



# AGRICULTURE, LAND USE FOOD & SEQUESTRATION

An enthusiastic group of faculty and staff from ACES, University Housing, and Facilities & Services, partnering with eco-conscious students who are focused on assisting the U of I campus in meeting its lofty iCAP goals for sustainability.

## OBJECTIVES

**7.1. Perform a comprehensive assessment of GHG emissions from agricultural operations — and develop a plan to reduce them — by the end of FY16.**

 Status:  
In progress

- Formed a consultation group focused on implementation strategies
- Next Step: Work with consultation group to develop a plan to assess and reduce GHG emissions on Illinois South Farms, calculate emissions based on consistent data sets, and reach out to managers of the farms to join consultation group.

**7.4. Implement a project that examines the food service carbon footprint for Dining and other on-campus food vendors, while increasing local food procurement to 40% by FY25.**

 Status:  
In progress

- University Dining conducted research on food waste streams during the 2016-17 school year.
- The South Farm is dedicating 30 acres to growing perennials and developing ways to include local food into University Dining.

- Next Steps:
- Reach out to on-campus food vendors about calculating their food waste and buying locally.
  - Create a page on the Housing Dining website detailing carbon impact of food.
  - Assess potential uses of campus infrastructure to encourage local food production.

**7.2. Design and maintain campus landscapes in a more sustainable manner; expand the specification of sustainable plantings in campus landscape standards, and develop and implement a tree care plan by FY16 and an integrated pest management program by FY17.**

 Status:  
In progress

- Completed Tree Care Plan: [http://icap.sustainability.illinois.edu/files/project/1279/2015\\_IllinoisTreeCampus.pdf](http://icap.sustainability.illinois.edu/files/project/1279/2015_IllinoisTreeCampus.pdf)
- Created pollinator consultation group to further amend the approved the plant list and state where planting would be appropriate.
- Next Step: Meeting with the consultation group to define campus integrated pest management.

**7.5. Increase carbon sequestration in campus soils by determining the sequestration value of existing plantings and identifying location for additional plantings, with a specific objective of converting at least 50 acres of U of I farmland to agroforestry by FY20.**

 Status:  
In progress

- Explore opportunities for expanding current agroforestry holdings to achieve a total of 50 acres — as of 2017, 30 acres have been secured.
- Funding has been received to begin a survey of trees and sequestration potential in Fall 2017.
- Next Step: Engage the Master Plan committee for areas to be converted to perennial low-mow or landscaped areas.

**7.3. Incorporate sustainability principles more fully into the Campus Master Plan.**

 Status:  
In progress

- Campus Master Plan has taken feedback suggestions, including zero net growth in building square footage.
- Next Step: Participating in further discussion and providing feedback. The Agriculture, Land Use, Food, and Sequestration (ALUFS) Sustainability Working Advisory Team (SWATeam) will also engage in discussions with other SWATeams to consider more holistic opportunities for campus sustainability.

**7.6. Reduce nitrates in agricultural runoff and subsurface drainage by 50% from the FY15 baseline by FY22.**

 Status:  
In progress

- Delineated South Farm watershed to determine drainage outlet.
- Next Steps:
- Identify and work with graduate student to sample runoff from South Farms for nitrates to establish a benchmark.
  - Reach out to faculty to consolidate data previously gathered on runoff.
  - Reach out to faculty to quantify conservation efforts implemented.
  - Find ways to incorporate addition of agroforestry into nitrate reduction.



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

We would like to acknowledge and thank our South Farms and pollinators consultation groups for assisting us with developing and designing implementation strategies. We would also like to thank the College of Agricultural, Consumer, and Environmental Sciences for the constant support in meeting the iCAP objectives.



