# 3 Dozen Sustainability Best Practices

Compiled by Steve Glazner

Since 2003 at least one issue per year of *Facilities Manager* has had a focus or special theme related to campus sustainability, energy efficiencies, and environmental stewardship. In 2016 I sent out a call for short case studies and received 17, all of which we published to show the variety and innovation of our campus sustainability, energy, and facilities departments. I expanded the call for case studies last year and was pleased to see an increase of submissions to 27; again, I published them all.

For this third installment of sustainability best practices, I reached out to the members of AASHE, the Association of College and University Housing Officials-International, my colleagues at the Higher Education Associations Sustainability Consortium, the Green School listserv, and several other venues. I planned to increase the number of published case studies to an even three dozen. The call was so successful that I had received a whopping 80 submissions for these 36 slots. A number of schools submitted more than one, with one university sending write-ups of seven separate projects. Clearly, there are innumerable positive and beneficial programs going on throughout North America that provide leadership to students, efficiencies to campuses, and a hopeful future.

The best practices included in this issue are from small private liberal arts colleges, large public research universities, community colleges, and one K-12 organization, with half a dozen from across Canada. What's going to happen to the 44 projects that were not included? Because of the wonderful response, we will include several more best practices in our May/June issue. In addition, APPA will soon be publishing a collection of all case study submissions from the past three years into a new publication later this spring. Be watching for it.

In the meantime, dive into the interesting and exciting programs that follow. There's a lot of great stuff here.

Arizona State University

## ARIZONA STATE UNIVERSITY

Tempe, Arizona

*Submitted by Kendon Jung, Student Involvement Coordinator, Leadership & Sustainability*

### EXPERIENCE THE CENTER OF STUDENT ACTIVITY AND LEADERSHIP

Changemaker Central @ ASU exists to create a university-wide culture that empowers students to apply their passion, knowledge, and expertise to create innovative solutions to local, national, and global challenges. We provide opportunities and resources to inspire, catalyze, and sustain student-driven social change through community service, high-impact careers, and social entrepreneurship.

Born from a student forum with President Michael Crow, change agents from the ASU West location, with a passion for bridging the gap between food waste and food insecurity, introduced Borderlands Food Bank. Since then, Changemaker Central @ ASU has worked with Borderlands Food Bank and volunteer student organizations to divert fresh, nutritious produce from the landfill into the hands of Arizona families.

During 2016 - 2017 academic year, ASU Borderlands has….

- Hosted 12 P.O.W.W.O.W.s
- Engaged 176+ student volunteers in food insecurity educational awareness
- Diverted 135,695+ lbs of food from landfill
- Supplemented 206,183 meals
- Connected 8,644 people to fresh produce
- Generated $73,876+ community stimulus

As #1 in innovation for three years running, this partnership initiative on the ASU Poly, Tempe, and West locations emulates personal action and social embeddedness characteristics that have driven ASU's design aspirations as the New American University.

## AUGSBURG UNIVERSITY

Minneapolis, Minnesota

*Submitted by Allyson Green, Chief Sustainability Officer*

### INTRODUCTORY ENVIRONMENTAL STUDIES COURSES LEARN TO "LOVE LOCAL WATER"

Augsburg University has a multipronged approach to implement a policy phasing out bottled water, including infrastructure changes, education, and culture shift. Using the campus and community as lab, Environmental Studies faculty participated by integrating experiential learning into two courses, one focusing on the global water crisis and one on water quality. Students undertook learning projects to address knowledge gaps, perceptions of health and safety, and infrastructure needs on campus.

Environmental Connections, an introductory environmental studies course, spent the semester exploring sustainable water use and our local Mississippi River watershed. Environmental Science students conducted water quality testing, taking samples from taps and fountains across campus. Minneapolis city water consistently exceeds clean drinking water standards, but building trust in our own taps is identified as a priority as we move away from bottled water.

Alongside experiential learning with community partners, including a trip in Voyageur canoes with Wilderness Inquiry, conducting surveys, and water "tasting" at Water Bar, these students also took action on campus. Students helped shift culture through blogs, our own "water bar" taste-test, waste audit, and reuseable water bottle sharing program. All efforts to shift the entire campus culture in recognition of local water as a valuable, safe, human right.

## BROWN UNIVERSITY

Providence, Rhode Island

*Submitted by Jessica Berry, Director, Sustainability Initiatives*

### OFFICE OF ENERGY & ENVIRONMENTAL INITIATIVES COMPOSTING PROGRAM


Brown University's Office of Energy & Environmental Initiatives implemented a composting program in FY17 after two years of planning, piloting, training, and infrastructure placement. With the University's increased focus on greenhouse gas mitigation and waste diversion, and the RI landfill expected to be at capacity by 2038, adopting compost program at the University was a natural fit to Brown's commitment to sustainability. Each dining facility has a pre-consumer composting program, and three facilities are piloting post-consumer programs.

Additionally, three office compost pilots are underway and, as momentum grows, more are expected to be added. In an effort to promote RI's economy, a key component to the program was for the life cycle of the material to stay within the region. The material is hauled by a locally owned small business to an aerobic facility in RI. The compost is in turn sold as a locally owned small business product. The successful implementation of the program can be attributed, in large part, to the many student interns and volunteers who dedicated their time to marketing, training, and education efforts. In FY17 Brown University diverted 485 tons of material to be composted, and the University is slotted to reach about 550 in FY18.

## CALIFORNIA STATE UNIVERSITY

San Bernardino, California

*Submitted by Jennifer Sorenson, Assistant Vice President Facilities Planning and Management, and Dr. Jennifer Braswell Alford Assistant Professor Geography & Environmental Studies, Co-Chair Resilient CSUSB Taskforce*

### DEFINING RESILIENCY FOR A SUSTAINABLE FUTURE

Located in the heart of the Inland Empire, California State University San Bernardino (CSUSB) serves communities characterized by diverse social, economic, and environmental settings that present numerous challenges. Throughout its history, the campus has implemented several sustainability-focused projects; however, ensuring an integrated sustainability effort campus-wide has proved challenging.

