Water

The Wellesley College campus abounds in both natural and landscaped water features: Lake Waban and the adjoining wetlands of Alumnae Valley; Paramecium Pond fed by the small waterfall and brook meandering through the Alexandra Botanic Garden; the Longfellow Pond fountain next to the Clapp Library. Less visible to those who live on, work at, or visit the campus are the college's two wells that provide water for drinking, domestic use, the power plant, and scientific research. The wells draw from an aquifer (the underground layer of permeable material of water-bearing rock--such as sandstone, sand, and gravel--that lets water pass through to a well) in the Charles River Basin. The college controls Zone I, the immediate area around the wellheads Botany Wells #1 and #2 (the sources of potable water) limited to water supply activities, and Zone II, the primary recharge area (the ground surface area that contributes water to a well) for the aquifer upon which most of the campus is located, including the new well (2012) for non-potable irrigation located on the Nehoiden Golf Course. The other important source of water for irrigation is Lake Waban.

Why should a college blessed with its own wells and the proximity of Lake Waban worry about water consumption? Three strong incentives encourage the college to become a better steward of its water.

First, the Charles River Basin is a stressed water environment: "With high growth rates in suburbs west of Boston, there is increased demand for public drinking water and expanded sewer systems - both of which jeopardize water levels in the Charles River. New public wells tap into aquifers that are already showing signs of stress - as evidenced by restrictions on water use in many suburban communities during the summer."[1]

Second, even though the college owns its wells, the Massachusetts Department of Environmental Protection issues renewable permits for the college's total withdrawals from those wells and from Lake Waban; the MassDEP is concerned about the stress on the Charles River Basin and beyond: "water withdrawals and an increase in development and impervious areas [such as asphalt and roofs], combined with the out-of-the-basin export of wastewater [water down the drain and flushed], substantially contribute to low flow in the Commonwealth." In the latest water withdrawal permit amendment (July 3, 2013), the department reduced the college's annual average withdrawal volume (from the wells and the lake) from 0.41 mgd (million gallons per day) to 0.35 mgd. In the event the MassDEP determines the Charles Basin will be adversely affected by current withdrawal levels, the college's withdrawal volume could be lowered further.[2]

Third, the college's commitment to reducing water waste on campus can serve as a powerful example to students and to the larger community on and off campus of its determination to protect this precious resource.

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[1] Charles River Watershed Association, "Charles River History."

[2] Massachusetts Department of Environmental Protection to Zuraw, "Permittee: Wellesley College."

A concomitant campus water issue is the volume of bulk bottled water purchases on campus. The college drinking water meets all applicable health standards regulated by the state and federal government; in fact, the college received the 2013 Public Water Systems Small Community Award, announced by the MassDEP during National Drinking Water Week.[3] (It is important to note that municipal water supplies are under much more stringent testing regulations than those for bottled water.) Yet most academic departments, administrative offices, and event organizers buy bottled water; the reason often cited is a "chemical" taste to campus water, a result of the aging campus water infrastructure. As the college works to improve that infrastructure, we can still recognize the purchase of bottled water is costly to the college in dollars--close to $20,000 for Poland Spring purchases alone in FY14 (T. Dolan, personal communication, May 19, 2015). Bottled water is also costly in its environmental impact. One study has found that "producing bottled water requires … as much as 2000 times the energy cost of producing tap water."[4] A Government Accounting Office's analysis shows that almost 77% of PET plastic water bottles are discarded, with most of them ending up in U.S. landfills.[5] We believe a commitment to phasing out bottled water purchases constitutes an additional example of the college's willingness to become good environmental citizens.

Main Issues/Primary Goals

1. Reduce potable water consumption an additional 11% to achieve a 50% reduction below 1999 baseline by 2026.
2. Improve metering of potable water to inform water consumption strategies.
3. Pursue strategies to improve the campus' already high quality water supply, including upgrade of the college's existing water supply infrastructure, the source for taste complaints about campus water. As feasible, continue to install hydration stations that filter water and facilitate filling of reusable water bottles.
4. Educate the community about the high quality of campus drinking water and campaign for a phase-out of bottled water purchases.

