek to create outdoor spaces that nurture mental restoration, social interaction, and physical activity. We will explore opportunities to integrate edible plants into university landscapes.

Promote Environmentally Responsible Operations and Grounds Maintenance

We will source the majority of landscape materials locally and compost or recycle 100 percent of vegetation trimmings, create a specialized sustainable landscape crew, implement Integrated Pest Management (IPM), and expand the use of alternatives to rock salt for de-icing.

Educate and Engage the University Community Around Sustainable Landscape Practices

We will expand annual tree plantings, launch a new campus sustainable landscape tour, and post educational signage that will engage the university community in our ongoing efforts to advance sustainable landscapes.

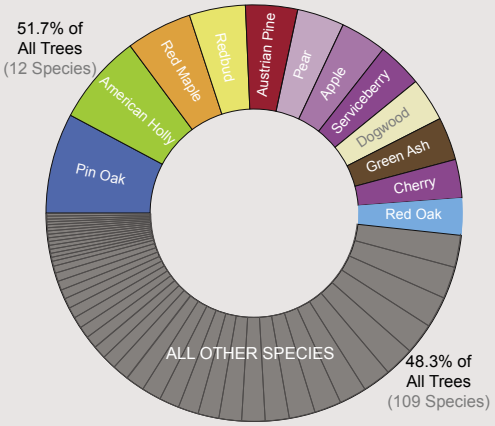
CASE STUDY

Oak Allée Tree Projection

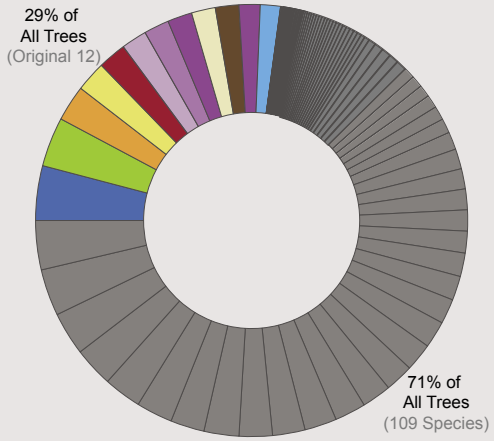
A number of the historic tree allees on the Danforth Campus are in decline. The Oak Allée adjacent to Olin Library has lost the majority of its trees through the years. Over the next few years, we will replant the Oak Allée with trees spaced further apart to allow for many decades of healthy growth.

Enhance Campus Species Diversity, Resilience, and Habitat

Over the next 20 years, Washington University will gradually increase the species diversity on campus to build a habitat-rich and diverse plant community that is less susceptible to disease and disturbance. The 12 tree species that currently comprise over 50 percent of the trees on campus will eventually represent less than 30 percent of the total trees as we diversify the landscape.



2014



2035

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES.

OBJECTIVE: Evaluate all landscape projects under a uniform standard of sustainable design.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Use the SITES checklist during the design phase to identify opportunities to enhance projects, where applicable.	Beginning in 2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	SITES criteria reviewed during design meeting.
Monitor landscape projects to verify they are performing as designed and effective at addressing project goals.	Beginning in 2016	Danforth Facilities, WUSM Facilities	Key staff and contractors.
Maintain a central database of all landscape projects to track the SITES achievements of each project.	Beginning in 2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Database updated at least annually.
Pursue SITES certification for a landscape project by 2018.	2018	Danforth Facilities	Project receives certification.

OBJECTIVE: Develop comprehensive sustainable landscape guidelines by 2018.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Update current landscape guidelines and plant material standards to reflect sustainable landscape objectives with an emphasis on native and adaptive species that support resilient campus ecology in the face of a changing climate.	2018	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed and published.
Develop non-plant material guidelines, including a red list of items not to be used.	2018	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed and published.
Develop guidelines for Best Maintenance Practices (BMP) and Integrated Pest Management (IPM).	2018	Danforth Facilities, WUSM Facilities, Office of Sustainability	Guidelines developed and published.
Incorporate Campus Tree Framework Plan into comprehensive sustainable landscape guidelines.	2018	Danforth Facilities, Office of Sustainability	Key elements of Tree Framework Plan included in comprehensive guidelines.
Establish biodiversity goals and metrics for the university.	2018	Danforth Facilities, WUSM Facilities, Office of Sustainability	Biodiversity goals and metrics established and published.

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES.

OBJECTIVE: Reduce negative impacts of stormwater runoff beyond regulatory requirements.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Conduct a stormwater management feasibility study that identifies high-impact opportunities for runoff reduction on existing sites.	2017	Danforth Facilities, WUSM Facilities, Office of Sustainability	Study complete and potential projects identified.
Use Low Impact Design (LID) strategies, including rain gardens, green roofs, bioswales, pervious pavers, cisterns, and underground vaults.	Ongoing	Danforth Facilities, WUSM Facilities	Track LID strategies through campus GIS.
Require full water quality management consistent with Metropolitan St. Louis Sewer District (MSD) standards for new construction.	Beginning 2016	Danforth Facilities, WUSM Facilities	MSD standards achieved or exceeded.
Reduce impervious surfaces beyond 2009 regulatory agreement with Metropolitan St. Louis Sewer District (MSD).	Ongoing	Danforth Facilities, WUSM Facilities	Reduction of impervious surface as a percentage of total area.
Design stormwater facilities as amenities.	Ongoing	Danforth Facilities, WUSM Facilities	Document projects and characteristics.
Increase permeable space by replacing surface parking lots in the East End of the Danforth Campus with an underground garage capped with a large green roof and open green space.	2019	Danforth Facilities	Project completed.

OBJECTIVE: Improve soils and biodiversity.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Increase, conserve, and restore native plant communities that foster a diversity of other native species, including birds, mammals, pollinators, lichen, moss, and herptiles.	Ongoing	Danforth Facilities, WUSM Facilities, TopCare	Area and quality of native plant communities.
Replace 10% of turf area with native, adaptive, and performative landscape by 2020, relative to a 2010 baseline.	2020	Danforth Facilities	2020 turf area as a percent of 2010 turf area.
Work to eliminate invasive species.	Ongoing	Danforth Facilities, WUSM Facilities, TopCare	Reduction of invasive species.
Require that all construction projects creating site disturbance issue a Soil Management Plan and ensure the correct type of soil is selected and properly installed on projects.	2017	Danforth Facilities, WUSM Facilities	SMPs issued for all projects.
Limit the use of chemicals for weed and pest management in accordance with Best Management Practices and Integrated Pest Management.	2018	Danforth Facilities, WUSM Facilities, TopCare	Track chemical use annually.
Explore partnership opportunities with Tyson Research Center to bridge operations, teaching, and research and to enhance biodiversity and soil health.	2016	Office of Sustainability, Tyson Research Center	Opportunities / projects identified.

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES.

OBJECTIVE: Promote environmentally responsible operations and grounds maintenance.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Compost and/or recycle 100% of vegetation trimmings within 50 miles of campus. Continue to harvest and mill wood from the trees for use in campus projects, where feasible.	Ongoing	Danforth Facilities, TopCare, Droege	Track vegetative waste diversion.
Reduce emissions by partnering with TopCare to ensure no-idling policy is followed and explore opportunities to convert landscape fleet vehicles to biodiesel or electric.	2017	Danforth Facilities, WUSM Facilities, TopCare	No idling policy enforced. Alternative fuel vehicles identified.
Expand use of low-emitting maintenance equipment and increase percentage of naturalized areas that require less mechanized upkeep.	2017	Danforth Facilities, WUSM Facilities, TopCare	Document changes in maintenance program.
Implement an Integrated Pest Management (IPM) and Best Management Practice program, including eliminating the use of “weed and feed” type fertilizers, set and enforce buffer zones where chemicals can not be applied adjacent to drains, and create list of approved chemicals less harmful to pollinators for use on campus.	2017	Danforth Facilities, WUSM Facilities, TopCare	PM program in place and staff trained on new approaches.
Use recycled materials accounting for at least 20% of total materials cost (excluding plants and soils).	2016	Danforth Facilities, WUSM Facilities, TopCare	Percent recycled materials used.
Use regional materials for at least 60% of total material cost: soils, compost, mulch, boulders, rocks, and aggregate within 50 miles. Plants from growing facilities and suppliers within 250 miles. All other materials within 500 miles.	2016	Danforth Facilities, WUSM Facilities, TopCare	Percent regional materials used.
Offer at least bi-annual training opportunities for TopCare staff on sustainable landscape practices.	2016	Danforth Facilities, WUSM Facilities, TopCare	Document attendance and topics.
Create a specialized TopCare crew that is knowledgeable and trained on sustainable landscape maintenance.	2016	Danforth Facilities, TopCare	Crew created and maintaining sustainable landscape sites.
Expand use of alternatives to rock salt to de-ice pavements.	Ongoing	Danforth Facilities, WUSM Facilities, TopCare	Alternatives used.
Explore alternatives to turf along the edge of Danforth Campus paths to reduce the need to annually replace edges.	Ongoing	Danforth Facilities, Office of Sustainability, TopCare	Identify, test, and deploy alternatives.
Evaluate current concrete design standards to limit urban heat island effect.	2017	Danforth Facilities	Updated standards adopted.
Continue to replace building roofs with white roofs.	Ongoing	Danforth Facilities, WUSM Facilities	Number of roofs replaced.

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES.

OBJECTIVE: Enhance human health and well-being through site design.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Continue to create and enhance outdoor spaces that foster social interaction for groups of various sizes and for a range of activities, including outdoor classes, dining, group discussions, and informal gatherings.	Ongoing	Danforth Facilities, WUSM Facilities	Track new and modified spaces.
Create outdoor spaces that foster mental restoration.	Ongoing	Danforth Facilities, WUSM Facilities	Track new and modified spaces.
Promote physical activity by creating safe and inviting pedestrian pathways, campus bike paths connecting to regional bikeways, open fields for flexible play, sports fields, and strong linkages to Forest Park.	Ongoing	Danforth Facilities, WUSM Facilities, Office of Sustainability	Track new and modified spaces.
Explore opportunities for integrating edible plants into university landscapes.	2016	Danforth Facilities, Office of Sustainability	Identify first tier of opportunities.
Establish lighting standards for new construction that limit light pollution under the standards of the International Dark Sky Association.	2017	Danforth Facilities, WUSM Facilities, Office of Sustainability	Lighting standards developed.
Conduct needs assessment for outdoor spaces.	2018	Danforth Facilities, Office of Sustainability	Needs assessment complete.