In April 2017, the campus refocused its commitment to sustainability through *Resilient CSUSB*. The plan aims to engage the campus community through working groups focused on Energy, Water, Food & Waste, Education & Sustainable Community, Transportation & Mobility, and Land Use & Buildings. Supported by faculty, staff, student, and alumni membership, these groups assist the Office of Sustainability with identifying specific strategies, actions, timeframes, and resources. The *Resilient CSUSB* platform allows for a more coordinated approach centered on student success and the *Triple Bottom Line*. The goal of this effort is to understand what resources exist on campus, what the campus community needs are and to build, operate, and nurture a healthier more resilient community both on campus and in our region.

Fall 2017 marked the launch of *Resilient CSUSB* planning and brought together students, faculty, staff, and alumni to shape the future of sustainability on the campus and in the region.

# Caltech

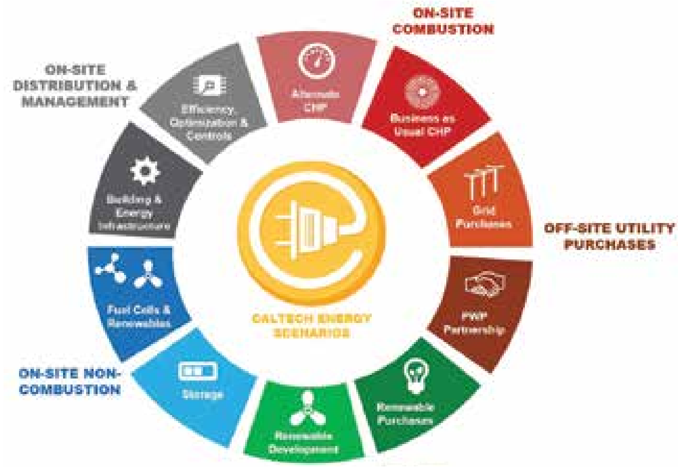
## CALIFORNIA INSTITUTE OF TECHNOLOGY

Pasadena, California
*Submitted by John Onderdonk, Director, Sustainability Programs*

### CHARTING A COURSE TO DECARBONIZED ENERGY FUTURE

Caltech, a world-renowned science and engineering institute located in Pasadena, California, has achieved a 22% reduction in GHG emissions since 2008 as a result of a focus on energy efficiency, the deployment of on-site distributed energy resources, and the construction of high-performance LEED certified buildings.

Recognizing that further reductions in GHG emissions will require reimagining current practices, Caltech embarked on a strategic planning process to identify a path to decarbonize the electrical utilities while reducing risk, addressing reliability, and improving adaptive capacity. Over the course of 2017, sustainability staff, supported by a faculty committee and a task force of facilities engineers, evaluated current operations, forecast future growth, identified tipping points and key drivers, and evaluated 15 unique generation technologies. Sixty-eight future scenarios




were modeled and analyzed to identify the lowest life-cycle cost generation technologies. The end result is a pathway to decarbonize the electricity supply by 2024 through a transition away from on-site cogeneration, deployment of additional on-site PV and fuel cell resources, and the integration of a large off-site renewable energy project into Pasadena's grid. The energy resource planning process also identified the need to develop a utility master plan to decarbonize thermal utilities that will be completed in 2018.

# Carleton UNIVERSITY

Canada's Capital University


## CARLETON UNIVERSITY

Ottawa, Ontario
*Submitted by Philip Mansfield, Manager, Sustainability Programs*

### BIKE SHARING TAKES OFF AT CARLETON UNIVERSITY

Carleton University expanded its bike share program on campus in 2017 to allow for greater and easier access to bikes by students and the wider Carleton community. In addition to the existing bike share program, right bike, which is available through the student residence reception desk, an additional program was launched.

The introduction of VeloGo bike share program, which is app-enabled and allows for hubs across campus and enables both cross-campus bike travel as well as off campus cycling. VeloGo also taps into an existing bike infrastructure in Ottawa. A new student tariff was launched and bike hubs were added to existing bike parking on campus.

In the past year there has been a 200% growth in student and visitors to the campus (through our conference services in the summer) who have been using these services. The Carleton campus sits adjacent to the UNESCO world heritage site, Rideau Canal, so allowing cycle access to the canal path is of great benefit.

Carleton provides a broad sustainable travel program, including both onsite electric charging stations in two of our covered parking garages, carshare programs, and a car pool program aimed at staff and faculty sharing rides to and from work.

CULVER
CULVER ACADEMIES

## CULVER ACADEMIES

Culver, Indiana

*Submitted by Chris Kline, Senior Instructor, Leadership Education and Sustainability Director*

### FOOD WASTE AND FOOD RECOVERY

Reducing food waste is one focal area in Culver's ongoing efforts to improve sustainability. Culver serves 2,500 meals per day and double that during our summer camp program. Our recovery program addresses both food scraps and prepared, unserved food. For the past three years, we have tried to compost our food waste, but our mixed food waste stream just wasn't composting satisfactorily. Last fall, we took a different tack. We now send 1,000 pounds per week of food scraps to a nearby dairy farm that operates a methane digester. The digester creates methane fuel used to power an electricity generator.

For the second component, as part of a student initiative, stakeholders came together to develop a solution for prepared, unserved food. We acquired a machine that students use to package food into individual containers. These containers are labeled and frozen. Twice a week, we deliver the frozen containers to local organizations who serve people in need. We averaging 280 recovered meals per week, making quite a difference for our rural community of 1,500!

Bleed Blue. Live Green.
I SUPPORT Sustainable Duke

## DUKE UNIVERSITY

Durham, North Carolina

*Submitted by Rebecca Hoeffler, Tavey Capps, and Jason Elliott, Sustainable Duke*

### UNDERGRADUATE CERTIFICATE IN SUSTAINABILITY ENGAGEMENT

Over the past three years Duke University has expanded sustainability education with the new Undergraduate Certificate in Sustainability Engagement. Earned upon graduation in conjunction with their major degree, students are eligible to apply until the first semester of their junior year. The Certificate provides interdisciplinary learning through gateways courses in combination with experience hours, giving students the hands-on education and application of their sustainability studies.

The Sustainability Engagement Certificate is designed to facilitate learning and research among students that confronts the interconnections between environmental, economic, and social aspects of sustainability. The program requires students to connect multiple disciplines, such as environmental science, economics, public policy, and or social justice. Through two immersive co-curricular experiences, students gain real-world application and knowledge. One of the experiences must exceed 300 hours, the other must exceed 150 hours. With the creation of the public facing ePortfolio, students creatively capture artifacts from their work and experiences throughout the certificate. This is meant to deepen their reflection of their participation in the program and provide tangible accounting of students' learning. The programs fosters critical analysis, systems thinking, and practical skills to create engaged leaders in sustainability.