How We're Doing

Wellesley College consumes **potable water** for drinking, irrigation, bathrooms, cooking and cleaning in the campus food service venues, domestic use in student housing, sports facilities, and off-campus facilities (faculty housing, the Center for Research on Women, Grounds, and Motor Pool). In the period 1999-2014, the college achieved a 39% reduction of potable water consumption (from 124,769,000 gallons to 76,603,590). These reductions were accomplished by the following actions:

1. The increased use of non-potable water from Lake Waban for irrigation.

2. The replacement of 90-95% of all fixtures and of all showerheads (except for the handicapped accessible showers) in the residential halls with low flow fixtures and showerheads.

[3] Wellesley College, "2014 Annual Drinking Water Quality Report for Wellesley College."
[4] Gleick and Cooley, "Energy Implications of Bottled Water."
[5] United States Government Accountability Office, "Bottled Water."

3. The complete swap-out of washing machines for high efficiency units in the residential halls.

Future projects will employ standards that further reduce consumption of potable water:

1. Dual flush toilets have been standard in all college renovations since 2008. Of course, it must be noted, most buildings on campus are not up for renovations that involve updating their plumbing systems.

2. The planned renovation of the greenhouses will use rainwater for most of its irrigation needs.

3. The new system to supply Paramecium Pond with recirculating feedwater from an abandoned well near #1 and #2 wells instead of potable water as is the current practice will constitute a large reduction in use of potable water.

4. The use of showerhead timer/reminders has been launched in several of the residence halls.

5. The future planned use of low-phosphate additives in our water distribution system would create a protective coating on the inside of pipes that inhibits corrosion and subsequent water leaks from pipes; this will have a positive effect on the taste of the college drinking supply. These additives have been implemented widely and safely in cities across the United States; the college is continuing to investigate this move and to consult with the campus community.

6. The Facilities metering project will continue to meter for water use each building as it is renovated. Currently out of 64 structures, only 12 faculty houses and 9 buildings are individually metered. The KSC pool house (not the KSC as a whole) is submetered for pool filling. The water use in all other buildings is recorded by two main meters, one for each well. Backing up the metering project is the Green Building Standards mandate that in all major building renovations meters will be installed for all utilities including water.[6]

The use of **non-potable** water drawn from Lake Waban and the wells on the Nehoiden Golf Course is for irrigation of the campus landscape. Overall, irrigation has become a good example of college's efforts to conserve water. Irrigation lines have been repaired. On the west side of campus, irrigation systems are weather station controlled; the rest of the campus is governed by rain sensors. All irrigation systems are already submetered. In addition the installation of a sophisticated controls system allows for highly efficient water use on the Nehoiden Golf Course. Irrigation does use water, but most irrigation water returns through the ground to the aquifer.

Several departments and offices on campus have taken steps to reduce the purchase of **bottled water**:

1. In 2007, the PERA (Physical Education, Recreation, Athletics) department located in the KSC prioritized programming for students over water and stopped purchasing bottled water. Although bottled water continues to be sold in KSC vending machines, the 2013 installation of 3 hydration

[6] Advisory Committee on Environmental Sustainability, "Wellesley College Green Building Standards."

stations with a refillable water bottle feature has nearly eliminated use of bottled water in that building.

2. In early 2015, a survey of 112 faculty and staff in the Science Center found that 93% would use on a regular basis a high-quality refillable water bottle if offered one; with funding from the Class of 57 Green Fund, 100 bottles have been made available and 3 hydration stations were installed in the summer 2015. In November 2015, the Science Center declared it will no longer provide disposable bottles of water for Science Center events.

3. To support these efforts, the Sustainability Office provides mobile water stations: "Wells on Wheels," for outdoor campus events and three gallon table-top dispensers for indoor events.

Projects are underway to improve the already high quality of the college's drinking water. The installation of 4-log removal systems, a testing protocol to assure that water treatment has been effective, will require changes to our piping and distribution system. The low-phosphate additives discussed above will improve drinking water and the taste of our drinking water by preventing the absorption of unwanted metals like lead, copper, and iron. These measures will be important in the campaign to phase out bottled water.