OBJECTIVE: Educate and engage the university community around sustainable landscape practices.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Host an annual planting event to involve students, faculty, and staff.	Ongoing	Danforth Facilities, Office of Sustainability	Documentation of event, including number of attendees and type of planting.
Annually seek renewal of the Tree Campus USA status.	Ongoing	Danforth Facilities	Maintain Tree Campus USA status.
Continue to host a guided Campus Tree Walk at least twice each year.	Ongoing	Danforth Facilities, TopCare	Events held and documented.
Install educational and species identification signage throughout the Danforth Campus.	2016	Danforth Facilities, Office of Sustainability	Signage installed.
Develop a Danforth Campus tree and sustainable landscape tour supported by a map, signage, and interpretive information.	2017	Danforth Facilities, Office of Sustainability	Signage installed and map published.

GOAL: FOSTER HUMAN AND ENVIRONMENTAL HEALTH THROUGH LOW IMPACT, RESILIENT LANDSCAPES THAT PROVIDE AN ARRAY OF ECOSYSTEM SERVICES.

OBJECTIVE: Increase tree canopy from 16 percent baseline in 2013 to 35 percent in 2035.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Use Danforth Campus Tree Framework Plan to guide tree installation and maintenance decisions.	Ongoing	Danforth Facilities, TopCare	Number and location of trees planted.
Achieve Level I Accredited Arboretum status for the Danforth Campus.	2016	Danforth Facilities, TopCare	Level I Accreditation achieved.
Achieve Level II Accredited Arboretum status for the Danforth Campus.	2020	Danforth Facilities, TopCare	Level II Accreditation achieved.
Reduce heat island effect by siting trees along roadways, pathways, and other impervious surfaces.	Ongoing	Danforth Facilities, TopCare	Number and location of trees planted.

TRANSPORTATION

TRANSPORTATION

According to the United States Environmental Protection Agency, the transportation sector accounted for 27 percent of total U.S. greenhouse gas emissions and 31 percent of U.S. carbon dioxide emissions in 2013, making it the country's second largest contributor after the electricity sector. At the individual level, car fuel is the single largest source of our emissions, representing 24 percent of the average American's carbon footprint.

Although total U.S. greenhouse gas emissions from transportation have increased by about 18 percent since 1990, a positive trend has emerged in personal transportation in recent years: the average American has been driving fewer miles every year for the past nine years. The trend is attributed, in part, to improvements in bicycle, pedestrian, and transit infrastructure, and a growing preference for mixed-use neighborhoods that reduce the need for driving.

With approximately 10,500 full-time parking permits sold annually at Washington University, vehicles commuting to and from our campuses account for an estimated 10,000 metric tons of carbon dioxide emissions each year. Through education and changes to policies and infrastructure, we have been actively working to advance low-carbon, active forms of transportation that lessen environmental impact, encourage healthy lifestyles, and strengthen sense of community.

In 2010, Washington University set a goal to reduce our greenhouse gas emissions by decreasing solo-occupant automobiles commuting to the Danforth Campus by 10 percent by 2012.

PROGRESS

Through the addition of new alternative transportation programs, partnerships to enhance public transit access, as well as bicycle and pedestrian improvements to our built environment, single-occupancy vehicle (SOV) commuting to the Danforth Campus decreased by 9.7 percent between 2010 and 2012 when adjusted for growth of the campus population. A subset of our growing alternative transportation initiatives are highlighted below and on the pages that follow.

Washington University is a strong supporter of expanding the regional transit system. Our partnership with the transit agency, Metro, includes transitioning a campus-operated bus fleet to Metro operations, building lightrail stations on our two academic and two administrative campuses, and providing free, unlimited "U-Passes" to all full-time staff, faculty, and students. The university distributed over 26,000 U-Passes in fiscal year 2015. The Central West End MetroLink station is the busiest in the entire system and is used by many faculty, students, and staff.

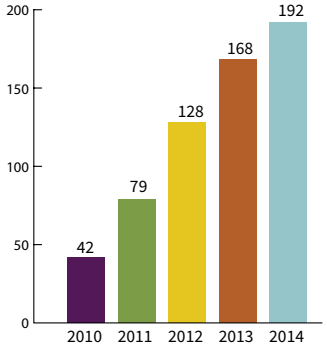
We expanded the Enterprise CarShare program from a fleet of seven vehicles in 2008 to a fleet of 21 vehicles in 2015, and we subsidize use of the program to support and encourage students, faculty, and staff to go car-free. All of the vehicles are hybrids or plug-in hybrids.

We partnered with regional greenway builder Great Rivers Greenway to build a section of the Centennial Greenway through the heart of the Danforth Campus, connecting Forest Park to the vibrant Delmar Loop mixed-use district. We are currently partnering with Great Rivers Greenway to develop a section of the Chouteau Greenway through the School of Medicine campus, which will connect the Cortex innovation district to Forest Park. We added over 300 bike parking spaces in "bike nodes," many of which include self tune-up Fixit stations, pervious pavers for stormwater infiltration, and trees for shade. We have added other bicycle and pedestrian infrastructure, including the first bike boxes in the region.

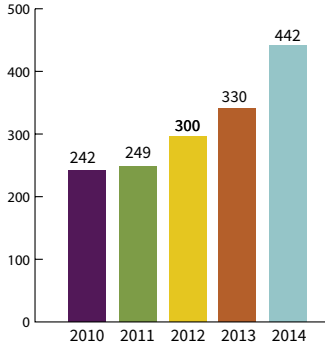
We hired our first full-time alternative transportation coordinator in summer 2013 to provide leadership and increased capacity to our efforts. We have launched new education and outreach programs to build a safe and fun culture of active transportation, including two Active Transportation Months per year, the Courtesy is Contagious safety campaign, and the Driving Change campaign to promote alternatives to SOV driving.

The university has also taken steps to reduce emissions from the campus fleet. We have replaced a number of vehicles with higher fuel economy options and operate three Dining Services delivery trucks on biodiesel.

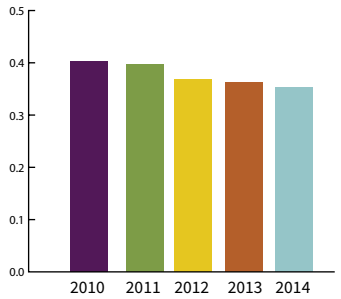
Bearly Drivers



Yearly Occasional Parkers



Danforth Campus Parking Permits per Full-Time Students and Staff



PROJECT PROFILES

BIKE BOXES

The bike box pictured above is a new feature to campus and a first in the St. Louis region. We added two bike boxes to the major bike commuting corridor connecting the South 40 residential area with the Danforth Campus in 2014. A bike box is designed as an on-street place for cyclists to wait for a traffic signal to change. Cars wait behind the box and do not advance until cyclists get a safe start through the intersection. The bright green bike boxes make cyclists more visible to drivers and provide cyclists the opportunity to gain balance and momentum when a light turns green.

COURTESY IS CONTAGIOUS CAMPAIGN

As the Danforth Campus population has grown and more people choose alternative transportation options, we have seen an increase in both cyclists and pedestrians. To promote safe movement throughout the interior of campus, this campaign reminds cyclists and pedestrians that "courtesy is contagious" and encourages safe behavior on shared paths. Campaign signs include: "Path crowded? Walk your wheels" and "Bikes: Ride Slowly."

PROJECT PROFILES

BEST WORKPLACE FOR COMMUTERS AWARD

Washington University was named the Best Workplace for Commuters (for workplaces with more than 100 employees) by regional public transportation advocates Citizens for Modern Transit. This award was further recognized nationally by the National Center for Transit Research. RideFinders, a regional rideshare program operated by Madison County Transit, presented the university with a Regional Sustainability Award, as well. Each of these awards recognized our commitment to sustainability and noted that these efforts have helped to improve air quality and reduce traffic congestion on regional roads.

BIKE FIXIT STATIONS

There are currently two Fixit self tune-up stations on the School of Medicine Campus and four stations on the Danforth Campus. The stations include an array of tools necessary to perform basic bike repairs and maintenance, including inflating tires, changing flats, tightening brakes, and adjusting derailleurs. Users lift their bicycles onto two hanger bars that allow the wheels to spin freely and access tools that hang on cables inside the vertical column. A bike pump is attached to the side of the main column. The Fixit stations support bike commuters by providing the tools and the peace of mind to keep rolling.

VISION AND COMMITMENT

GOAL: BECOME A MODEL IN THE MIDWEST FOR ALTERNATIVE AND LOW CARBON TRANSPORTATION

Reduce Number of Vehicles Coming to Campus

Washington University is aiming to reduce the number of single-occupancy vehicles coming to campus an additional 10 percent by 2017.

Increase Participation in Key Alternative Transportation Programs

To support the shift to alternative transportation, we will enhance existing programs, add new programs, and increase membership in several initiatives by 2017. We will promote usage of the U-Pass to increase the number of employees and students commuting via transit. To encourage carpooling, we will launch Zimride with a target of 200 university members within the first year. We aim to increase active users of the CarShare program. Also, we aim to increase membership in the Guaranteed Ride Home program by 10 percent.

Improve Convenience and Safety for Bicycles and Pedestrians

We aim to achieve at least Silver level Bicycle Friendly University designation by 2017. We will continue to improve infrastructure for pedestrians and bikes, including: extending the Danforth Campus perimeter path; improving walkability and linking to nearby bike ways at the School of Medicine Campus; and developing a comprehensive strategy for shower, locker, and other commuter facilities. We will continue to offer discounted bike locks and participate in a national bike registry. We will create an active transportation "Hub" as part of the enhancements to the east end of the Danforth Campus.

