



Above: A thermal green roof at American University. Below left: Geothermal digging at Ball State University. Below right: The pond at Ball State.



Water, water everywhere —

managing and conserving water resources is a major factor at campuses worldwide. Doing so is a challenge, since water is one of the most-used and ubiquitous resources in any environment. Water is often taken for granted and not measured by the people who use it the most, yet it might have the greatest potential for helping facilities managers and sustainability coordinators improve usage and conservation.

Campus facilities professionals are focusing on water use as part of larger concerns over sustainability, invoking innovation, and working with other departments, faculty, and students to make the best use of this essential natural resource.





INNOVATION & COLLABORATION ARE KEYS TO CAMPUS WATER MANAGEMENT

By Ruth E. Thaler-Carter



ASSESSING USE, IDENTIFYING CONCERNS

Knowing how much water is being used where, when, and how often is critical to management, conservation, and reuse.

“Since we’re in the arid southwest and have had drought issues, a lot of time we’re irrigating for the trees,” said Carol Dollard, P.E., LEED AP, energy engineer at **Colorado State University** (CSU) in Fort Collins. “In the 1960s, we switched from treated to raw water, which saves not so much the amount of water we use but the treatment costs. We implemented a project about five years ago when we retrofitted and saved about 15 million gallons of water a year from 42 devices. The retrofit paid for itself in the first year.”

That is one of the factors in CSU receiving the second-highest STARS rating of any university in the U.S., Dollard noted. “We’re very proud.” [Ed. note: STARS is the Sustainability Tracking, Assessment & Rating System developed by the Association for the Advancement of Sustainability in Higher Education.]

At **American University** in Washington, D.C., “One of the bigger issues is stormwater, because we are in the Chesapeake Bay area—we have too much water and pollution runoff,” said Chris O’Brien, AU’s director of sustainability. Since local government has tightened up its stormwater rules and charges institutions for using it, “We have done a lot to mitigate—we’ve put a lot of energy into green roofs; we have 11 on campus. We have a number of rain gardens and bioretention ponds, some permeable paving, a double cistern in one building to flush toilets, and a building designed to have near-zero stormwater use.”

One parking pad for utility vehicles has spacers between the bricks so water can soak into the ground. The school is working on replacing surface parking: “Slowly but surely, we’re removing impervious areas.”

AU, one of five institutions winning APPA’s first Sustainability Award in 2012, is working to certify 25 existing buildings in LEED. “We are one of only three schools in the world to

Left: Garden area near Evergreen State College’s Longhouse Center. Center: Emory University’s greywater tanks. Right: AU’s sustainability team.



Greywater research is conducted at Aspen Hall, Colorado State University.

attempt LEED Volume,” O’Brien said. The focus is on establishing a baseline to compare to a performance-based metric as a benchmark for aerators in faucets, low-flow showerheads and toilets, and other areas of potential resource reduction and conservation.

Another 2012 recipient of APPA’s Sustainability Award, the **University of Prince Edward Island**, of Charlottetown, PEI, Canada, is monitoring water use and developing its own methodologies based on the BOMA (Building Owners and Managers Association) Best guidelines, since “we don’t have the Green Globes standards,” according to David Taylor, manager of environmental services. “We’re looking for policies and procedures for tracking usage. It’s a challenge because we do a lot of aquatics research,” making extensive water use essential.

Even with that research aspect, “we don’t have enough use” to justify sophisticated metering of water. “Our utility budget is about \$5 million and water is only 4 percent of that, so it isn’t seen as a need when saving money,” Taylor explained. “We still care about conservation, though, so we partner with other departments when they’re looking at retrofits. We can show faster paybacks (with conservation-oriented equipment)—four versus ten years. The measures don’t necessarily sell themselves; it’s based on economics.”

The assessment process provides “a snapshot for comparing usage among buildings,” Taylor said, which can lead to an important find. “We engaged our engineering students to assess water usage and do an analysis, and they found that one residence building was using three times more water than the others,” he recalled. “We found a massive underground leak on our side of the water meter. A sump pump was running, but just sending water back into the ground. It was eye-opening for us as something to monitor. Now we assess water use every summer with students.” That has double advantages: It gives facilities the necessary usage monitoring and picture, and “we have students engaged in learning. Students love to do that.”