## ENDICOTT COLLEGE

Beverly, Massachusetts

*Submitted by Cat Bartolini, Associate Director of Sustainability*

### STORMWATER MANAGEMENT FOR A COASTAL CAMPUS

Endicott College is located in Beverly, Massachusetts, adjacent to the Salem Sound Watershed, an inlet leading to the Atlantic Ocean. Due to the college's proximity to the ocean, Endicott has implemented a robust stormwater management system to adapt to the effects of climate change and conserve the surrounding ecosystem.

Several detention basins exist throughout the Endicott College campus. The pond in the center of campus acts to catch, slow, and then release stormwater. In addition, several rain gardens are used to capture and treat water from multiple buildings on campus, including the green roof on the Walter J. Manninen Center for the Arts. These are vegetated areas that are engineered to collect water from the building, treat it with plant material, and release it slowly into the campus system.

The college's most recent parking lot was constructed with pervious pavement, allowing water to be absorbed into the ground with little runoff. By flowing through the rock-filled bed, the water is able to recharge the wetlands and allow the natural water cycles to continually flow.

These systems mimic the natural hydrologic cycle and assist in reducing nutrient pollution caused by surface runoff. In turn, decreasing erosion, increasing biodiversity, and protecting the ecosystem services that wetlands provide.

## FURMAN UNIVERSITY

Greenville, South Carolina

*Submitted by Hannah Dailey, Program Coordinator*

### COMMUNITY CONSERVATION CORPS: HOME WEATHERIZATION FOR EFFICIENCY, STABILITY, AND NEUTRALITY

Imagine a $500 energy bill during the winter months because you are using space heaters after your furnace failed. Then, picture some of that expensive heat escaping through cracks in the windows and floors. The Community Conservation Corps (CCC), a collaboration between Furman University, Habitat for Humanity, and Piedmont Natural Gas, addresses these issues through free home weatherization services to low-income families in the greater Greenville area. Weatherization includes anything that lowers energy consumption, like attic insulation, LED lighting, air sealing (caulking), HVAC unit servicing, and duct sealing. Since its founding in 2009, the CCC has weatherized 119 homes. On average, the program saves 25% on a homeowner's utility bill.


Not only is the program increasing energy efficiency and financial stability, but it is also contributing to Furman's goal of carbon neutrality by 2026. Because Furman is providing the service and measuring the energy savings, we are able to claim the carbon offset in our greenhouse gas reporting. Thus far, the program has prevented the release of 410.89 metric tons of $CO_2$. This combination of tangible and intangible benefits makes the program both trusted and valuable in our community.

## JOHNSON COUNTY COMMUNITY COLLEGE

Overland Park, Kansas

*Submitted by Dr. Jay Antle, Executive Director, Center for Sustainability*

### JOHNSON COUNTY COMMUNITY COLLEGE'S POWERSWITCH PROGRAM

Johnson County Community College's Center for Sustainability and Campus Services staff are tackling the escalating cost of electricity, reducing the college's carbon footprint, and providing learning opportunities for students.

These energy efficiency efforts, branded Powerswitch, have created a cost avoidance of almost $3 million in costs with electrical usage down by 25 percent since 2008, despite new buildings on campus. Solar PV panels are now being installed on rooftops as the second "switch" of the Powerswitch program.


Powerswitch began with upgrades to HVAC systems, particularly motors in the college's original buildings. Next came more efficient lighting through aggressive conversion to efficient LEDs (including parking lots). Housekeeping services, once performed at night, are now completed during the day so building temperatures can be adjusted to save energy overnight. Most campus rooms are now fitted with motion sensors. Retrocommisioning is currently underway, which includes chiller optimization, HVAC system rebalancing, equipment replacement, and instituting a more robust building automation and scheduling system.

JCCC currently has 242kW of photovoltaic solar power throughout campus which is paired with student learning opportunities. A plan of retrofitting most roofs with solar is underway in stages. Further, JCCC students have built five solar charging tables on campus.

# MCGILL UNIVERSITY

Montreal, Québec
*Submitted by Shona Watt, Sustainability Officer*


### MCGILL LAUNCHES SUSTAINABLE WORKPLACE PROGRAM

McGill University has launched the Sustainable Workplace Certification Program to challenge staff and students throughout the University to foster healthier, more environmentally-friendly, and connected workplaces through individual and collective practices.

After gathering feedback from students and staff throughout the university with expertise in areas such as accessibility, energy management, procurement, mental health and equity, a framework was created to evaluate and improve their workplace's sustainability performance. The certification uses teamwork to achieve four increasingly rigorous levels: Bronze, Silver, Gold, and Platinum. Each level includes approximately 15 actions and one bonus initiative. The program incorporates a range of beneficial actions, from reducing air travel and disposable cups to encouraging employees to take a lunch break. 75% of the designated team must commit to doing all points to get certification. An office determines the scope of the team, identifies key stakeholders, and decides on a vision and goals that will help achieve the desired level.

The Sustainable Workplace Certification Program is one of many priority actions listed under the recently released Vision 2020 Climate & Sustainability Action Plan, which outlines McGill's plan to mitigate its greenhouse gas emissions and boost its sustainability from 2017 to 2020.

# MOUNT ROYAL UNIVERSITY

Calgary, Alberta
*Submitted by Priscilla Rajan, Space and Communications Specialist*

### MOUNT ROYAL UNIVERSITY REDUCES CARBON FOOTPRINT

The Mount Royal University main campus building is an approximately 2,957,807 sq.ft. campus on 48 hectares of land. The University Strategic Plan outlines the commitment to reduce the University's carbon footprint. The Facilities Management department is responsible for the efficiency of operational sustainability and savings on campus.

Grant Sommerfeld, associate vice-president of facilities management, has overseen the move at Mount Royal University to cutting-edge technology that will reduce the university's environmental footprint while also saving money that can then be invested back into the University. He believes Mount Royal will become a leader in sustainability amongst postsecondary institutions.