Build a Culture of Active, Low-Carbon Transportation

Alternative transportation education will be integrated into student and employee orientations and via skill and safety classes, consultations, and initiatives, with an emphasis on active modes of transportation.

Reduce Emissions From Vehicles Coming to Campus

We aim to expand participation in the Occasional Parking Program and the Bearly Drivers carpool program. We also plan to implement new pricing standards to reduce the demand for parking.

Reduce Emissions From the Campus Fleet

To contribute to the university's greenhouse gas reduction target, we will decrease emissions from the campus fleet by 22 percent by 2020, increasing vehicle efficiency, decreasing miles driven, and using lower-carbon fuels.

Work With Regional Partners to Advance Alternative Transportation

The university will continue to partner with Metro to enhance transit, including signage and facilities. We aim to develop a working group with neighboring municipalities to improve pedestrian and bicycle facilities and enhance connectivity. As efforts to create a regional bike share system move forward, we seek to support implementation and host stations on our campuses.

Work to Minimize the Impact of Parking Cost Increases

By 2017, the university will evaluate several options to minimize the impact of parking cost increases on employees and students. We seek to increase the use of lower-cost parking at the North and West campuses.

CASE STUDIES

Active Transportation Months

Every April and October, the Washington University community is encouraged to kick the car habit and try active, low-carbon means of transportation. Activities throughout the month include free bike tune-ups, a Bike-In Movie on Forest Park's Art Hill, personal transportation consultations, breakfast for bikers events, and the Active Transportation Challenge.

The challenge offers individuals and teams support to shift their commutes, a tool to track their progress in calories-burned and CO_2-saved, and healthy competition with themselves and others. Hundreds of our faculty, staff, and students participate each year, earning organic cotton "I [Bike, Walk, or Metro] WUSTL" t-shirts for participating. Alternative transportation-themed trophies are awarded at the end of the challenge to recognize winning teams.

In April 2014, challenge participants logged over 16,500 car-free miles, saving an estimated 16,000 pounds of carbon dioxide from being released into the air!

Alternative Transportation Impact

3,390 Car share members

192 Bearly Driver carpoolers

1,250+ Bicycles at the university

Driving Change Campaign

In 2014, Washington University launched the Driving Change campaign to better educate the community about our alternative transportation programs. Driving Change highlights how staff can customize their commute by selecting the programs that work best for their needs. The campaign spotlights staff members who take transit, bike, and have multi-modal commutes and the programs they use.

Parking & Transportation Services supports the Driving Change campaign by providing personal transportation consultations to help individuals map out all transportation options from their home address to campus and identify ways to reduce transportation costs and make the commute more safe and enjoyable.

Metro Passes

Washington University subsidizes a free U-Pass for all full-time students and benefits-eligible employees, granting access to St. Louis' entire public transportation system. MetroLink light rail is anchored by 37 stations, and the MetroBus system consists of more than 75 bus lines that traverse most of the St. Louis region.

By increasing the university community's use of transit, the U-Pass program reduces emissions, decreases roadway congestion, and eases parking demands at university campuses and facilities.

26,129 U-PASSES

GOAL: BECOME A MODEL IN THE MIDWEST FOR ALTERNATIVE AND LOW CARBON TRANSPORTATION.

OBJECTIVE: Reduce number of single-occupancy vehicles coming to campus an additional 10 percent by 2017 from a 2013 baseline.

IMPROVE ACCESSIBILITY TO TRANSPORTATION ALTERNATIVES

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Increase usage of U-Pass for staff, faculty, and student commuting.	2017	Parking & Transportation	Quantify number of U-Passes distributed.
Promote and increase usership of Zimride to encourage both long- and short-term carpooling and bikepooling.	2017	Parking & Transportation, Enterprise	Grow usership to 200 members within the first year of implementation.
Increase membership of CarShare program and respond to demand.	2017	Parking & Transportation, Enterprise	Increase active users of the program within the last 12 months.
Increase membership in Guaranteed Ride Home Program.	2017	Parking & Transportation, CMT, Ridefinders	Increase membership by 10%.

INCREASE ACCESSIBILITY AND SAFETY OF BICYCLE AND PEDESTRIAN TRANSPORTATION

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Increase and improve bicycle and pedestrian infrastructure.	2017	Facilities, Bike Working Group, Office of Sustainability, Parking & Transportation	Install covered bike racks in key locations around campus, add bike racks to campus-to-home vehicles, expand bike lanes and bike boxes.
Develop a comprehensive strategy for university commuter facilities.	2017	Parking & Transportation, Bike Working Group	Develop recommendations for building standards: shower and locker facilities at strategic locations around each campus, Fixit stations, bike part vending machines.
Expand events to promote alternative transportation.	2015	Office of Sustainability, Parking & Transportation	Organize one large annual event, incorporate alternative transportation into existing events, host education events.
Increase bicycle registration and number of discounted locks sold.	2017	Parking & Transportation, Washington University Police Department	Annually track number of registered bikes and bike locks sold.
Achieve at least Silver level Bicycle Friendly University designation by 2017.	2017	Parking & Transportation, Office of Sustainability	Receive designation.
Explore feasibility of a “Bike Hub” for resources, enforcement and culture.	2017	Parking & Transportation, Office of Sustainability	Complete a feasibility study for developing a Bike Hub.

GOAL: BECOME A MODEL IN THE MIDWEST FOR ALTERNATIVE AND LOW CARBON TRANSPORTATION.

OBJECTIVE: Reduce number of single-occupancy vehicles coming to campus an additional 10 percent by 2017 from a 2013 baseline. (Continued)

INCREASE ALTERNATIVE TRANSPORTATION PROGRAM PARTICIPATION

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Integrate alternative transportation education into student orientation.	2015	Office of Sustainability, Residential Life, Parking and Transportation	Leverage Green Ambassadors and RA's to teach freshmen about alternative transportation.
Educate new employees on alternative transportation options.	2015	Parking and Transportation, Office of Sustainability, Human Resources	Alternative transportation options are presented at 24 employee orientations per year.
Educate student groups on alternative transportation options.	2016	Parking & Transportation, Office of Sustainability	Alternative transportation options are presented to 12 student groups per year.
Increase accessibility to alternative transportation information on campus.	2016	Parking & Transportation, Public Affairs	Create a comprehensive alternative transportation website, audit campus websites for consistency and clarity.
Host bicycle skill and safety classes and promote safe cycling.	2016	Parking & Transportation, Public Affairs	Safety barrier removed for interested and existing bikers.
Provide personal transportation consultations to students and staff.	2017	Parking & Transportation	50 consultations annually with at least 20% reporting attempted commute changes.
Leverage Active Transportation Months to promote alternative transportation.	2016	Parking & Transportation, Office of Sustainability	Increase challenge participants to 200 and event participants to 500.
Promote active transportation.	2016	Health & Wellness, Office of Sustainability, Parking & Transportation	Collaborate with Health & Wellness team.

REDUCE CARBON EMISSIONS FROM VEHICLES COMING TO THE UNIVERSITY

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Promote the Occasional Parking program and Bearly Drivers carpool program to reduce full-time parking permits.	2017	Parking & Transportation	Fewer full-time parkers.
Adopt technology and process solutions that make alternative transportation programs more convenient and easy to use.	2016	Parking & Transportation	Alternative transportation is more convenient and easy to use.
Implement new pricing standards to reduce demand for parking.	2016	Parking & Transportation	Fewer full-time parkers.

GOAL: BECOME A MODEL IN THE MIDWEST FOR ALTERNATIVE AND LOW CARBON TRANSPORTATION.

OBJECTIVE: Reduce the CO_2 footprint of campus fleet 22 percent by 2020.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Increase the number of fleet vehicles using alternative energy (biodiesel, electric, hybrid).	2017	Parking & Transportation	More fuel efficient fleet, quantified impact of more efficient vehicles on carbon.
Expand biodiesel fueling infrastructure.	2017	Parking & Transportation, Office of Sustainability	Develop recommendations for future biodiesel fueling stations.
Increase the blend ratio for biofuel vehicles in fleet.	2016	Parking & Transportation, Office of Sustainability	Increased buy-back of biodiesel from spent fryer oil and decreased gallons of diesel fuel purchased.
Seasonally adapt circulator/shuttle routes and timing to decrease mileage.	2016	Parking & Transportation	Reduced routes during summer and winter breaks.
Explore opportunities to decrease number of vehicles.	2017	Parking & Transportation	Vehicle size, power, and model align with need across all departments.

OBJECTIVE: Work with regional partners to advance alternative transportation.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Partner with Metro to improve public transportation.	2017	Parking & Transportation, Office of Sustainability	Improved bus stop signage and facilities.
Develop working group with neighborhood municipalities.	2017	Government & Community Relations, Parking & Transportation, Office of Sustainability	Improved bike and pedestrian access on roadways surrounding campus.
Participate in regional bike share implementation.	2017	Parking & Transportation, Office of Sustainability	Plentiful on- and off-campus access to a fully functional bike share program.

OBJECTIVE: Explore opportunities to minimize impact of parking and transportation cost increases.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Explore a parking permit system with varying prices among staff to promote cost equity.	2017	Parking & Transportation, Office of Sustainability	Parking permit cost is more equitable.
Increase use of underutilized parking at West and North Campuses with public transit to Danforth Campus.	2017	Parking & Transportation, Office of Sustainability	Increased usership of economy parking program.

WASTE

WASTE

According to the EPA, Americans generate approximately 254 million tons of municipal solid waste each year. That is an average of 4.4 pounds of waste per person per day or 1,600 pounds per person per year. Approximately two-thirds of this waste ends up in landfills or incinerators, resulting in numerous public health and environmental issues, including contamination of soils and waterways, methane emissions that contribute to global warming, and even smoldering sub-surface fires that release toxic chemicals into the air.