Recommended Strategies

Phase 1 = Within 2 years of plan being adopted
Phase 2 = Within 5 years of plan being adopted
Phase 3 = Within 10 years of plan being adopted

* Office of Environmental, Health, and Safety

1. Improve conservation of potable water.

Issue	**Strategy**	**Responsible Party**	**Status**	**Phase**
W1.1	Installation of a water recirculation system for Paramecium Pond	Facilities	In progress	1

Currently Paramecium Pond is fed by 12 million gallons of potable water. Steps to install a recirculating feedwater system of non-potable water should be resolved as soon as possible and will constitute a 16% reduction in current potable water use on campus (or a 10% reduction relative to the 1999 baseline for potable water consumption). Installing the feed system will be necessary if phosphate is added to the water supply; the additives could result in significant algae blooms in Paramecium Pond.

W1.2	Synergistic engagement with the power plant evolution to reduce water consumption.	Facilities	In Progress	2

W1.3	Steam traps to capture condensate leaks	Facilities	In Progress	2

The power plant uses a large amount of potable water due to the currently poor state of the cooling towers and steam condensate leaks. After steam gives up its heat, it condenses in the system and unless removed as quickly as possible affects heating efficiency. In the future as the power plant evolves into a more efficient system, the conservation of water in its operations should be a major consideration. Proper maintenance of steam traps can increase the operating efficiency of the college's steam-based heating system. Steam traps should be routinely inspected and repaired as quickly as possible if found defective. For more information on steam traps see Gorelick & Bandes.[7]

W1.4	Low-phosphate additives	Facilities, Office of Sustainability, Office of EHS*	Planned	2

Low-phosphate additives prevent corrosion in the college's aging water distribution infrastructure. Additives help maintain water mains, service lines, valves, meters and building plumbing by reacting with metals on the interior pipe surface to form a microscopic protective film. Facilities with help from Office of Sustainability and the Office of Environmental Health and Safety will educate the public on the safety of these additives.

W1.5	Use of rainwater for greenhouse irrigation	Facilities	Planned	3
W1.6	Replacement of outdated toilets, faucets, etc. with low-flow fixtures.	Facilities	During Renovation	3

The renovation of the greenhouses will include the use of rainwater for irrigation; the use of greywater is being considered. Although the technology for using grey water in campus buildings is available, the cost of replacing current plumbing systems to do that is significant. As noted earlier, most buildings on campus still operate with outdated plumbing fixtures.

2. Completion of campus-wide metering of potable water use to provide data for strategies (both for Facilities and educational purposes) to reduce consumption.

Issue	**Strategy**	**Responsible Party**	**Status**	**Phase**
W2.1	Campus-wide metering	Facilities	In progress	2

Facilities has an on-going metering project: every building will be metered for water, steam heat, and electricity. The 2014 **Green Buildings Standards**, which mandates metering in all new and renovated buildings, should provide support to Facilities in this regard. However,

[7] "Why Do Steam Traps Fail?"

with 44 out of 65 buildings not metered, even though the cost will be substantial, the critical concern has to be complete metering--the crucial factor in implementing water conservation actions both for Facilities and in the education of the campus on limiting water use.

W2.2	Use of metered consumption to educate about and provide incentives for reduced water consumption	Facilities, Office of Sustainability, Residential Life	Planned	2

Facilities should provide user-friendly public online access to water use data. With that data the Office of Sustainability can highlight areas on campus where water waste can be further curbed.

3. Pursue strategies to improve the campus' already high quality water supply.

Issue	Strategy	Responsible Party	Status	Phase
W3.1	4 log removal systems	Facilities	Planned	1

4 log removal systems are one of the essential components of the EPA's 2006 Ground Water Rule (GWR) aimed at testing drinking water quality in order to ascertain that we are indeed already meeting this threshold. Completing the 4-log removal system will ensure that treated drinking water reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.