# ENERGY CONSERVATION & BUILDING STANDARDS

More than 80% of campus greenhouse gas emissions result from on-site combustion and grid electricity purchases that heat, cool, and provide electricity to campus buildings. Consequently, achieving our carbon neutrality goal will require a strong building energy conservation program, and this is considered top priority as it leads directly to both emission reduction and cost savings that can facilitate even further emission reductions. The ECBS SWATeam members recommend actions the Urbana-Champaign campus can take to best reduce building energy consumption.

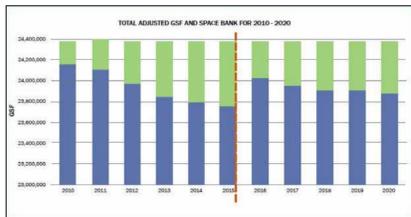
## OBJECTIVES

### 2.1. Maintain or reduce the campus gross square footage relative to the FY10 baseline.



Status:  
Policy approved in 2015

- The Net Zero Space Growth Policy was approved and adopted into the Campus Administrative Manual effective July 1, 2015.
- Associate Director for Space Analysis Jill Maxey is tracking square footage of campus and the "space bank." See DRAFT below. Green bar represents current and projected space bank. Blue bar represents current gross square footage (GSF).



### 2.3. Strengthen centralized conservation efforts focusing on building systems to achieve a 30% reduction in total campus building energy use by FY20. This includes meeting the LED Campus commitment.



Status:  
In progress

- Based upon the FY17 energy data, we have achieved a 33% energy reduction, surpassing our 2020 iCAP goal of 30%.
- ESCO projects are continuing. Retrocommissioning (RCx) projects at the Illini Union and Memorial Stadium are underway. RCx accrued avoided utility costs of more than \$47 million in 10 years of operation.
- More funding is needed to achieve more energy conservation. We do have advisable energy projects that require funding.
- Recommendation to create a Green Labs Coordinator position approved to focus on reducing energy consumption in labs (e.g. fume hoods, freezers).
- LED bulbs continue to be installed in exterior lights and interior exit signs.

### 2.2. Identify the highest achievable energy standards for new buildings and major renovation, and incorporate these into the campus facility standards by the end of FY16.



Status:  
In progress

- Adopted American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) 90.190.1-2013 energy standard — superseding the ASHRAE 90.1-2010 standards — for new construction.
- Will exceed energy savings that are specified in the most current LEED version 4, by 8%.
- Considering adopting 30% above code for new construction & 26% above code on renovations.

### 2.4. Engage and incentivize the campus community in energy conservation, including a comprehensive energy campaign, with at least 50% of units participating by FY20.

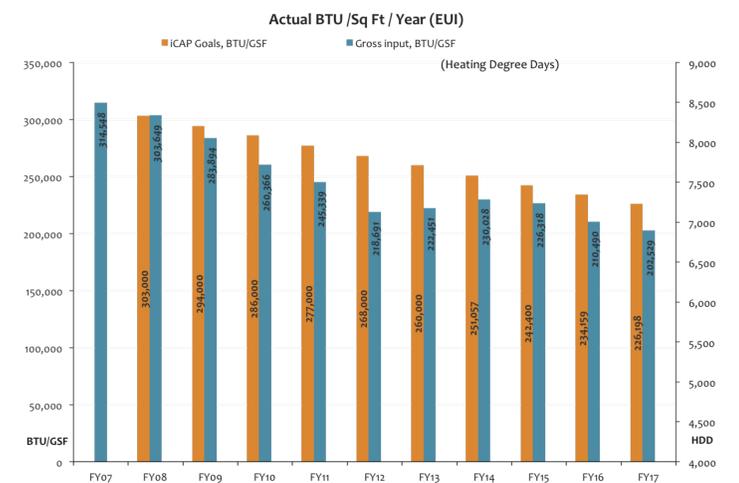


Status:  
In progress

- Illini Lights Out in 2016-17: 11,000 lights turned out. ~ \$3,400 saved. 200+ students participated. 2017-2018: Being implemented monthly through iSEE.
- Certified Green Office Program (CGOP) had 46 departments participating in 2016. Goal is to have 75 certified offices by May 2018.
- Energy Conservation Incentive Program (ECIP) awarded \$168,000 for FY17. Eight units participated.
- Eco-Olympics engaged 11 residence halls in 2017 with 183 active students participating, resulting in a 300% greater participation rate than previous years.
- Building-level energy report cards: Sustainability minor student is piloting these in 10 facilities.