Diverting waste from landfills through recycling and composting can mitigate many of these negative impacts. In 2013, Americans recycled and composted approximately 87 million tons of municipal solid waste or one-third of the waste we generate. The EPA estimates this resulted in a reduction of 186 million tons of carbon emissions, equivalent to taking 39 million passenger cars off the road.

Despite steady increases in recycling rates in America over the last four decades, the dominant culture of single-use products and the use of materials produced through energy- and chemically intensive processes result in additional negative impacts up-stream during material extraction, manufacturing, and transportation.

Fortunately, the decades-old focus on reducing, reusing, and recycling has expanded in recent years to include aggressive "zero waste" targets that require new ways of thinking about and planning for material streams. Full life-cycle assessments that aim to reduce the impact of material streams from extraction to end-of-life are informing procurement and disposal decisions. Material standards — including compostable designation, Cradle to Cradle Certification, and the Healthy Product Declaration — are empowering consumers with important information and beginning to shift industry practices.

In 2010, Washington University set a goal of lowering our landfill impact by achieving solid waste diversion rates of 20 percent on the School of Medicine Campus and 35 percent on the Danforth Campus by 2012.

PROGRESS

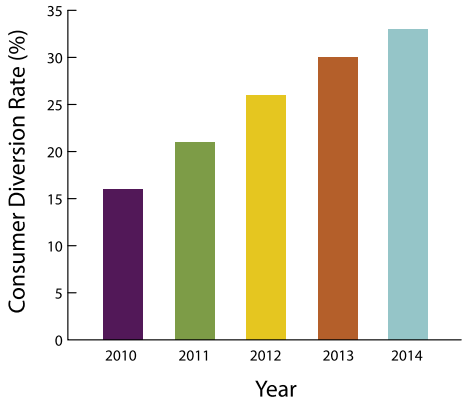
Through the efforts highlighted below and many others, Washington University achieved an overall waste diversion rate of 38 percent on the School of Medicine Campus and 73 percent on the Danforth Campus in fiscal year 2012, significantly exceeding our goals.

Waste reduction and diversion initiatives have long been a hallmark of Washington University's sustainability efforts. The university steadily expanded recycling infrastructure throughout the late 1990s and 2000s, with waste diversion rates increasing with the improvements. In 2009, we were the first North American university to ban the sale of bottled water, reducing an estimated 390,000 plastic bottles from our waste stream each year. That same year, administrators worked with students to launch the Share Our Stuff move-out donation drive, which is highlighted on the next page.

The adoption of the 2010 Strategic Plan for Sustainable Operations further accelerated our waste efforts. The university switched to single-stream recycling and labeled trash bins "landfill," which resulted in a near doubling of our consumer recycling rate from 2008 to 2010. Compost collection was introduced in 2010 and has grown to over 300,000 pounds annually. The consumer waste diversion rate has been growing annually ever since, as shown in the graph above.

Consumer Diversion Rate

Both Campuses



Note: consumer diversion rates are lower than the overall waste diversion rate, which includes construction and demolition waste.

Dozens of large events throughout the year, including Commencement and the School of Medicine's employee appreciation picnic, have achieved zero waste (greater than 90 percent waste diversion) through the use of green waste stations. Student and staff volunteers can often be seen wearing "ComPoster Child" t-shirts while working the stations. The green waste station approach, which was first piloted in 2012, has now been institutionalized into our custodial team's standard service offerings.

Washington University Dining Services was awarded the 2014 NACUFS (National Association of College and University Food Services) Sustainability Gold Award for Excellence in Waste Management as a result of its many efforts to reduce waste, including: extensive promotion of reusable wares at dining facilities, the Eco To-Go reusable take-out program, eliminating plastic bags from campus markets, coffee discounts for customers with reusable mugs, donating unused food to organizations that serve individuals and families in need, and converting fryer oil to biodiesel to power Dining Services delivery trucks.

PROJECT PROFILES

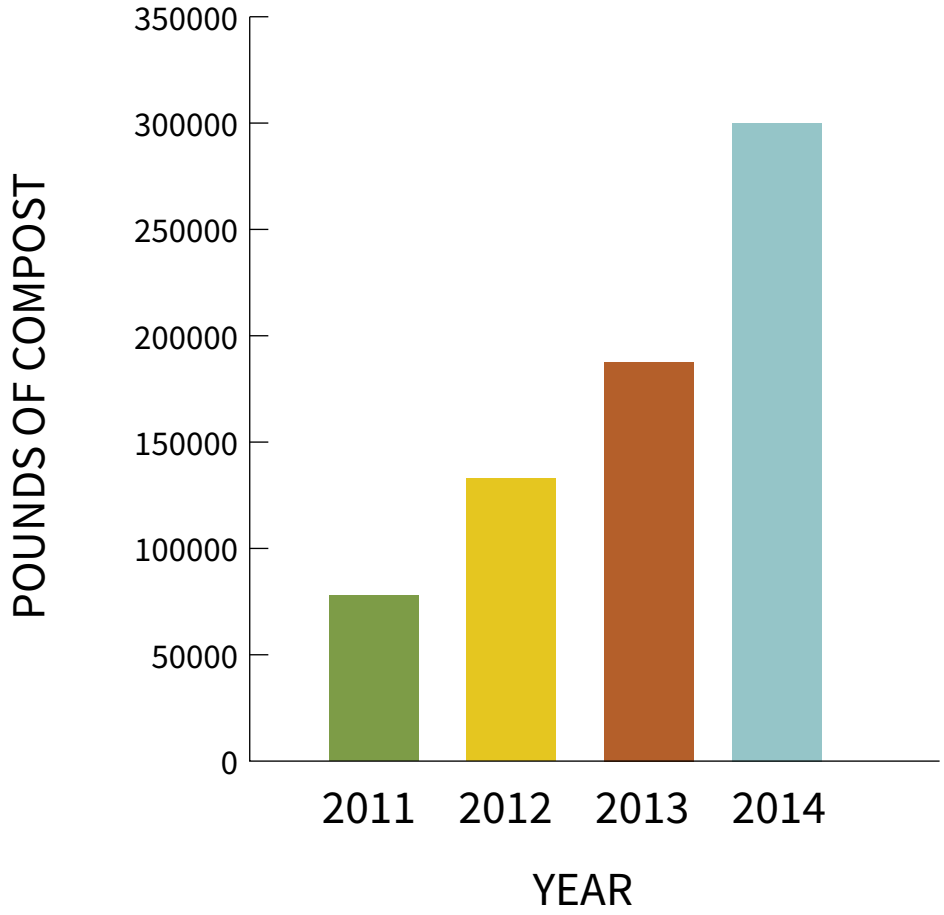
GREEN WASTE STATIONS — WILD CASE STUDY

Green waste stations have become a prominent feature at large-scale campus events, including WILD, a major biannual concert on campus. The stations consist of a tent, "green waste station" banners, tables, and table-top bus tubs for recycling, composting, and landfill. Volunteers help attendees sort their waste into the correct tubs, providing important peer-to-peer education. In fall 2014, WILD attained a diversion rate of approximately 95 percent through the use of green waste stations and procurement of compostable service ware. Secondary benefits of green waste stations include less visual clutter at events and faster event clean up due to less litter.

SHARE OUR STUFF — REUSE THROUGH DONATIONS

Share Our Stuff (SOS) is Washington University's annual move-out donation drive for on- and off-campus residential units. Prior to SOS, students eager to get home would fill dumpsters with usable furniture, clothing, and more. In 2009, Washington University partnered with area non-profits to make it easy for all students to donate their unwanted items at move-out in a manner that benefits people in need and keeps usable goods out of the landfill. In spring 2015, SOS was responsible for donating an estimated 78,500 pounds of furniture, appliances, clothing, books, and more to Goodwill, Operation Food Search, and the student-run social venture, Sharing With A Purpose (SWAP).

PROJECT PROFILES



ECO TO-GO PROGRAM — REDUCING WASTE

Students in Washington University's chapter of Net Impact have been partnering with Dining Services and Bon Appetit to promote the Eco To-Go program since its inception in 2013. Inspired to reduce the enormous amount of post-consumer waste coming from cardboard to-go containers, Net Impact successfully applied to the Student Sustainability Fund (SSF) to do a full-scale launch of Eco To-Go, receiving over $8,000 of funding. The funding allowed the students to provide free Eco To-Go memberships for all incoming students beginning in fall 2013. Students at the School of Medicine also successfully applied to the SSF to use Eco To-Go for their lunch lectures in place of disposables.

COMPOSTING — ANNUAL GROWTH

Washington University first began collecting pre-consumer compost in dining facility kitchens in 2010. Each year since, the volume of compost collected at the university has increased by over 50,000 pounds through the expansion of pre-consumer composting to additional kitchens and the introduction of post-consumer composting at dining halls, campus restaurants, and events. In fiscal year 2014, our efforts resulted in 305,365 pounds of material being composted. Washington University closes the loop by purchasing finished soil amendment and organic compost fertilizer for our campus landscape from the same vendor who composts our food waste.

VISION AND COMMITMENT

GOAL: CHART A PATH TOWARD ZERO WASTE

Increase Waste Diversion

We aim to achieve a 55 percent diversion rate on the Danforth Campus and a 45 percent diversion rate on the School of Medicine Campus by 2020, excluding construction and demolition waste. We will assess and upgrade recycling and composting infrastructure. We will align the color coding of the system, including waste labels, liner, and dock-side infrastructure for easier visual auditing. We will adjust purchasing practices in our dining areas to improve clarity for consumers. We will study the feasibility of creating a material recovery facility to increase diversion.

Reduce Consumer Waste Generated Per Capita

In tandem with our efforts to increase recycling and composting rates, we will simultaneously work to reduce the overall amount of consumer waste generated by 35 percent per capita by 2020, relative to a 2010 baseline. To accomplish this, we will audit the consumer waste stream to identify the opportunities for waste reduction. We will significantly limit disposable products in dining facilities, including eliminating single-use to-go boxes in residential areas by expanding the Eco To-Go reusable to-go program. We will develop purchasing standards to limit the packaging and landfill-only products coming to the university.