W3.2	Low-phosphate additives	Facilities	Planned	2

Low-phosphate additives not only protect the water infrastructure, but improve the quality of drinking water by "sequestering" unwanted metals from the water, such as lead and copper, addressing complaints about the "chemical" taste of Wellesley water.

4. Educate the community about the excellence of campus drinking water and campaign for a phase-out of bottled water purchases.

Issue	Strategy	Responsible Party	Status	Phase
W4.1	Educate campus community about the quality of campus drinking water and environmental waste associated with bottled water	Office of Sustainability, Residential Life, Faculty Building Representatives	In progress	1

Bringing the campus community's attention to the continuing efforts to make our drinking water supply as safe as and "clean" tasting as possible will be an crucial argument in the

campaign to phase out the use of bottled water on campus. The college annually issues a Drinking Water Quality Report; that report and the above measures should figure in the Office of Sustainability's outreach. The Office of Residential Life can provide data and recommendations on water consumption and conservation to incoming students during orientations in "The Bubble," the new all-inclusive communications channel for students to receive news and information from faculty, staff, and administrators in one convenient location. Faculty Building Representatives can help educate faculty and departmental staff and agitate for improved drinking water systems.

W4.2	Phase-out campuswide the purchase of bottled water	Trustees, Purchasing, Senior Staff	In Progress	1

The phase-out will best be accomplished by the following actions:
1. The education of the college community about the high quality of the college's drinking supply, as noted in P4.1, and thus the unnecessary environmental waste of using bottled water.
2. College government should consider legislation banning the use of SOFC money to purchase bottled water. Club leaders and event planners should be trained by the Sustainability Office in finding alternatives.
3. By direction of the Trustees, the Purchasing Office should direct that individual bottles are not to be purchased and/or their purchase by other entities will not be reimbursed.
4. The Office of Sustainability will continue to provide table-top dispensers for indoor events and "Wells on Wheels" for outside events.
5. A detailed list of locations without water fountains and filling stations should be drawn up and funding requested to supply these locations with hydration stations.
6. A list of drinking water options on campus should be made public.
7. Replacement of Poland Spring jugs in offices and departments with alternative drinking water options, like the hydration stations in the KSC featuring chilled, filtered water with a refillable water bottle fixture.

Financial Implications

Campus-wide metering, again the most crucial step for water conservation on campus, is an enormous investment, but without it large scale efforts to conserve water are difficult to pursue effectively. Costs with modernizing the power plant, including the use and repair of steam traps, are considerable, too, not only for purchase of equipment upfront but for properly maintaining it.[8] However, the long-term savings in energy efficiency and the long-term effects of conserving water should mitigate costs. Saving $20,000 plus each year (as noted above) by ending the purchase of bottled water could offset the expense of supplying more modern hydration stations all over campus.

Climate Implications

[8] Risko, "Understanding Steam Traps."

The availability of fresh water is the most critical resource on earth. Global warming and increased consumption all over the planet is depleting the planet's reserves. Even though Massachusetts is not currently in an extreme water emergency, as noted earlier, the Charles River Basin aquifer from which it draws its water supply is a highly stressed environment. Given the high probability of even more development in Boston's western suburbs and the rising average temperatures in Massachusetts, we should be very concerned about the future of our water supply. It is crucial for the college to uphold strong environmentally sound practices related to water consumption. In this respect, the college can serve not only as a model for women's education, as it has for one hundred and forty years, but in the future as a model for education about water management for our students and the greater community.

Potential Student Involvement

Although Wellesley College is fortunate in having an ample supply of potable water, many of our students will return to or move to areas all over the globe where water is a much more precious resource. Student awareness of water conservation efforts should be a part of a Wellesley education. Student organizations like WEED (Wellesley Energy and Environmental Defense) and SCoop (the Sustainability Co-op) are already working to raise awareness of our water consumption on campus and how to reduce it. The Eco-Reps in the residence halls will increasingly play a role in day-to-day water awareness. A highly advertised campaign to phase out bottled water along the lines of the "Take Back the Tap On Your Campus" model sponsored by Food and Water Watch can recruit an even larger number of students to get involved.[9]

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