Mount Royal is currently integrating a combined heat and power (CHP) unit within the base building electrical and heating distributions. Executing this project is Owen Zarazun, the director of facilities operations. "This installation demonstrates our commitment to sustainability and our ongoing quest to reduce our power consumption," he says. "Saving energy saves money, and our electricity provider has estimated the CHP will reduce greenhouse gas reductions by 1,800 tonnes per year. Within seven years, we'll see a payback." Zarazun says the combined heat and power unit is one of many projects that achieves energy savings on campus in an overall sustainability campaign that also encourages students, staff, and faculty to adopt more sustainable practices. Next up - piloting a 400 kilowatt solar power install!

NC STATE UNIVERSITY

## NORTH CAROLINA STATE UNIVERSITY

Raleigh, North Carolina
*Submitted by Carla Davis, Communications Coordinator*

### A BEE-FRIENDLY GARDEN HIGH IN THE SKY

Atop the roof of NC State's Talley Student Union is a feast of a living lab. Vegetables, herbs, and pollinator-friendly plants are growing in a rooftop garden that NC State installed during fall 2017.

The garden is divided in two regions: the pollinator garden and the produce garden. The pollinator garden is managed by two Department of Horticultural Science professors, who received a $23,306 grant from the university's Sustainability Fund. This garden will expand research and education of green roofs and pollinator habitat in the southeastern United States.

The produce garden is managed by Campus Enterprises. This unique garden supplies food such as salad greens, herbs, onions, and garlic to the chefs at a campus restaurant.

The Division of Academic and Student Affairs and the Park Scholars Class of 2017 Legacy Gift also partnered to help fund this rooftop garden. Together, both gardens serve as a living lab for the university community and the public, as well as a model of local food production in an urban campus environment.

Northwestern
sustainNU

## NORTHWESTERN UNIVERSITY

Evanston and Chicago, Illinois
*Submitted by Stephanie Folk, Communication and Engagement Manager*

### KRESGE HALL RECEIVES NORTHWESTERN'S FIRST LEED PLATINUM CERTIFICATION

Extensive renovations transformed a 63-year old Northwestern University academic building into one of the greenest facilities on campus. Following a two-year renovation project, in 2017, Kresge Centennial Hall received Leadership in Energy and Environmental Design (LEED) Platinum certification from the U.S. Green Building Council. It is the University's first LEED Platinum building and the 11th to earn LEED certification.

Home to the Weinberg College of Arts & Sciences humanities programs at Northwestern, virtually all undergraduates pass through Kresge Hall at some point in their academic careers. Sustainable features of the renovated building include:

- A 254-panel rooftop solar array that provides 5 percent of the building's electricity
- 100 percent low-emitting interior materials (paints, flooring, sealants, etc.) that dramatically reduce indoor air pollution
- Daylight sensors that automatically dim or brighten the building's high-efficiency LED lights based on sunlight
- Highest-grade possible exterior insulation and windows
- Radiant ceiling panels that use chilled water from the Central Utility Plant to reduce the amount of energy needed for air conditioning

Kresge Hall earned 86 points on the LEED certification's 110-point scale. A minimum of 80 points is needed to achieve Platinum status.

Portland State UNIVERSITY

## PORTLAND STATE UNIVERSITY

Portland, Oregon
*Submitted by Amanda Wolf, Program + Assessment Coordinator*

### CREATING A SUSTAINABLE CAMPUS THROUGH INCLUSIVE RESTROOMS

Portland State University recently unveiled several new all-gender restrooms across campus in accordance with the newly adopted All Gender Restroom Policy. The policy was created to provide accessible, safe, and convenient facilities to all people, including all gender identities and people with attendants or caregivers of a different gender.

Creating an inclusive and welcoming campus for all students, faculty, and staff is one of Portland State's sustainability goals, serving as a driving force for the All Gender Restroom Policy. The policy


requires the addition of at least one all-gender restroom in all new construction and major renovations giving preference to multi-stall over single-occupancy restrooms. Additionally, the renovation of existing restrooms is prioritized in an effort to increase all-gender restroom options throughout campus.

Units across campus identified 18 restrooms for retrofit, receiving support and funding from administration and students. The University now has a total of 63 all-gender restrooms in 25 buildings, with more to come, including two major renovation projects that will include a multi-stall all-gender restroom.

SJSU SAN JOSÉ STATE UNIVERSITY

## SAN JOSE STATE UNIVERSITY

San Jose, California
*Submitted by Debbie Andres, Utilities and Sustainability Analyst*

### CONVERSION OF STEAM MAKE-UP FROM POTABLE WATER TO RECYCLED WATER

San Jose State University (SJSU) is the oldest public institution for higher education in California and occupies 155 acres in the heart of downtown San Jose. The campus has more than 20 years of experience with recycled water project planning, construction, staff development, annual cross-control testing, and four-year certifications.

In October 2017, SJSU converted its existing boilers that generate steam from potable water to recycled water, using their existing reverse osmosis (RO) equipment, saving approximately 25,000 CCF annually in potable water usage. Use of reclaimed water as a source for steam make-up was an ambitious technical challenge due to the high purity required and it now eliminates the single remaining largest potable water usage at SJSU.

The second phase will design and implement a system that will include design of a duplex media filter and reclaimed water pretreatment complete with coagulant mix tank, filtered water tank, chemical feed system, pumps and pipelines within the central plant, and improvements to the plants mixed bed softener and RO membrane system. This project is in the first phase of development and will be completed in June 2018.

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

## SIMON FRASER UNIVERSITY

Burnaby, British Columbia

*Submitted by Ashleigh Erwin, Communications and Engagement Manager, Sustainability Office*


### FACILITIES SERVICES LEADS INTERNATIONAL ZERO WASTE EXCELLENCE

A leading institution in pursuing ecological, social, and economic sustainability, Simon Fraser University (SFU) has been the recipient of multiple national and international awards for quality, innovation, productivity, and communication for its Zero Waste Initiative, thanks in part to a collaborative Facilities Services team.

In response to SFU's ambitious waste diversion and reduction targets set out in the university's sustainability goals, Facilities Services teamed up with SFU's Sustainability Office, Ancillary and Procurement Services to develop the Zero Waste Initiative in January 2014. The Initiative developed a new standard for public space waste management, employed infrastructure improvements, cross-departmental governance, a comprehensive communication strategy, and demand-side management; it also achieved its goal of diverting 70% of the university's total waste in just 18 months.