Train and Enlist Staff and Students as Champions

Key university staff, including custodial teams, dining staff, and department managers, are integral to the success of our waste reduction and diversion efforts. We will expand training programs, create new resources, and recognize staff for their efforts. Student peer-to-peer education through the Green Ambassador program and the Eco Rep program will be expanded during orientation and throughout the school year.

Expand Construction and Demolition Waste Recycling

All LEED projects at Washington University currently recycle high percentages of the waste generated during construction and demolition. Many of the smaller projects have not yet adopted the same practices. We will begin collecting waste data from all projects large enough to require a dumpster in 2017 to improve our understanding of the types of materials leaving our smaller projects. We will use the data to develop a set of strategies that support waste recycling and donations on all projects beginning in 2018.

Collect Data on Waste Sorting and Diversion to Guide Education and Action

Interns and volunteers will continue to conduct periodic waste audits to track and report progress to the university community. Audit data will guide our outreach efforts and adjustments to infrastructure.

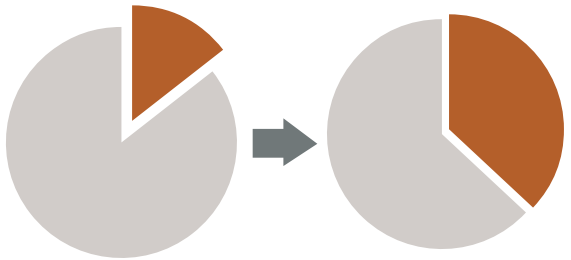
Expand Opportunities for Safe Disposal of Hazardous and Toxic Materials

Washington University community members often handle hazardous waste and toxic materials, including laboratory chemicals and electronic waste. We will continue to spread awareness about alternative disposal of these materials and expand e-waste and battery collection services to be accessible to all students, faculty, and staff.

Further Develop Donation Initiatives That Benefit the Community

Washington University will continue to participate in collection drives — including Share Our Stuff, the Holiday Lights Drive, and the annual shoe collection — that benefit non-profit organizations and keep usable goods out of the landfill.

Overall Waste Diversion



17%
Fiscal Year 2010

37%
Fiscal Year 2014

CASE STUDIES

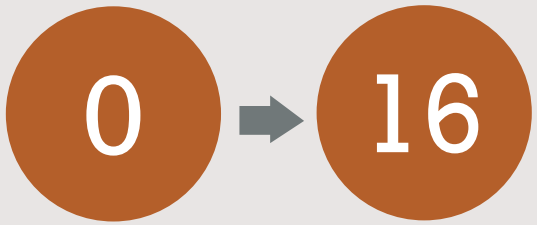
Zero-Waste Events

Beginning in August 2013, a group of 30 student Green Ambassadors has played an integral role in educating incoming freshmen about waste reduction and diversion. During move-in and throughout orientation week, the Green Ambassadors introduce incoming students to low-impact living on campus, participate in events, and operate green waste stations to educate students, parents, staff, and faculty on composting and proper waste sorting.

The Green Ambassadors, along with staff and faculty volunteers, have succeeded in making most major university events "zero waste," with greater than 90 percent of event waste recycled or composted. Historically, less than 25 percent of the waste from these events was recycled.

Events that have achieved or nearly achieved zero waste include: Commencement, Convocation, the WUSM Employee Appreciation Picnic, Danforth Staff Day, biannual WILD concerts, SUp All Night, First Floor Dinner, Thurtene, Bike-In Movie, Carnival, alumni Reunion BBQ, senior class toast and gift celebration, and Facilities' annual United Way event. These efforts keep thousands of pounds of food waste and recyclables out of the landfill each year.

Shifting Campus Culture



New Use For Old Turf

Washington University began planning to replace the grounds of Francis Field on the Danforth Campus in summer 2012. One million pounds of artificial turf were headed for the landfill until the Facilities Department contacted the Office of Sustainability to try to find an alternative. This collaboration grew into a regional partnership including St. Louis Green and the Teamsters Joint Council 13, who helped find uses for all the rolls of turf.

Although the turf had reached the end of its life as a competitive sports surface, it still had years of life for other uses. Ultimately, the turf went to approximately 26 community organizations throughout the region who used it for batting cages, field dugouts, and dog parks where natural grass often cannot grow well due to large amounts of foot traffic. The Teamsters Joint Council 13 volunteered to transport the turf to the organizations. This unique partnership kept one million pounds of material out of the landfill and saved the community organizations money.

Construction and Demolition Waste

A major component of greener building practices is the diversion and tracking of the waste generated through the construction and demolition process. Washington University's construction contractors help divert our construction waste from the landfill and provide all documentation necessary to track our efforts by volume. The university diverted more than 90 percent of construction and demolition waste for recent LEED projects like the BJC Institute of Health and the Stephen F. and Camilla T. Brauer Hall. For non-LEED projects, we are working to increase the amount of construction and demolition waste captured by improving our project management processes and through enhanced tracking and reporting mechanisms.

CASE STUDY

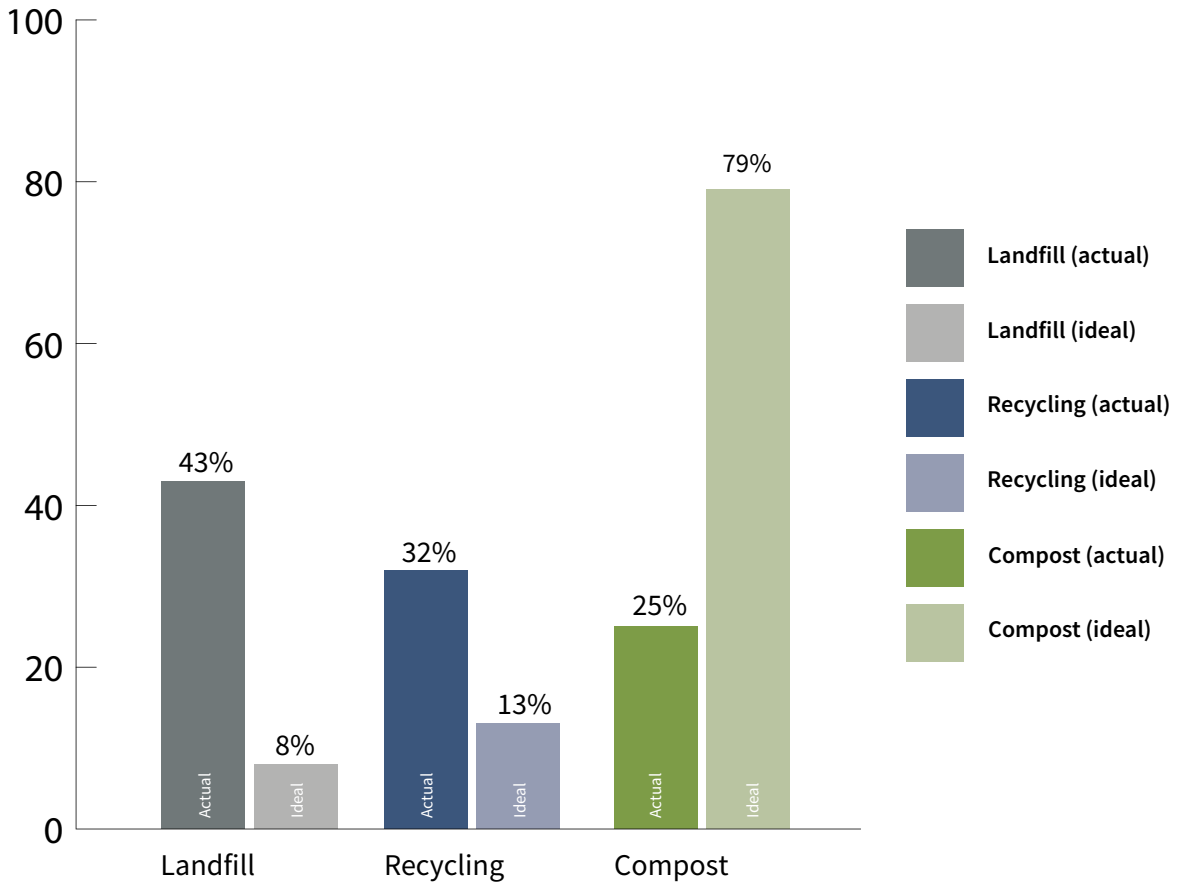
Waste Audit Findings

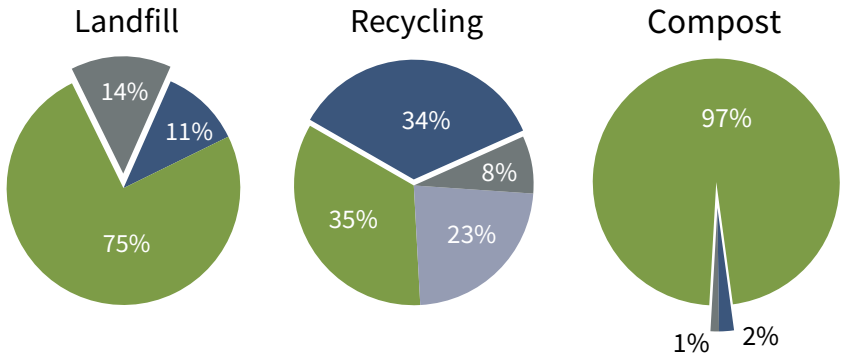
Office of Sustainability interns and volunteers conduct regular waste audits to assess how far current consumer practices fall from ideal waste sorting. These audits provide valuable insight into student and staff behaviors, allowing the office to evaluate the effectiveness of strategies for improving waste diversion on campus.