## ENERGY USAGE TREND



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

Paul Foote, SWATeam community member 2017  
 Claire Kredens & Vince Spagnola, iSEE student interns implementing Illini Lights Out



# ENERGY GENERATION, PURCHASING & DISTRIBUTION

Energy is by far the largest contributor to the campus' emissions inventory. The iCAP focuses on a detailed strategy of building energy conservation, de-carbonizing generation systems, and the addition of renewable energy sources. This "conserve-and-load" approach is achievable, affordable, and implementable. The 2015 iCAP calls for a reduction in building energy use of 30 percent by FY20.

Progress on efforts to de-carbonize our energy generation systems is monitored by the Energy Generation, Purchasing and Distribution (EGEN) SWATeam.

## OBJECTIVES

**3.1. The EGEN SWATeam, in collaboration with Facilities & Services and topical consultation groups, will lead an exploration of options for 100% clean campus energy during FY16, and submit recommendations through campus sustainability process.**

 Status:  
In progress

- **COMPLETE:** A 200 kW biomass boiler was commissioned at the Energy Farm in June 2017. This system will provide all of the heat for the greenhouse at the Energy Farm, replacing the current propane energy source. Future expansion will look at additional buildings on the Energy Farm that use excess capacity of the biomass boiler system during off-peak heating periods.
- A team at the Illinois State Geological Survey led by Yu-Feng Forrest Lin has been conducting a geothermal study on campus, including high resolution subsurface temperature profiling and geothermal property analysis. The team drilled 330 feet and installed a geothermal loop and fiberoptic cables at the Geothermal Research Station in the Energy Farm. Results will help determine the costs and efficiency of geothermal exchange on campus.
- A DOE-funded research project on utilizing heated fluid from deep aquifers on campus has been started in Oct. 1, 2017. This feasibility study led by Lin will determine if there are opportunities for harvesting the heat from the subsurface fluid to serve multiple buildings on campus (e.g., Energy Farm) and similar applications (e.g., military bases).

**3.3. Expand purchases of clean energy. By FY20, obtain at least 120,000 MWh per year and by FY25 at least 140,000 MWh per year from low-carbon energy sources.**

 Status:  
In progress

- A request was submitted to allow longer-term contracts for the purchase of renewable power. iSEE is reviewing this request with campus legal counsel to determine what options exist and potential next steps.
- **COMPLETE:** A power purchase agreement (PPA) has been executed for the purchase of ~25,000 MWh of wind power annually for 10 years.
- **COMPLETE:** Total purchase of wind power in FY17 (began in November 2016) was 19,856 MWh.

**3.2. Expand on-campus solar energy production. By FY20, produce at least 12,500 MWh/year, and by FY25 at least 25,000 MWh/year, from solar installations on campus property.**