The University of PEI is among the campuses that are starting to find ways to discourage wasteful use of water bottles. “We haven’t been able to adopt a bottled water ban yet—the stars haven’t been aligned—but we started installing refill stations,” Taylor said. “We have seven around campus with chilled, filtered water—I wasn’t keen on chilled water because of energy usage, but we found that people are more likely to use the refill stations when they have chilled water. We’ve seen far fewer plastic bottles around campus, and the stations help raise awareness of the issues of bottled water.”

The University of Prince Edward Island also does source separation—separate streams for waste, paper, and water—with waste going to an incinerator and sending heat and water back to the campus. “We use absorption chilling cycle for heat sources; it’s a success story—it lets us ride the oil market because we aren’t using only one source, which provides price stability,” Taylor said. The school also reuses 40 percent of its solid waste instead of sending it to a landfill.

WATER CONSERVATION INNOVATIONS

Water only becomes an issue for the **Evergreen State College**, Olympia, Washington, in the summertime, since “we get about 50 inches of rain a year,” said Paul F. Smith, director of facilities services. “Internally, we’re looking to reduce domestic water usage because it helps the budget.”

Evergreen has installed a cistern in its newest renovated building, to collect rainwater for use in restrooms and for irrigation. Renovations are opportunities to install waterless or low-flow urinals, dual-flush toilets, and faucets with timed sensors for automatic shut-offs—“that is now standard for any renovations,” said Smith.

Working with an on-campus weather station that measures evapo-transpiration rates, the facilities department shuts down irrigation after a rainfall and is working with making that an automatic system.

At **Ball State University** in Muncie, Indiana, “We try to limit water use for irrigation by using wells,” said James Lowe, director of engineering. “We capitalize on a broad base of interest and gather everyone together to talk about water use. We’re always looking for ways to reduce and recycle.”

Ball State is “leaning on LEED certification for new buildings and construction project. For specifications, you would find all you need for low-flow water systems.” A “very aggressive” renovation effort over the past few years includes installing low-flow devices throughout the campus. “One way to reduce water use is to remove old, large users of water with every project,” Lowe said. “Anytime we work on residential units for routine maintenance, we replace shower heads.”

Ball State has seen very little increase in water use, even though there has been growth on campus, said Lowe.

The issue for **Emory University**, Atlanta, Georgia (another 2012 APPA Sustainability Award winner), is familiar through-

out the American southeast: water shortage caused by drought conditions. “We’re a small watershed with a large and growing population, so we’re trying to think innovatively about addressing water usage,” said environmental engineer Brent Zern, P.E. That means three main strategies:

- “We started with cisterns around campus as part of new building construction for using rainwater for irrigation.”
- “We have a green building effort—we embraced LEED, green plumbing fixtures, low-flow faucets and toilets, combined with innovative stormwater technologies—we collect rainwater in cistern-like tanks to use for toilet flushing, and collect greywater for flushing from laundry facilities, dish-washing, sinks, and showers.”
- “We are building a comprehensive water reclamation facility that will treat blackwater—sewage—and reuse reclaimed water primarily as makeup.”

The new facility will be capable of producing 200,000 gallons of water a day, although not all will be needed every day; leftover water will be used for irrigation and flushing. “It will give us almost a 25 percent reduction in our water footprint,” Zern said. “From a sustainability standpoint, it is awesome!” Knowing that water rates will “only go up,” Emory is positioning itself

to respond: “The economics are also impressive—there will be tremendous savings.”

The technology involves a hybrid system, “never been used before in the U.S.,” that combines two existing technologies: Organica Bluehouse and Living Machines. “We wanted more capacity than either could provide, and we have odd-shaped parcels of land that are adaptable,” Zern said. Organica Bluehouse is essentially an adaptive ecosystem in a greenhouse building, featuring special plants with root systems that dangle below and clean the water. When about halfway clean, the Living Machine simulates tidal flow and rains by pumping water through bio-cells, providing a final cleansing.

“This will save a ton of money and a ton of energy, and it will provide a great educational value to our students, faculty, and staff,” said Zern.

A BUILT-IN ADVANTAGE

Educational facilities professionals have built-in access to a huge resource in working to conserve and manage resources: the research power of a college or university campus, through both collaboration with faculty, staff, and other departments, and the hands-on contributions of students in a variety of disciplines.

“We work a lot with students in Environmental Studies and



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the Student Environmental Society” on research and projects, said the University of Prince Edward Island’s Taylor. “We try to work with residences, and we work closely with the Engineering Department.” For instance, an environmental studies class surveyed the campus to gauge awareness of issues and activities, asking students, “Do you know about ...” both collected knowledge and relayed information.