Starting in December 2012, waste audits have been conducted in a variety of locations on the Danforth Campus, including the Bear's Den, the Village, the Village kitchen, and Olin Library. For each audit, the students receive and sort two full pulls of all three waste streams (compost, recycling, and landfill), weighing the waste before and after the sorting process. The graphs to the right show data from an audit at the Bears' Den dining facility tray return conducted in February 2015. The bar graphs indicate the actual and ideal sorting. The pie charts indicate the composition of each waste stream. For example, the landfill pie chart indicates that 75 percent of the material thrown in the landfill container is compostable and 11 percent is recyclable.

In the fall of 2014, Office of Sustainability interns prepared and presented a waste report to staff from Dining and Facilities. In addition to outlining waste diversion outreach efforts and waste audit findings, the report provides recommendations related to waste bin liners, staff training, accessibility and layout, purchasing, and signage.

Bear's Den February 2015





GOAL: CHART A PATH TOWARD ZERO WASTE.

OBJECTIVE: Achieve a 55 percent diversion rate on the Danforth Campus and a 45 percent diversion rate on the School of Medicine Campus by 2020, excluding construction and demolition waste.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Audit availability and quality of recycling infrastructure throughout the university and upgrade as needed.	Ongoing, beginning in 2015	Danforth Custodial, WUSM Custodial, Office of Sustainability	Adequate and well-labeled recycling infrastructure exists throughout the university.
Provide consistent color-coded waste infrastructure and signage throughout the university that aligns label colors, bag colors, and dumpster colors.	2017	Office of Sustainability, Danforth Facilities, WUSM Facilities	Updated infrastructure and signage in place. Color-coded bags operational at all locations.
Expand recycling program to all laboratories.	2017	Office of Sustainability, Environmental Health and Safety, Danforth Custodial, WUSM Custodial	Recycling available in all labs.
Expand green waste station program to all major campus events with over 500 attendees.	2017	Office of Sustainability, Danforth Custodial, WUSM Custodial, and event hosts	List of events that have achieved zero waste.
Add soft plastic recycling in select locations, including shipping and receiving areas and central collection bins in residential areas.	2017	Danforth Custodial, WUSM Custodial, Office of Sustainability	Soft plastic recycling locations in place and data incorporated into waste tracking sheet.
Explore the feasibility of developing a material recovery facility to improve waste diversion.	2016	Office of Sustainability, Danforth Facilities, WUSM Facilities	Feasibility report published.
Assess and upgrade kitchen back-of-the-house compost and recycling processes, infrastructure, and signage in all dining locations.	2017	Office of Sustainability, campus dining partners	Document changes.
Assign recycling and composting staff champions at major dining facilities and train kitchen staff on pre-consumer composting and recycling practices biannually.	Ongoing, beginning in 2016	Campus dining partners with Office of Sustainability support	Staff champion list. Number of staff trained and frequency of staff training.
Expand post-consumer compost collection to all dining facilities.	2020	Office of Sustainability, Dining Services	Infrastructure in place to collect post-consumer compost waste at all dining facilities.
Streamline Dining Services purchasing practices to make waste stream more clear to consumers.	2017	Dining Services	Reduction of landfill-only materials and improved waste diversion.
Create a simple system for consumers to compost at catered events.	2017	Office of Sustainability, Dining Services, Danforth Custodial, WUSM Custodial	Composting is an option for all catered events.

GOAL: CHART A PATH TOWARD ZERO WASTE.

OBJECTIVE: Reduce consumer waste tonnage per capita by 35 percent by 2020 relative to a 2010 baseline.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Assess waste streams on campus to identify key target areas for waste reduction.	2017	Resource Management, Danforth Custodial, WUSM Custodial, Office of Sustainability	Publish report of priority areas for waste reduction.
Create campus-wide purchasing standards to reduce landfill-only materials and overall tonnage of materials coming to the university.	2018	Resource Management, Office of Sustainability, Dining Services	Standards/policy published.
Promote use of reusable service ware, including plates and Eco To-Go, over single-use products in dining facilities.	Ongoing	Dining Services	Decrease number of single use products consumed. Track at least quarterly.
Eliminate disposable to-go boxes in residential areas.	2016 - South 40 2017 - Village	Dining Services	Residential dining locations no longer provide single-use to-go boxes.
Train dining staff quarterly to default to using reusable service ware.	Ongoing, beginning in 2015	Office of Sustainability, Dining Services	Number and frequency of trainings.
Expand and promote the reusable mug discount.	2016	Dining Services	Decrease number of single-use coffee cups consumed. Track at least quarterly.
Promote reusable water bottles and water consumption over high calorie alternatives.	Ongoing	Director of Nutrition, Dining Services, Office of Sustainability	Campus culture of reusable water bottles reinforced annually to incoming and returning students.
Increase amount of seating in the DUC and Bears' Den to encourage dine-in eating.	2020	Dining Services	Number of seats added.
Collect spent fryer oil at all dining locations for conversion to biodiesel.	2016	Office of Sustainability , Dining Services	Track weight of recycled fryer oil.
Add a fall semester Share Our Stuff drive.	2016	Office of Sustainability, Residential Life	Track weight of donated items.
Donate excess food to local organizations.	2015	Dining Services	Track donations.
Reduce food waste by closely monitoring demand and cooking in appropriately sized batches.	2015	Dining Services	Reduce food waste.
Partner with Greek organizations to create a culture of recycling and composting in houses and at events.	2016	Student Involvement and Leadership, Office of Sustainability	New initiatives and outreach in partnership with Greek leadership.
Create system to reuse cardboard delivery boxes for student move-out.	2016	Office of Sustainability	Launch moving box reuse program.

GOAL: CHART A PATH TOWARD ZERO WASTE.

OBJECTIVE: Expand construction and demolition waste recycling to all campus projects by 2017.

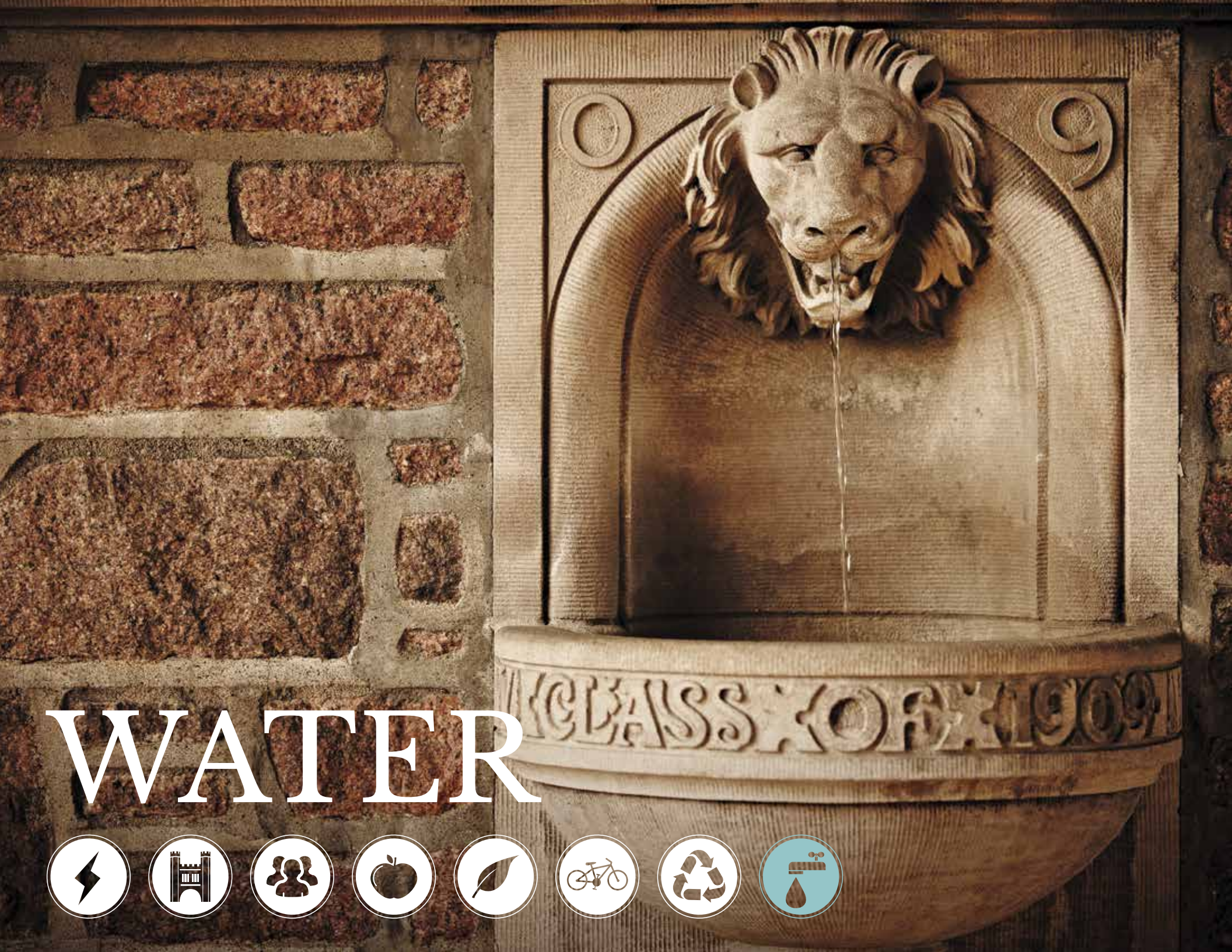
STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Require all projects to collect and report waste data to a central database.	Beginning in 2016	Danforth Facilities, WUSM Facilities, Office of Sustainability	Project Managers and contractors track and report waste data for all projects.
Require all projects to divert materials from landfill through recycling and donations.	2017	Danforth Facilities, WUSM Facilities	Construction and demolition waste recycling is standard practice on all projects.

OBJECTIVE: Reduce waste stream contamination.