Going beyond waste management, the Initiative looks upstream at innovative ways to incorporate circular economy principles into everyday university functions, such as developing packaging standards for food vendors and caterers to eliminate non-recyclable or compostable packaging, and introducing a life-cycle assessment tool to guide purchasing decisions. The next phase is to remove approximately 150 stand-alone external bins with strategically placed four stream stations to further improve diversion rates.

By standardizing recycling across three campuses within three municipalities, Facilities Services has helped SFU to achieve financial and greenhouse gas emission savings, improve operational efficiencies, enhance sustainability education institutionally, and produce tools and services to support other groups and partners to achieve zero waste.

## ST. LAWRENCE UNIVERSITY

Canton, New York

*Submitted by Ryan Kmetz, EFP, Assistant Director of Sustainability and Energy Management, and Marcus Sherburne, Assistant Director of Grounds and Campus Support*

### LOW-MOW ZONES: PROMOTING SUSTAINABILITY THROUGH CAMPUS BEAUTIFICATION

Low-mow zones began as a pilot project at St. Lawrence University and today have blossomed into 70 acres of sustainable landscape on campus. These areas, located throughout the entire campus, serve to provide both sustainability and beautification benefits to the University and the surrounding community. The low-mow zones are populated with native wildflowers and feature over 20 bird houses. The areas provide habitat for native flora and fauna – including bees, butterflies, birds, and wildflowers. Our students, faculty, and staff also use these area to create unique outdoor field learning experiences. Additionally, these areas allow the University to see a reduction in emissions, noise, and costs associated with traditional turf maintenance.

## ST. MARY'S COLLEGE OF MARYLAND

St. Mary's City, Maryland

*Submitted by Bradley Newkirk ASP, CHMM, Environmental Health and Safety Coordinator*

### THE ESTABLISHMENT OF A GREEN REVOLVING FUND

In the spring of 2010, students at St. Mary's College of Maryland voted in favor of establishing the College's first green revolving fund. GSMRF (Green St. Mary's Revolving Fund) is funded by annual student fees of $25 per student. It aims to finance on-campus green projects that demonstrate a quantifiable return on investment and fiscal responsibility. Since its creation, GSMRF has funded numerous green projects that have increased the energy efficiency of several facilities on campus.

One highlighted example of a GSMRF funded project is the installation of energy efficient heat pumps in the townhouse style residence halls on campus. The switch from poor energy performing models to newer, more efficient heat pumps saves approximately 372,478 kWh annually. In turn, the College sees approximately $40,972.56 in savings on electricity bills each year.

These savings will be put back into the revolving fund each year until the initial cost of the project is paid back. Once the initial cost of the project is put back into the revolving fund, the savings will then be returned to the College.

## TEMPLE UNIVERSITY

Philadelphia, Pennsylvania
*Submitted by Katherine Switala Elmhurst, PhD, LEED AP*

### TEMPLE TINY HOUSE

The Temple Tiny House project is a student-designed and student-constructed sustainable building located at the university's urban garden site on main campus. The 175 square foot net-zero structure features a high-performance thermal envelope, vegetated roof, rainwater harvesting system, off-grid photovoltaic system, a thermal energy collection system, and a composting toilet.

Designed as an interdisciplinary project, the Temple Tiny House proved to be one of the most collaborative projects on campus, and involved the participation of a diverse group of faculty members, students, and administrative staff from around the university. With an overall goal of creating a small-scale sustainable showpiece for the university, the project facilitates interaction with and demonstration of its systems and provides co-curricular and community engagement opportunities.

The project is registered under the rigorous building performance standard, the Living Building Challenge, and was the first project to be registered under this program in the city of Philadelphia. Since its completion in spring 2017, the Temple Tiny House continues to offer educational opportunities to students and the larger Philadelphia community and serves as a food access programming and demonstration space for the student-run Temple Community Garden.

## UNIVERSITY OF ALBERTA

Edmonton, Alberta
*Submitted by Michelle Hauer, Project Planner, Office of Sustainability*


### GREEN BUILDING SIGNAGE - MORE THAN JUST A PLAQUE

While certification plaques indicate how green buildings score in rating systems, the University of Alberta's signage goes further by explaining the sustainable features of the building to the people using it every day. Large displays in several certified buildings highlight resource-saving features, like recycled flooring or water-saving lab equipment. Strong statistics are also displayed to illustrate the impact of green building design.

These displays have been installed in three of UAlberta's certified buildings and more are on the way. They are designed to suit the aesthetic of each building, while maintaining similar design elements between displays for a cohesive look across campus. The designs have aimed to minimize resource use, and have incorporated FSC-certified wood and composite board made with locally sourced agricultural residues.

In addition to the large central displays, smaller signs are installed in five buildings to prompt sustainable actions or draw attention to green building features where they can be seen close-up. Examples include pointing out green roofs, encouragement to commute sustainably near bike racks, and showing how low-flow fixtures have reduced water consumption by up to 40%.

Together with plaques that demonstrate the university's commitment to sustainability, this signage is an important part of UAlberta's green buildings.

## UNIVERSITY OF DELAWARE

Newark, Delaware

*Submitted by Michelle Bennett, Sustainability Manager*

### REDUCE, REUSE: UNIVERSITY OF DELAWARE ADDRESSES WASTE WITH WATER

The University of Delaware has installed over 50 water bottle refill stations across its Newark Campus in an effort to reduce waste. By placing the refill stations in popular locations, including most Residence Halls and our Athletics centers, UD seeks to encourage students to reuse their water bottles instead of buying and discarding bottled water.

The refill stations have proved so popular that students are calling for them in all Residence Halls and on each floor. Informal surveys have found that students prefer the refill stations, stating that they look cleaner and more inviting than traditional water fountains. A recent audit of the water bottle refill stations found that, collectively, they had been used over 3 million times, totaling nearly 500,000 gallons of water refilled into reused containers. That's the equivalent of over 5 million disposable plastic 12oz water bottles and 75% of an Olympic swimming pool.

UD will continue to roll out more water bottle refill stations and is completing a comprehensive maintenance plan for new and existing water fountain infrastructure. This is part of a larger strategy to improve UD's municipal recycling rate to meet our goal of diverting 60% of all waste from landfill by 2020.