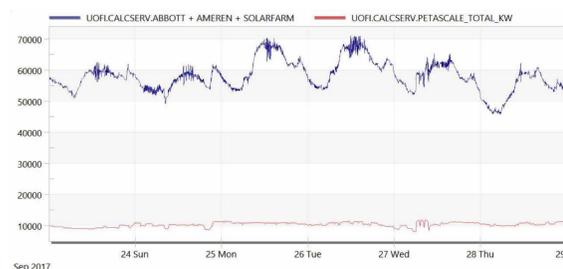
 Status:  
In progress

- **COMPLETE:** Solar farm was put into operation in December 2015.
- **COMPLETE:** Total generation for on-campus solar in FY16 was 3,971 MWh/year and 7,084 MWh/year in FY17. Total generation from the solar farm through September 2017 is 11,175 MWh.
- **COMPLETE:** Additional existing installations include Building Research Council (15 kW), Business Instructional Facility (33 kW), and Wassaja Hall (33kW).
- Projects in progress including a 300 kW system on top of ECE building (installation planned by May 2018) and a 1.2 MW system on North Campus Parking Deck (funding needs to be secured).
- A recommendation to require all new buildings on campus to include a solar array covering the majority of rooftop surface area was submitted to the iCAP Working Group in February 2017.
- A recommendation to start a project to expand the existing Solar Farm or install a larger farm in a new location was submitted to the iCAP Working Group in April 2017.

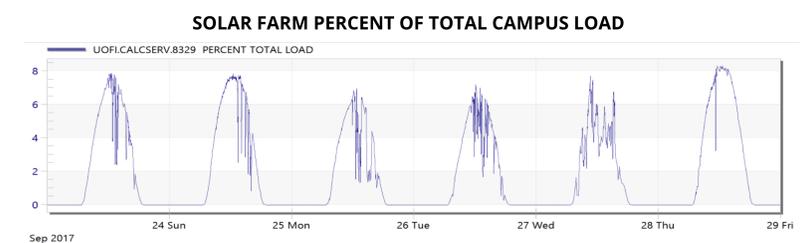
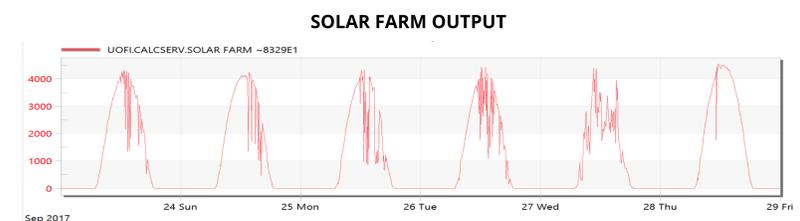
**3.4. Offset all emissions from the National Petascale Computing Facility (and other successor facilities) by FY18.**

 Status:  
In progress

- A recommendation was submitted to the iCAP Working Group in February 2017 to continue discussions with the Vice Chancellor for Research and NCSA about planning a budget to procure offsets for Petascale emissions. iSEE (Ximing Cai) is reviewing this objective with NCSA.
- Graph depicting total campus electric demand (in blue), and total Petascale electric demand (in red).



## SOLAR FARM PERFORMANCE



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

The EGEN SWATeam would like to recognize past members Jack Morrissey, Catherine Yee, John Flanagan and professor Scott Willenbrock for their participation on our committee.



# PURCHASING, WASTE & RECYCLING

This team is focused on how to best maintain and improve the University's purchasing, waste management, and recycling programs. The group will work to implement a Zero Waste movement (like that described in the iCAP), which will require a "whole system" approach to resource management that implicates purchasing, maximizes recycling, minimizes waste, reduces consumption, and ensures that products are made to be reused, repaired, or recycled back into the system. This system will save energy and reduce greenhouse gas emissions through reduction of energy consumption associated with extracting, processing, and transporting raw materials and waste, and through reduction and eventual elimination of the need for landfills.

## OBJECTIVES

**6.1. By FY17, environmental standards will be applied to purchases of office paper, cleaning products, computers, other electronics, and freight/package delivery services. At least 50% of purchases in these categories will meet standards by FY20, and 75% by FY25.**



Status:  
In progress

- **COMPLETE:** Reviewed draft policy and training video on recycled-content paper purchases. Worked with F&S Stores to provide discounts on recycled-content paper.
- **IN PROGRESS:** Integrating a university policy on paper purchasing into the Campus Administrative Manual to require a minimum of 30% recycled content.

**Next Steps:**

- Continue discussion on green cleaning products and potential E-waste and battery recycling programs.
- Apply EPEAT purchasing standards for electronics and educate the campus community about the benefits of choosing EPEAT-registered products. Apply SmartWay standards for transportation services.