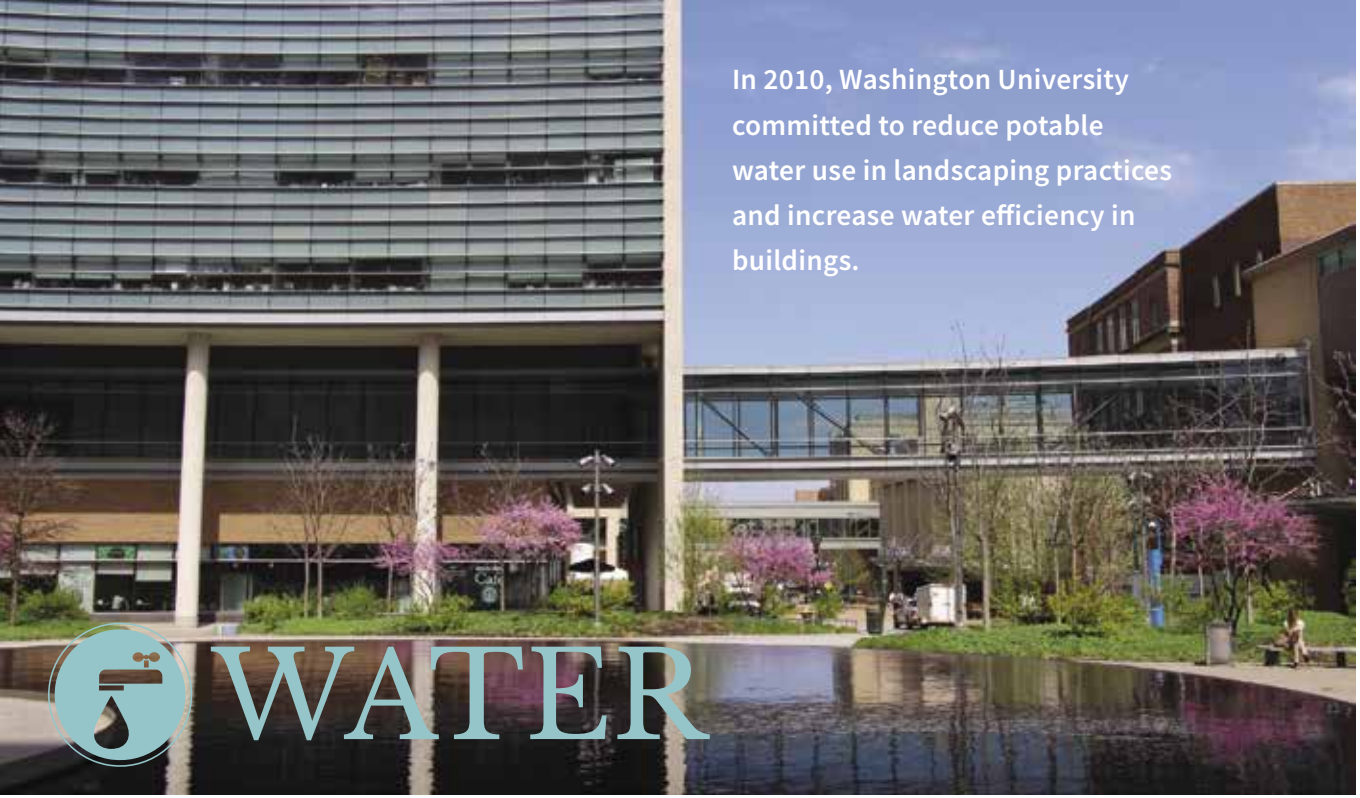
STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Collect waste audits at least quarterly to guide future action and education.	Ongoing	Office of Sustainability, Dining Services	Conduct periodic waste audits to track progress.
Integrate waste-sorting education into new student orientation through Green Ambassador program, Residential Advisor training, and orientation events.	Ongoing	Office of Sustainability, Green Ambassadors	Number of Green Ambassador volunteer hours, number of trainings, and number of events with waste education.
Continue and expand ComPoster Child volunteer program to supervise tray return stations at peak meal times during orientation.	Ongoing	Office of Sustainability, ComPoster Child Program	Number of volunteer hours. Improvements in waste diversion measured through waste audits.
Expand staff outreach and education efforts to increase diversion rates in offices and labs.	2016	Dining Services, Office of Sustainability	New materials developed and disseminated, number of staff reached.

OBJECTIVE: Expand opportunities for safe disposal of hazardous waste and toxic materials.

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Spread awareness about alternative disposal of hazardous materials.	2016	Environmental Health and Safety, Danforth Custodial, WUSM Custodial, Office of Sustainability	New materials developed and disseminated, number of people reached.
Expand e-waste collection services to be accessible to all students and staff.	2016	Environmental Health and Safety	University-wide access to e-waste collection.
Host an annual e-waste collection drive for staff and students.	Ongoing	Environmental Health and Safety, Danforth Custodial, WUSM Custodial, Office of Sustainability	E-waste drives held, data collected and added to waste tracking spreadsheet.
Make Student Technology Services an e-waste recycling collection site for residential students, including batteries, laptops, and other devices.	2016	Student Technical Services, Environmental Health and Safety, Office of Sustainability	Collection protocol developed, program marketed through website and other means.



WATER



In 2010, Washington University committed to reduce potable water use in landscaping practices and increase water efficiency in buildings.

WATER

Water covers about 71 percent of the Earth's surface according to the U.S. Geological Survey (USGS) and is essential for life on our planet. The majority of Earth's water is saltwater found in the oceans. Freshwater, which is essential for human life, only accounts for an estimated 2.5 percent of total global water. The majority of freshwater is locked up as glaciers and ice caps, with less than 1 percent of freshwater readily available to humans as surface water in lakes and rivers.

Rapidly growing global population is already straining water resources, and climate change will exacerbate our water challenges, resulting in droughts in some places and floods in other places.

In the United States, the USGS reports that the majority of water is used for irrigation and once-through cooling of power plants. Public water uses, including homes, institutions, parks, and pools, only account for approximately 12 percent of U.S. water use. Although this section focuses on the on-site water uses at the university, it is important to understand that our total water footprint is strongly linked to our energy use, referred to as the "water-energy nexus," as well as the campus food system. The university's sustainability efforts in those domains will reduce our overall water footprint. At the same time, our work to use less potable water on-site will reduce our carbon footprint — a tremendous amount of energy is used to filter and pump potable water to our sinks, showers, and toilets.

A positive trend emerged in the U.S. water-use profile in 2010. The USGS reported that water consumption dropped to its lowest level since before 1970, despite a growing population. Recent years have seen increasing social awareness of the importance of water conservation. Low-flow fixtures have become much more common in homes, hotels, and businesses. Landscape practices are shifting towards native and adaptive plant communities that require less irrigation, and homeowners are beginning to use rain barrels to capture rainwater for irrigation. The Living Building Challenge's net-zero water requirement is helping spur innovations in building-scale and district-scale rainwater capture and wastewater recycling systems.

PROGRESS

Washington University is located less than 20 miles from the confluence of the Missouri and Mississippi rivers in a water rich region with very low costs for potable water.

Nonetheless, we recognize the great importance of water in our lives today and the increasing challenges that lie ahead. Missouri's annual average temperature in 2012 was the highest on record and paired with a historic summer drought that compromised agriculture and stressed natural and urban ecosystems throughout the state. We are also seeing rising costs: Over the last 10 years, water costs on the Danforth Campus have risen by an average of 10 percent each year. The addition of this water section to the Strategic Plan for Sustainable Operations represents the expansion of our commitment to action.

Since 2010, we have taken a number of steps to reduce our potable water consumption and create more resilient campus water systems. All new construction and major renovations projects are built with low-flow fixtures that reduce water use by at least 30 percent and often over 35 percent relative to code. In addition, landscape projects are designed to reduce irrigation water use by over 50 percent through native and drought tolerant plantings, efficient irrigation systems, and rainwater harvesting. We now have four rainwater harvesting cisterns in place with a total capacity of nearly 230,000 gallons of water that replace potable water for irrigation.

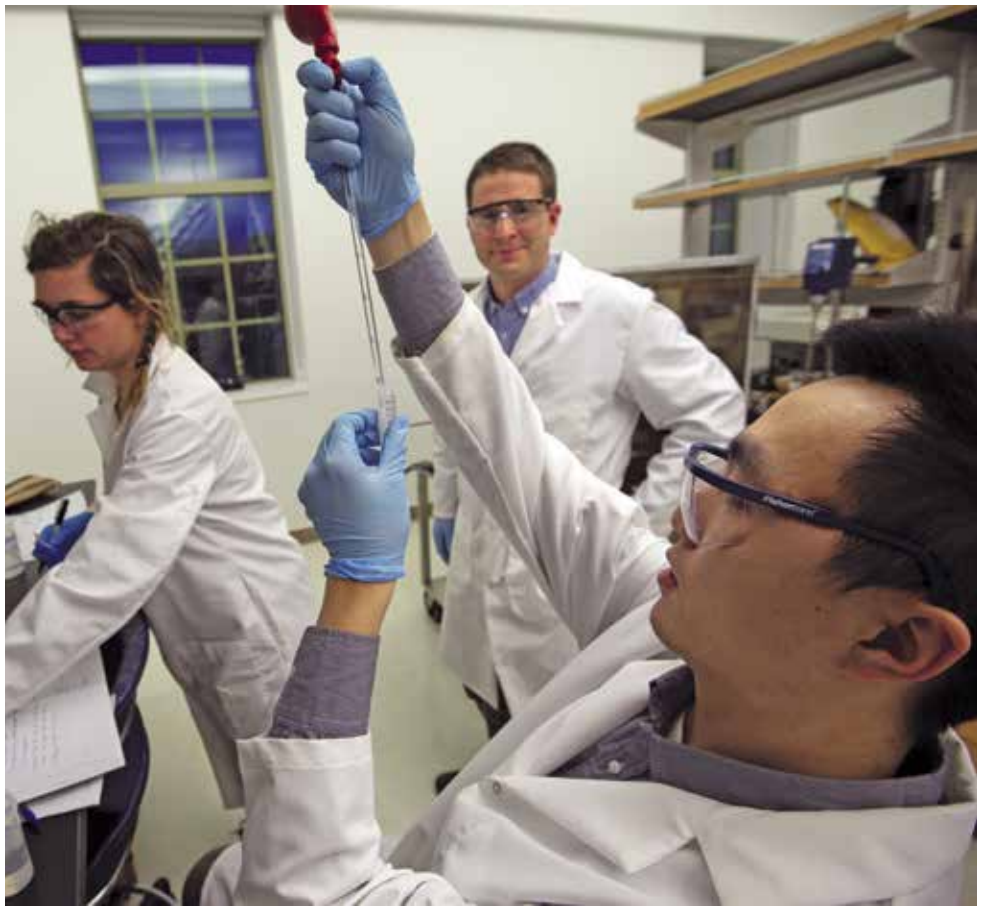
We have retrofitted many old domestic water fixtures throughout the university with low-flow fixtures, including shower heads, faucets, and dual flush mechanisms. We have upgraded the Danforth Campus irrigation system with more efficient sprinkler heads and deployed a computer-driven system that adjusts irrigation frequency and intensity based on weather data.