At the Evergreen State College, some program units (the school’s version of departments) are involved in sustainability, according to Smith. “We have organic farms and various gardens reflecting local flora, and have done projects with students and faculty for bioswales, which reduce runoff and the need for irrigation,” he said.

“Archaic” water laws in Colorado mean that CSU cannot capture rainwater and use it for dual purposes; a greywater research project is ready for implementation once the school can clarify it will be legal, Dollard said. “We do have a system in a residence hall involving capturing shower and hand-sink water and using it to irrigate around the building.” That project is a partnership with the Civil Engineering Department.

“When researchers come to us, we work with them,” Dollard added. A horticulture researcher wanted to test plants for a green roof, and the facilities department had a location available. Facilities is also working with mechanical engineering as they recommission and retrofit buildings. The whole campus benefits: “Everybody’s getting smarter—and students are getting valuable experience,” she said.

There is “lots of research” into water use at CSU, thanks to the Colorado Water Institute and because of the school’s roots as an agricultural university—“we have civil engineering, weather, and climate studies as core competencies.”

Ball State has a geothermal project underway that will let the school reduce water use. “The old process of cooling towers is no longer needed,” said Lowe. “We’re looking forward to a 36-million gallon reduction—13 to 15 percent—in water use when it’s done.”

The school has “enjoyed an aggressive program of returning water to the plant” and is finding ways to reduce its makeup water by changing to filters with reverse osmosis. “We think we can save 40 percent of our makeup/condensate return and see less use of the soda ash system,” said Lowe. “That’s remarkable for a campus of 800 to 900 acres.”

Ball State is one of many campuses that have recognized that improved boiler systems contribute to water conservation efforts by reducing the amount of water they have to buy.

Most of the green roofs at AU, which recycle and use water efficiently, were built by volunteers through a partnership with the neighborhood adjacent to the school. “We call it a green-roof raising,” said AU’s O’Brien.

To encourage the campus community to use tap water instead



Emory University's bioretention facility.

of bottled water, AU has retrofitted all water fountains so it is easy to fill glasses and bottles, and replaced some fountains with quick-fill water stations so people can see the advantages of reusing containers. “Our students are really engaged” in such efforts, O’Brien said. “The student government resolved that funds may no longer be used for bottled water, so the school is moving to the same principle, calling for coolers and biodegradable cups.”

Three outreach efforts at AU offer insights for colleagues:

- Green Teaching, with a checklist for behavioral changes that can be used in the classroom;
- Green Office program;
- Green Eagle Program (the eagle is the school mascot) of peer educators—students trained by the facilities department on issues and behaviors.

“These are all designed to do peer education and outreach about water use and conservation,” O’Brien said.

AU also has a Sustainable Living Community—a residence hall with students from different disciplines who take a sustainability course together. They have developed a stormwater map that facilities can use to calculate runoff and identify areas to take action.

GETTING THE WORD OUT

Communicating about the need to manage water use and conservation efforts is, of course, key to success. At the University of PEI, Taylor does guest lectures and his department maintains a website to inform the campus community about projects and concerns.


CSU can rely on the Colorado Water Institute, which Dollard said “does a fantastic quarterly communication that reaches all across the west.” A campus energy coordinator works with faculty and staff on behavioral factors, including reporting on issues that “help us keep water usage at bay,” she said. “We try to communicate with students electronically, but students have so much information coming at them that it’s hard to get through. We

Ball State's efforts benefit from having had an organization on campus for 20 years that focuses on environmental issues. The Council on the Environment, established as a collaboration between the academic and business sides of the school, meets every month with representation from student groups, faculty, and the community. "It's one way to move the message to everyone in the campus community," said Lowe.

One communications innovation at Evergreen is a Resource Conservation Management Grant that supports a half-time employee who is working on putting up educational stickers, obtained through a student government grant, and writing articles about water use and conservation for the department's intranet. A Clean Energy Committee sponsors energy and conservation projects as well.

Interactive energy dashboards in Emory's newer buildings let students see real-time usage of water and other resources. Facilities builds interest in water conservation by creating competitions between buildings to reduce water usage.

LOOKING AHEAD

These are only a few examples of how APPA institutions are making a difference in water use and conservation. For more information and resources, go to the APPA website and look for the Sustainability Awards. 

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