## UNIVERSITY OF IOWA

Iowa City, Iowa

*Submitted by Katie Rossmann, Manager, Data Analytics & Commissioning*

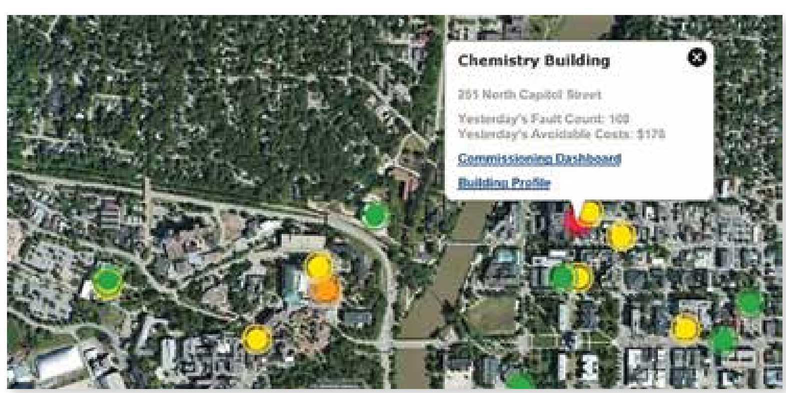
### UNIVERSITY OF IOWA FAULT DETECTION & DIAGNOSTICS PROGRAM

In 2014, University of Iowa Facilities Management began an exhaustive study of a Big Data evolution in building systems management - Fault Detection and Diagnostics (FDD). After visiting Microsoft's Redmond Campus and seeing the substantial impact FDD had on their operations, UI embarked on a groundbreaking, large-scale effort to implement FDD in a campus environment.

By March 2017, UI deployed FDD in 20 buildings across campus encompassing academic, lab, recreational, and office spaces. Integration included all major HVAC equipment, air-handling units (AHU), heating water/chilled water (HW/CHW) systems, pumps, terminal units, and four different Building Automation Systems (BAS).

Within six months, UI realized $600,000 in energy savings and demonstrated 24% of quarterly work orders were generated by FDD for predictive maintenance—transitioning the organization from reactive to planned mode. During this time, the UI team addressed 117 energy issues, 171 comfort issues and 304 maintenance issues. UI also leveraged FDD for commissioning two newly constructed buildings and warranty punch lists.

The successful adoption of a new data-driven culture generated insight and best practices, which UI shared publicly on-stage at APPA's Annual Conference and APPA Institute in 2017.



## UNIVERSITY OF KENTUCKY

Lexington, Kentucky

*Submitted by Nic Williamson, Agriculture Extension Associate, Department of Forestry*

### THE UK URBAN FOREST INITIATIVE: PROMOTING HEALTH AND WELLNESS THROUGH (AND FOR) CAMPUS TREES

The Urban Forest Initiative (UFI) is a faculty-led working group of the Tracy Farmer Institute for Sustainability and the Environment. The mission of the group is to advocate for, and elevate the function, value, and perception of urban forests in the Bluegrass Region, from the UK campus to broader regional communities, by providing a dynamic framework for opportunities across organizational and community boundaries to enhance urban forests. UK Grounds and Sustainability staff are active stakeholders and assist with many of the ongoing initiatives.

This summer, UFI launched an exciting new initiative led by UK nursing student Brianna Damron. Brianna received a Summer Sustainability Research and Creativity Fellowship to work with UFI to create a series of tree walks on campus that promote mindfulness, wellness and stress relief. These self-guided walks have accompanying audio and text guides that combine information about campus trees with tips for personal health and wellness. The trees included on these walks will be marked with labels that include species identification and web links to information about the program. The initiative will be promoted through partnerships with UK HealthCare, the UK Counseling Center, and during exam periods at campus libraries.

## UNIVERSITY OF NEBRASKA MEDICAL CENTER

Omaha, Nebraska

*Submitted by Melanie Stewart, Sustainability Manager*

### ACTIVE TRANSPORTATION PROGRAM REAPS MULTIPLE BENEFITS

Parking and traffic congestion can be a challenge on urban campuses, and the University of Nebraska Medical Center (UNMC) is no different.

To alleviate this problem, the Office of Sustainability was challenged to quickly move the needle on their newly released sustainability master plan's transportation goal: increase the percentage of commuting trips to campus other than single-occupancy driving from 12.7% to 20% by 2023.

In 2015 UNMC, along with its primary clinical partner Nebraska Medicine, launched the "TravelSmart" program. TravelSmart incentivizes employees and students to walk, bike, ride the bus, or carpool to campus by providing free bus passes, indoor bike storage, access to showers and locker rooms, as well as free parking for carpoolers. TravelSmart also provides trip planning, carpool partner matching, a free emergency ride home, and a flexible, pay-by-the-day parking for days when active transportation is not used.

By the end of 2017 TravelSmart had increased the number of active transportation trips to campus to 22%, exceeding the goal six years early.

TravelSmart saves participants money while decreasing parking pressure and traffic congestion. It also promotes healthy lifestyles and reduces an estimated 29,000 single-occupant-vehicle travel miles per week, and all the carbon-based pollution that comes with them.

## UNIVERSITY OF RICHMOND

Richmond, Virginia

*Submitted by Rob Andrejewski, Director of Sustainability*

### INNOVATIVE SOLAR ARRAY EXCEEDS EXPECTATIONS AT UNIVERSITY OF RICHMOND

The first solar installation in Dominion Virginia Power's service territory to operate under a pilot power purchase agreement has outperformed expectations by nearly 20 percent. The University of Richmond installed a 205 kW solar array on the roof of the Weinstein Center for Recreation & Wellness in 2016 to move closer to achieving its 2050 carbon neutrality goal. The 22,000 square-foot, 749-panel project produced 283,400 kWh of electricity (about the same as the annual electricity usage of 32 homes) in its inaugural year.

The solar array was designed as a living lab for sustainability. Students on campus have compared the different energy production rates of the installation's bifacial and monocrystalline panels on both gravel roofs and white rubber TPO surfaces. The array employs string inverters and micro-inverters, which allows for further performance comparisons to be made. Between student research, tours of the site, and educational signage, the solar array has become a well-known symbol for sustainability on campus.