Process water used for heating and cooling and in labs is also being conserved through a series of conservation efforts highlighted on the next page.

PROJECT PROFILES

WATER INNOVATIONS AT TYSON RESEARCH CENTER

Tyson Research Center, the university's 2,000-acre ecological research station, has significantly reduced on-site potable water use through rain water harvesting and composting toilets. The Living Learning Center (LLC), a Living Building certified project, achieves net-zero water performance through the use of composting toilets that eliminate water use for flushing, as well as a 3,000-gallon cistern and chemical-free water purification system that provides 100 percent of the water needs. Due to the effectiveness of the composting toilets in the LLC, we replaced traditional toilets in the adjacent headquarters building with composting toilets when it was renovated in 2013. In 2014, we added a 20,000-gallon rainwater collection system, shown above, that provides irrigation for a 15,000-square-foot ecological research garden.



PROCESS WATER CONSERVATION

Water conservation is often inherent when improving cooling and heating efficiencies. Less cooling means less cooling tower blow down, and less heating means less make-up water used to replace losses in the steam systems. The highly efficient heat recovery chillers that we have been installing at both campuses avoid the use of cooling towers, reduce blow down, and reduce evaporation. Sixteen cold rooms at the School of Medicine that formerly used potable water for condensing cooling now use water from the chilled water system, saving 7.9 million gallons and over $30,000 per year. In laboratories, it has been common practice to cool experiments in fume hoods and on benches with domestic water that was put straight to drains. The School of Medicine's new 4515 McKinley research building was designed with a process chilled water loop that provides chilled water to hoods and some benches to avoid this practice.

PROJECT PROFILES

LOW-FLOW RESIDENTIAL FIXTURES

The Lofts of Washington University, a LEED Platinum student housing and retail complex in the vibrant Delmar Loop neighborhood, was designed to reduce domestic water use and irrigation water use. The 167 apartments are outfitted with water-saving fixtures, including low-flow shower heads, faucets, and toilets that are projected to reduce water use by over 35 percent. The Lofts was also designed to use over 50 percent less water for irrigation than similar projects due to a 25,000 gallon underground cistern that captures rainwater for irrigation and native and adaptive plants that require less water.

WEATHER SENSITIVE IRRIGATION

Over the last 10 years, the Danforth Campus irrigation system has been upgraded with a number of water conservation features. The irrigation system on much of the campus is monitored by a computer system and several weather monitoring stations that will adjust the irrigation run times based on weather forecasts and prediction of rainfall. Sprinkler heads throughout the system have been upgraded to reduce evaporation and to ensure water is being delivered to the desired areas. The new sprinkler heads use an estimated 30 percent less water than standard irrigation heads.

VISION AND COMMITMENT

GOAL: BECOME A LEADER IN WATER CONSERVATION

Decrease Potable Water Use 15% by 2020

Through the various strategies outlined in this section, we will decrease potable water use 15 percent by 2020 relative to a 2010 baseline.

Enhance and Develop Resources to Support a Strong Water Conservation Program

To support our ongoing efforts to conserve water, we will enhance our water use data tracking, create high-efficiency performance guidelines for new and replacement water fixtures, and require all new construction and major renovation to include water meters.

Study Next Generation Water Systems

The build-out of the east end of the Danforth Campus presents exciting opportunities to explore advanced water systems, including living machines, composting toilets, rainwater harvesting, and district-scale waste water recycling. We will study the feasibility of a range of opportunities to identify viable options to include in the build-out.

Identify and Implement Major Water Conservation Projects

We will study current water use patterns to identify the highest impact potable water conservation projects, including domestic water use, process water, and irrigation. We will prioritize water conservation projects that also conserve energy, when evaluating projects with similar net present values (NPV).

Evaluate Water Conservation Projects Using Consistent Guidelines

The university's Financial Modeling Guidelines will be applied to water conservation projects to evaluate opportunities to save water and reduce costs. We will prioritize projects that conserve both water and energy when evaluating projects with similar net present values.

Retrofit Old Fixtures with Low-Flow Fixtures

We will replace all residential shower heads with low-flow fixtures by 2018. We will continue to replace other fixtures to meet or exceed EPA WaterSense criteria on an ongoing basis.

Foster a Culture of Water Awareness and Engagement

Existing sustainability outreach efforts, including the Green Office Program and the Less is More campaign, will be updated to include additional water-related education, with a particular focus on highlighting the water-energy nexus.

GOAL: BECOME A LEADER IN WATER CONSERVATION.

OBJECTIVE: Decrease campus potable water use 15 percent by 2020 relative to 2010 baseline. Revisit objective in 2017 based on enhanced water data and results of water reduction study.

ENHANCE AND DEVELOP RESOURCES TO SUPPORT A STRONG WATER CONSERVATION PROGRAM

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Improve water use data tracking for university-owned property, including Danforth, WUSM, North, West, South, and Tyson Campuses and Residential Life off-campus student housing.	2016	Office of Sustainability, Danforth Facilities, WUSM Facilities	Updated data tracking system developed and updated at least annually.
Meter water use in all new construction and major renovations.	Beginning 2016	Danforth Facilities, WUSM Facilities	Water meters installed and data used to evaluate building-level usage.
Develop high-efficiency performance guidelines for new and replacement water fixtures.	2016	Office of Sustainability, Danforth Facilities, WUSM Facilities	Guidelines developed and published.
Conduct life cycle cost analysis (LCCA) on potential water conservation projects using the university's Financial Modeling Guidelines, accounting for energy savings from water conservation projects, where applicable.	2016	Danforth Facilities, WUSM Facilities, Financial Planning	LCCA produced for water conservation projects.
Prioritize water conservation projects that also conserve energy, when evaluating projects with similar net present values (NPV).	2016	Danforth Facilities, WUSM Facilities	Combined water and energy conservation projects pursued.
Include water use in the university's scope 3 greenhouse gas inventory.	2020	Office of Sustainability	Water use tracked, converted to GHG emissions, and included in GHG inventory.

IDENTIFY AND IMPLEMENT WATER CONSERVATION PROJECTS

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Study the feasibility of advanced water recycling systems for the east end of the Danforth campus, including composting toilets, living machines, rainwater harvesting, and district-scale waste water reclamation.	2015	Danforth Facilities, Office of Sustainability	Study complete, viability of potential projects evaluated.
Designate staff to focus on water use reduction projects.	2016	Danforth Facilities, WUSM Facilities	Staff identified and empowered to pursue water conservation projects.
Study current water use patterns at the university to identify major opportunities to reduce potable water use for irrigation, process water, in laboratories, in dining facilities, and in residential areas.	2016	Office of Sustainability, Danforth Facilities, WUSM Facilities	Study complete and potential projects identified.
Design new and upgraded irrigation systems for a minimum 50% reduction against baseline water use after establishment period.	2016	Danforth Facilities, WUSM Facilities	New irrigation systems deployed. Water use reduced.
Replace all residential shower heads with fixtures that meet or exceed EPA WaterSense criteria.	2018	Residential Life, Danforth Facilities	Shower heads replaced.
Upgrade water fixtures throughout campus to meet or exceed EPA WaterSense criteria.	Ongoing	Danforth Facilities, WUSM Facilities	High-flow fixtures replaced with low-flow fixtures.

GOAL: BECOME A LEADER IN WATER CONSERVATION.

OBJECTIVE: Decrease campus potable water use 15 percent by 2020 relative to 2010 baseline. Revisit objective in 2017 based on enhanced water data and results of water reduction study. (Continued)

FOSTER A CULTURE OF WATER AWARENESS AND ENGAGEMENT

STRATEGY/ACTION	END DATE	RESPONSIBILITY	METRIC
Expand the water conservation components of the Less Is More outreach/education campaign.	2017	Office of Sustainability	Campaign updated with new materials and promoted throughout the university.
Integrate new water outreach/education efforts into existing initiatives, including the Green Office and Green Labs Programs.	2017	Office of Sustainability	Initiatives updated.
Educate the campus community about the water-energy nexus.	2017	Office of Sustainability, Danforth Facilities, WUSM Facilities	Educational opportunities identified and implemented, including newsletter articles and speakers/events.
Partner with Dining Services and Custodial Services to engage and empower staff to conserve water.	2017	Office of Sustainability, Danforth Facilities, WUSM Facilities, Dining Services	Water conservation included in staff trainings.

Environmental Calculator

Savings achieved through the use of postconsumer recycled fiber in place of virgin fiber for this brochure:

- 4 trees preserved for the future
- 1 lb. waterborne waste not created
- 1,470 gallons of water saved
- 135 lbs. solid waste not generated
- 313 lbs. net greenhouse gases prevented
- 2,000,000 BTUs energy not consumed

Additional savings achieved because the paper was manufactured with carbon offsets:

- 313 lbs. ghg emissions not generated
- .16 barrels fuel oil unused
- Not driving 161 miles
- Planting 2 trees

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