**6.3. Utilize landfills with methane capture.**



Status:  
Complete!

- Former SWATteam member Karin Hodgin Jones conducted study investigating greenhouse gas (GHG) emissions from local landfills. The study identified the auxiliary campus buildings contracting independent hauling vendors, estimated waste volumes produced by these facilities, and presented a methodology that may be used to correct campus reporting on carbon dioxide (CO<sub>2</sub>) emissions associated with landfill use.
- Identified three auxiliary buildings not previously in Illinois Climate Action Plan (iCAP) reports: Biel-feldt Athletics Administration Building, Atkins Tennis Center, and Illini Union. Estimates for waste volume and CO<sub>2</sub> emissions were provided for these buildings in Hodgin Jones's report.

**Next Steps:**

- Make recommendation to campus buildings to continue or begin contract with vendors that haul to Brickyard Landfill, a disposal center in Danville, IL, whose methane capture strategy produces less CO<sub>2</sub> than other landfill options.
- More thorough reporting on real and seasonally adjusted estimates of waste volumes from auxiliary buildings is needed to better estimate CO<sub>2</sub> emissions for the next iCAP revision.

**6.2. Reduce municipal solid waste (MSW) going to landfills. Increase the diversion rate of MSW to 45% by FY20, 60% by FY25, and 80% by FY35, while also increasing the total diversion rate of campus waste to 90% by FY20 and 95% by FY 25.**



Status:  
In progress

- **COMPLETE:** Standardized labeling for recycling bins and increased receptacles on the Quad. As of April 2015, 20 new recycling bins were added to the Quad.
- **COMPLETE:** Integrated battery recycling into the Certified Green Office Program.
- **COMPLETE:** Waste audits were conducted showing an effective diversion rate of 27% based on FY17 solid waste and recycled data.
- **IN PROGRESS:** Collection programs for special waste streams have been introduced and expanded (e.g. nitrile gloves from dining halls and labs, polystyrene, and Dump and Run for campus move out). Others are currently under consideration.
- **IN PROGRESS:** The Illini Gadget Garage is working with the campus community to promote repair of electronics and small appliances, helping to extend the useful life of products and keeping them out of the waste stream.

**Next Steps:**

- Create a map of all waste and recycling bins on campus.
- Engage Illinois staff as active promoters of campus recycling.

**6.4. Appropriately staff Zero Waste efforts through the hiring of a full-time Zero Waste Coordinator.**



Status:  
Complete!

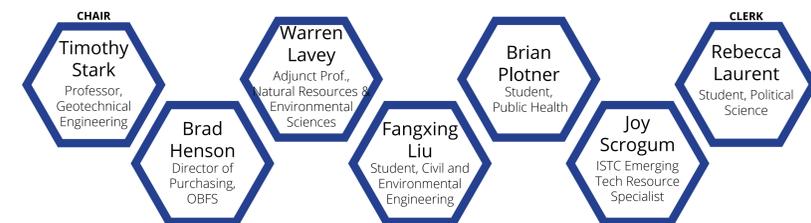
- Zero Waste Coordinator positions have been established full time in the Office of Business and Financial Services (OBFS) and part time for F&S.

**Next Steps:**

- Request funding for a full-time coordinator in F&S.



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

We would like to thank Bart Bartels and the entire Illinois Sustainable Technology Center (ISTC) Zero Waste Illinois Team, Karin Hodgin Jones, Tracy Osby, Morgan White, Marcy Wright, Ben McCall, Matthew Snyder, Michael Olinger, and the entire F&S and OBFS teams.

# TRANSPORTATION

The Transportation SWATeam is a team of faculty, staff, and students who work to advance the 2015 iCAP transportation objectives. The team forms recommendations to reduce the 10% of campus emissions that are attributable to transportation. We address air travel emissions, fleet emissions, single-occupancy vehicle usage, renewable fuels, and active transportation.