The University of Texas at Austin
Housing and Dining
*Division of Student Affairs*

## UNIVERSITY OF TEXAS AUSTIN

Austin, Texas

*Submitted by Jess Cybulski, Assistant Director of Communication, Office of the Vice President for Students Affairs*

### INCREASING SUSTAINABILITY THROUGH RESIDENTIAL COMMUNITY

Serving as campus ambassadors for environmentalism, social justice, and economic longevity, 40 students in the Sustainability Living Learning Community (LLC) are raising awareness about these issues. The University of Texas at Austin on-campus residential community supports University Housing and Dining's robust sustainability program, including two on-campus gardens, an on-campus farmer's market, food waste reduction initiatives, and educational programs.

This LLC gives students the opportunity to interact and learn from faculty and staff, City of Austin employees, and community members. Partnering with the Office of Sustainability to develop the curriculum, University Housing and Dining staff teach students about the surrounding ecosystem and the impact personal behavior has on the environment.

"These Longhorns will use their academic and social skills beyond the Forty Acres to enact positive change in their community. UT Austin is a leader in the field of sustainability and this community furthers our efforts to bring education and best practices into all areas of life," says University Housing and Dining's Sustainability Coordinator Neil Kaufman.

This initiative complements degree programs in the College of Liberal Arts and School of Undergraduate Studies. It is one of five communities integrating academic and social learning through faculty and staff involvement, and holistic education. The others include Healthy Lifestyles, Global, Women in Engineering, and Women in Natural Sciences.

University of Victoria

## UNIVERSITY OF VICTORIA

Victoria, British Columbia

*Submitted by Melanie Groves, Uvic Communications and Marketing*

**REDUCING ENERGY THROUGH HEAT RECOVERY**

The swimmers in UVic McKinnon Pool on a sunny afternoon probably don't realize it, but the warm water they're enjoying is—in a feat of engineering—heated by the air above them.

From his office laptop, UVic energy manager David Adams can log in to monitor the performance of the heat recovery air handling unit for the pool along with other campus buildings and systems. The silver rooftop boxes and piping network use dehumidification and heat pump technology to transfer energy from building exhaust air into heat for the swimming pool, leading to "huge energy savings and reductions in greenhouse gas emissions," says Adams. "From this unit alone UVic is saving $25,000 in natural gas costs and reducing its CO2 emissions by more than 200 tonnes annually—the equivalent of taking 77 cars off the road."

"I wanted to contribute by engineering solutions that reduce our impact to global climate change," says Adams, a UVic alumnus with a master's in clean energy engineering. "The university is well on its way to meeting and exceeding our energy reduction targets, and beyond 2019 we'll be looking at alternative energy sources and technologies so that we can shrink our carbon footprint even further."

## UNIVERSITY OF VIRGINIA

Charlottesville, Virginia

*Submitted by Sandra A. Smith, Manager of Quality Assurance and Staff Development, Custodial Services*

### JUST TAKE THE FIRST STEP: MAKING SUSTAINABILITY "SECOND NATURE" WITH FOOD, FUN, AND A FAIR!

In late 2015, FM's Sustainability Council wanted to help building occupants make sustainability "second nature."

As a Green Partner in this effort, I was assigned the top floor of FM's Leake Building to help inspire occupants to adopt as many sustainable office practices as possible.

To kick off this effort, I planned for a Sustainability Fair to be held in one of the conference rooms. The idea was to promote it as an Open House—drop by when you can and enjoy some bulk-purchased almonds, fresh fruit that would be composted, and receive a colorful personal mini trash bin to replace your regular office trash can.

Our objectives were to:

- Showcase sustainability initiatives in a festive, but informative, setting
- Provide visual demonstrations of these initiatives
- Enlist Subject Matter Experts to help answer occupants' questions
- Promote, educate, and excite so that the majority of attendees would just take the first step toward reducing the usage of energy, paper, copier ink, and disposable paper products used for meals

Some demonstrations that we showcased were zero waste meals, battery collection units, centralized trash, energy-saving computer settings, and composting.

As it turned out, most of the folks came at the opening of the fair and stayed throughout so we were able to present information and answer questions for the majority of floor occupants in one setting.

It received a lot of good press and it was the perfect way to introduce easy ways to make sustainability second nature while on the job.

## THE UNIVERSITY OF WISCONSIN-MADISON

Madison, Wisconsin

*Submitted by Timothy Lindstrom, Boxable Project Advisor, Doctoral student, Nelson Institute for Environmental Studies*

### CAMPUS INITIATIVE DIVERTS EXPANDED POLYSTYRENE WASTE FROM LANDFILL TO RECYCLING

For the past four years, students, faculty, and staff at the University of Wisconsin-Madison have collaborated to keep a particularly pesky product out of the landfill: expanded polystyrene (EPS), commonly but incorrectly known as Styrofoam™. EPS is a widely used material for shipping and packaging due to its low density, durability, and insulating properties. However, these characteristics often doom EPS products to landfill after a single use, as most recycling facilities do not accept EPS with mixed plastics. These issues present specific concerns at large research institutions like UW-Madison, where over 3,000 labs receive roughly 14,000 EPS boxes each month.

To address the issue of landfilled EPS, students at UW-Madison created Boxable, an EPA-funded* project to pilot an EPS collection and recycling program. Boxable partnered with facilities employees and laboratory staff to establish drop-off sites in buildings with high volumes of EPS waste. Campus services then collected the EPS and trucked it to a recycling facility 10 miles from campus where the material was densified and remanufactured into new products. So successful was the Boxable project that EPS recycling at UW-Madison is now an institutionalized practice. Campus services employees collect roughly two cubic yards (100 pounds) of EPS from more than 25 dropoff sites each week. The Boxable project and its legacy are testament to what a campus can accomplish when campus operations, academics, and research align their efforts in the name of sustainability.

*Grant title: U.S. Environmental Protection Agency, P3 2014 Phase II - SU835731, "Exchange Network for Expanded Polystyrene Shipping Containers"

## UNIVERSITY OF NORTH CAROLINA ASHEVILLE

Asheville, North Carolina
*Submitted by Sonia Marcus, Director of Sustainability*

**INTENSIVE MENTORING AND SUPPORT FOR SUSTAINABILITY PROJECTS**

The McCullough Fellows program at UNC Asheville offers intensive mentoring and support to undergraduate students engaged in sustainability projects and research in the greater Asheville area. Each fellowship includes funding for students, materials support, a faculty stipend, and an honorarium for partnering businesses and organizations.