## OBJECTIVES

### 4.1. Reduce air travel emissions from a new FY14 baseline by 25% by FY20, 50% by FY25, and 100% by FY30.



Status:  
In progress

- Creating a virtual storeroom in which campus units have the option to voluntarily buy air travel offsets (Ben McCall and Scott Willenbrock).

#### Next Steps:

- Integrate emissions tracking within the Travel and Expense Management (TEM) system.

- Educate the campus community about air travel alternatives, and improve infrastructure supporting online conferences and virtual meetings.

### 4.4. Reduce percentage of staff trips made using single-occupancy vehicles from 65% to 55% by FY20, 50% by FY25, and 45% by FY30.



Status:  
In progress

- Developing a mode split survey for students and staff to understand current transportation attitudes, habits, and barriers (Julie Cidell and Morgan White).

- Introducing faculty and staff to MTD through "It's Your MTD, Too" campaign (Lily Wilcock).

#### Next Steps:

- Create a new pricing scheme for parking in which greater discounts will be given for parking further away from campus, carpooling, and a joint purchase of a bike parking permit (Yanfeng Ouyang).

- Provide a frequent shuttle service from peripheral parking locations to main campus locations (Ouyang).

- Create incentive mechanisms to encourage more sustainable travel modes based on the results of the mode split survey.

### 4.2. Reduce emission from the campus fleet by 20% by FY20.



Status:  
Complete!

- Conducted a feasibility analysis for replacement of departmental vehicles with electric vehicles (by Hursh Hazari and Pete Varney).

- Installed EV charging stations at the Illini Union and the North Campus Parking Deck (Scott Willenbrock and Philip Krein).

- Received green certification for the Facilities & Services vehicle fleet (Varney).

#### Next Steps:

- Discourage idling of vehicles by installing GPS idling tracker equipment.

- Promote sharing of vehicles on campus via online information platforms and vehicle delivery service.

### 4.5. Implement the Campus Bike Plan on the schedule noted in that plan.



Status:  
In progress

- **COMPLETE:** Campus recognized as a Bronze-level Bicycle Friendly University by the League of American Bicyclists (Stacey DeLorenzo, Lily Wilcock).

- **COMPLETE:** Funding secured for a "Bike at Illinois" website, for development in the winter and spring months this fiscal year (Wilcock).

- **COMPLETE:** Significantly increased bike parking capacity (Wilcock).

- Coordinating and reviewing dock-less bike sharing companies seeking to come to campus (Wilcock).

- Implement new parking pricing schemes based on discounts for parking at farther locations, employee carpooling, and joint purchase of bike parking permits (Yanfeng Ouyang).

- Review the results of the campus bike census (Oct. 18) and the multi-modal survey to develop future recommendations.

### 4.3. Conduct a detailed study by the end of FY17 to develop scenarios for complete conversion of the campus fleet to renewable fuels.



Status:  
In progress

#### Next Steps:

- Create a task force with faculty chair and campus representatives to consider fuel alternatives such as sustainably produced biodiesel, CNG from organic waste, and electricity from zero-carbon sources such as solar and wind.

- Propose conservative/moderate/aggressive strategies for GHG emission reduction and consider their financial and environmental impact.

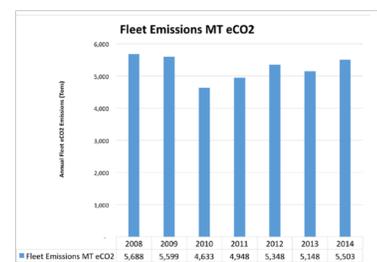
### 4.6. Appropriately staff sustainable transportation efforts.