Applicants are invited to propose faculty advised, applied research projects addressing one or more of the following areas: land use and conservation; urban planning; sustainable agriculture; resilience; and environmental sustainability. Past projects include native plant and pollinator meadow workshops, urban redesign charrettes, stormwater impact mitigation at a retirement community campus, reestablishment of native chestnut populations along the Blue Ridge Parkway, edible city parks and greenways, tool libraries for community garden networks, point of sale micro-donations to support land conservation, gardening, and food preservation classes in Section 8 housing communities, and control strategies for rhododendron after the decline of the Eastern hemlock.

UNC Asheville's multidisciplinary approach to environmental and community resiliency is ideally suited to tackling sustainability challenges while supporting the character of the Asheville region, the values of its residents, the strengths of its local businesses and non-profits organizations, and the interests of students and faculty.

## UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Charlotte, North Carolina

*Submitted by Michael Lizotte, University Sustainability Officer*

### BRINGING LIGHT RAIL SERVICE TO CAMPUS

Commuting is a barrier for campus sustainability, contributing to both pollution and costs associated with obtaining a college education. For urban universities, mass transit projects can create a cascade of opportunities.

UNC Charlotte anchors a 9-mile extension of the light rail system by the Charlotte Area Transit Service that opened March 2018. The university is a signature location for the terminal station, and arrival of light rail has contributed many smaller improvements to meet our community's needs.


Bringing the station into campus required land for elevated tracks over a floodplain and space to reverse trains. The campus added sidewalks, crosswalks, directional signage, and bus pull offs to support pedestrian traffic from stations. For a station on the edge of campus, the University, in part, funded a pedestrian bridge over a major roadway.

Several "last mile" upgrades assist arriving commuters and visitors. Campus bus service expanded frequency of stops and service hours to meet the demand of over 100 daily train arrivals. Ten new bike share locations provide 100 bicycles.

With a discounted transit pass for enrolled students, light rail provides affordable and reliable transportation, including access to Uptown Charlotte. As light rail trips replace automobile use, the university anticipates lowering commuting costs and the carbon footprint.

## VASSAR COLLEGE

Dutchess County, New York

*Submitted by Colin Peros, Collins Fellow in the Environmental Research Institute*

### ASSESSING AND IMPLEMENTING ENERGY PRACTICES AND POLICIES

As Vassar strives for sustainable stewardship, the energy policies established in their Climate Action Plan must be implemented to reach their goal of carbon neutrality by 2030. In summer 2017, the Office of Sustainability deployed 25 Bluetooth loggers (HOBO MX100) in public, academic, and administrative spaces to compare internal building temperatures to the established energy policies. Additionally, 67 employees were surveyed to gauge thermal-comfort levels to ensure optimal conditions for the college community.

The temperature profiles illustrated discrepancies between policy setpoints and actual setpoints that, if corrected, could cut annual energy costs (~$3,000) and carbon emissions (~1,000 tons of carbon) for the cooling season alone. Most employees surveyed (78%) expressed being too cold or no thermal discomfort, underscoring the potential savings by coordinating building temperature setpoints to the established energy policies. Building-cooling performances were also visualized with the data loggers. These building-performance assessments revealed that central AC units more efficiently cooled spaces than window AC units. The benefits of replacing window units with central AC are multifold: more efficient cooling in the cooling season and less thermal loss in the heating season. Altogether, a comprehensive knowledge of current practice and performance is instrumental to implement modified energy policies.

VOLUNTEER STATE COMMUNITY COLLEGE

## VOLUNTEER STATE COMMUNITY COLLEGE

Gallatin, Tennessee

*Submitted by William Newman CFM, PEM, Senior Director of Plant Operations*

### FINDING THE MIDDLE GROUND IN SUSTAINABILITY

Prior to any sustainable project a college or university must ask themselves if they are interested in saving money, being “green,” or both. Yes it’s true, some “green” or sustainable endeavors do not end up saving money in the long term. Volunteer State Community College has elected to find the middle ground through automated controls and active management.

In 2013, Vol State was working hard to reduce campus utilities cost. The campus consisted of 19 buildings totaling 468,814SF. The control systems were all pneumatic and prone to inefficiencies. The thermostats were analog and unreliable. Annual utilities CPSF was $1.66.

Working under funding from the American Recovery & Reinvestment Act, VSCC began implementing electronic automated controls throughout the entire campus. The project took two years to complete and cost $1.3 million. This was just a building block to the long-term plan of sustainability and cost savings.

After seeing quick ROI, VSCC elected to implement variable frequency drives and lighting controls across campus. These changes paired with daily active management from Plant Ops Staff have made a dramatic impact. Now, almost four years later and with an additional four buildings that increased square footage by 24%, VSCC is maintaining electrical operating cost at $1.50 per square foot!

WESTERN STATE COLORADO UNIVERSITY

*Learning, Elevated.*

## WESTERN STATE COLORADO UNIVERSITY

Gunnison, Colorado

*Submitted by Nathan King, Director of Sustainability, and Ayodeji Oluwalana, Campus Sustainability Director*

### ROAD MAP TO INSTITUTIONALIZING ZERO WASTE

During the 2015-16 academic session, eight graduate students in the Master in Environmental Management program in partnership with Facilities, conducted a campus-wide waste audit. Their results showed a diversion rate of 24% despite existing infrastructure being able to handle up to 72%. This led to identifying several target areas for increased waste reduction.

A year later, our President institutionalized a goal to be zero waste by 2020. This meant that departments must ensure they minimize waste and recycle as much as possible to increase overall diversion. Collaboration efforts were intensified among three major departments (Residence Life, Athletics, and Facilities) to pilot this process during the 2016-17 academic year.

Several campus-wide zero waste events were held with rigorous outreach to ensure full participation. Results showed that diversion rates increased to 55-62% across those departments which increased the overall campus diversion rate to 34%.

Another focused effort occurred in October, 2017 when the University Center sought and was awarded a $25,000 RREO Mini-Grant from the State of Colorado to upgrade their recycling infrastructure. This will allow the purchase of new recycling bins with better labeling and education to further zero waste.

These case studies were compiled by Steve Glazner, editor of *Facilities Manager*, who can be reached at *steve@appa.org*.