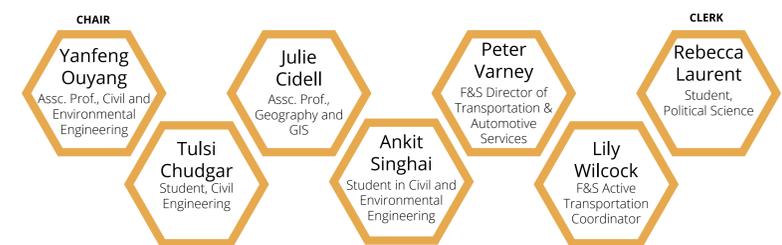
Status:  
Complete!

- Lily Wilcock hired as Active Transportation Coordinator at F&S.

- Active Transportation Coordinator will collaborate closely with iSEE and the Transportation SWATeam.



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

We express our thanks to our former team members, Professor Imad Al-Qadi, Mr. Benjamin Cigelnik, Ms. Claire Dodinval, Mr. Brian Farber, Mr. Joshua Feldman, Professor Bumsoo Lee, Mr. Zhaodong Wang, and all others who helped the Transportation SWATeam in previous years to gather and interpret data, initiate proposals and programs, and draft recommendations.

# WATER & STORMWATER

The University of Illinois has increased its water conservation efforts, with a potable water reduction target of 40 percent by 2025. Opportunities to utilize non-potable sources will be harnessed, including connecting the existing raw water system by 2020. Two goals are listed for campus water use: 1) reduce annual potable water use by 25% by FY20; and 2) capture and reuse 25% of campus stormwater by FY20. Rather than discharging stormwater, it could be used for irrigation across campus acreage, freeing up potable water for other campus uses. The campus will undertake a number of studies and pilot projects to better understand its water usage and to plan for smarter consumption.

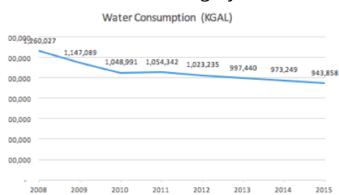
## OBJECTIVES

### 5.1. Obtain and publicize more granular water use data by FY16, including water quantity and quality data where available.



Status:  
In progress

- Water quality report can be found at <http://fs.illinois.edu/services/safety-and-compliance/water-quality/public-water-supply>.
- Funding has been received for installation of a grey water line meter at the Business Instructional Facility. Planned time of installation is Fall 2017.
- Water is metered at five points on campus. Next steps: publicize on website.



### 5.4. Inventory and benchmark campus' existing landscape performance by FY17.



Status:  
In progress

- Undergraduate 2015-16 SWATeam member David Douglas completed a report of inventory and benchmarking performance of two areas on the south side of Boneyard Creek.
- The study concluded that campus will have to implement a variety of strategies that are substantially different than current management practices.

Table : Quantities of campus surfaces that drain to Boneyard Creek

| Surface Type | Parking | Street+ Service Drive | Sidewalk | Building | Hardscape | Unpaved | Total Area |
|--------------|---------|-----------------------|----------|----------|-----------|---------|------------|
| Acres        | 87.47   | 79.5                  | 81.11    | 123.55   | 371.63    | 321.53  | 693.16     |
| Percent      | 12.6%   | 11.5%                 | 11.7%    | 17.8%    | 53.6%     | 46.4%   |            |

### 5.2. Improve the water efficiency of cooling towers by limiting the amount discharged to sewer to less than 20% of water intake for chiller plant towers, and less than 33% for stand-alone building towers, by FY20.



Status:  
Complete!

- Water softening is an alternative water treatment to manage dissolved salt left behind from evaporated water in cooling towers while reducing water consumption.
- All but two cooling towers managed by F&S have been replaced with connections to a more water-efficient chilled water plant. Methods of water use reduction by remaining towers are still considered until those towers are replaced.
- F&S works to improve water efficiency by reconnecting stand-alone cooling towers to the chiller plant, although modifying the chiller plant is not feasible at this time.

### 5.5. Through an open solicitation process, implement at least four pilot projects to showcase the potential of water and/or stormwater reuse by FY20, with the objective of implementing a broader program by FY25.



Status:  
Not complete

- One project would be studying the continuous use of non-potable water for buildings like the Business Instructional Facility and incorporating water recycling criteria into design standards.
- A full inventory and benchmarking performance report needs to be completed to identify more feasible projects.

### 5.3. Perform a water audit to establish water conservation targets and determine upper limits for water demand by end-use, for incorporation into facilities standards by FY16.



Status:  
Not complete

- F&S completed a month of metering at the Business Instructional Facility, and the study proved promising.
- According to the meter, the building took 169,000 gallons of water during a one-month period.

#### Next Steps:

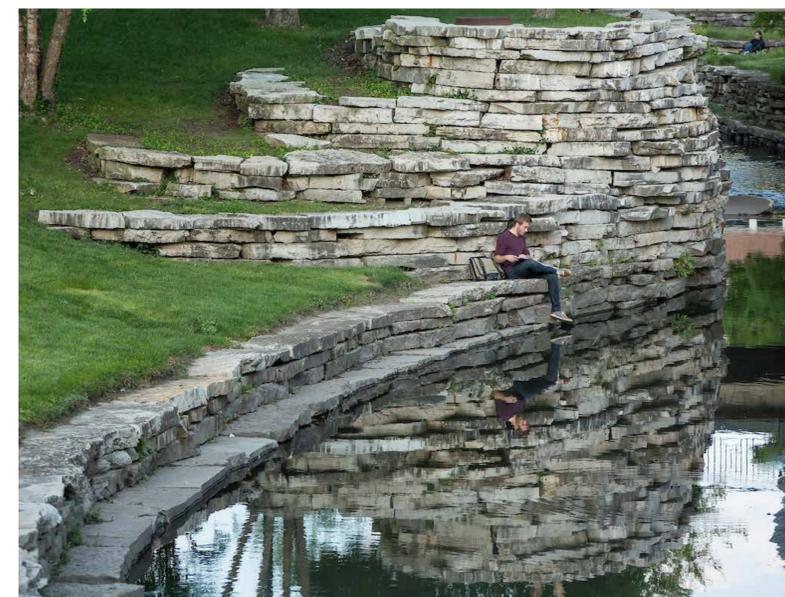
- A student minoring in sustainability plans to complete a water audit on selected buildings, especially considering DRES and NSRC.
- We welcome other students to get involved!

### 5.6. Investigate the water quality impacts of stormwater runoff and potential ways to reduce stormwater pollutant discharges by FY18.

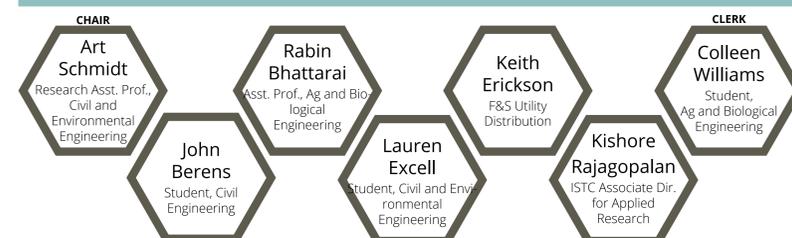


Status:  
Not complete

- Potential for student projects to investigate impacts — especially at the Boneyard Creek, which is the only campus-area body of water that is classified as "impaired."
- Porous parking lot C9 at 5th Street and Chalmers has potential for study, as well as permeable pavement near Wasaja Hall.
- As part of the EPA RainWorks Challenge during Fall 2017, Illinois students will design a reconstruction of the often-flooded parking lot F4 and neighboring street intersection.



## TEAM MEMBERS



## ACKNOWLEDGEMENTS

The Water SWATeam would like to acknowledge the Student Sustainability Committee for providing funding for the installation of the water meter at the Business Instructional Facility, the Illinois Sustainable Technology Center for its study of standalone cooling towers, and Facilities & Services for providing campus water consumption data.