This presentation premiered at WaterSmart Innovations

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The Hidden Gem – College Campuses in 14 States Know How to Save Water!

October 5, 2017

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Maddaus Water Management Inc.

Paul Lander – Faculty, Sustainable Practices Program
University of Colorado-Boulder

Water Efficiency Group Panel Topics

1. **College Water Efficiency Group Overview**
   - **Review of group goals**
   - **How can the group provide ideas for water utility/energy savings**
2. **College Campus Water Use Overview**
   - **Experience from Stanford University**
   - **Experience from University of California San Francisco**
   - **Experience from Emory University**
   - **Technical Tours**

College Water Efficiency Group Members

- September 2012: group established
- October 2017: group has 150+ members
- Group includes representatives from the following entities:
  - Water / Energy Utilities
  - Universities – public and private in 14 states (CA, HI, TX, IN, CO, GA, FL, NC, IL, WA, AZ, NY, NM, NV) and South Africa
  - Industry
  - Water Reuse Committee
  - Regional water agencies - MWDOC / SCVWD / BAWSCA / Sonoma County Water Agency / MWD
  - Consultants

Presenters for in person meeting at California State University East Bay (Hayward) in May 2013

https://nces.ed.gov/programs/digest/d16/tables/dt16_317.20.asp

IES NCES National Center for Education Statistics ☰ MENU Search Go

DIGEST of EDUCATION STATISTICS

2016 Tables and Figures | All Years of Tables and Figures | Most Recent Full Issue of the Digest

◀ Previous Page | Download Excel (60KB)

Table 317.20. Degree-granting postsecondary institutions, by control and classification of institution and state or jurisdiction: 2015-16

State or jurisdiction	Total	All public institutions	Public 4-year institutions							Public 2-year	All nonprofit institutions	Nonprofit 4-year institutions							Nonprofit 2-year	For-profit institutions		
			Total	Research university, very high[1]	Research university, high[2]	Doctoral/research university[3]	Master's[4]	Baccalaureate[5]	Special focus[6]			Total	Research university, very high[1]	Research university, high[2]	Doctoral/research university[3]	Master's[4]	Baccalaureate[5]	Special focus[6]		Total	4-year	2-year
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
United States	**4,583**	**1,620**	**710**	**81**	**74**	**38**	**271**	**198**	**48**	**910**	**1,701**	**1,594**	**34**	**30**	**54**	**406**	**469**	**601**	**107**	**1,262**	**700**	**562**
Alabama	77	39	14	1	4	0	8	1	0	25	21	20	0	0	0	4	10	6	1	17	11	6
Alaska	9	4	3	0	1	0	2	0	0	1	3	2	0	0	0	1	0	1	1	2	1	1
Arizona	86	30	10	2	1	2	2	1	2	20	13	13	0	0	0	2	4	7	0	43	27	16
Arkansas	53	33	11	1	0	1	6	2	1	22	16	12	0	0	0	2	9	1	4	4	3	1
California	448	150	34	8	2	3	18	1	2	116	148	142	3	1	9	30	23	76	6	150	88	62
Colorado	87	28	14	2	3	0	6	3	0	14	17	14	0	1	0	3	3	7	3	42	25	17
Connecticut	43	21	9	1	0	0	4	4	0	12	18	18	1	0	1	8	4	4	0	4	4	0
Delaware	9	3	2	1	0	0	1	0	0	1	5	4	0	0	1	0	1	2	1	1	1	0
District of Columbia	20	2	2	0	0	0	1	0	1	0	13	12	2	3	0	2	0	5	1	5	4	1
Florida	229	42	38	5	2	1	4	26	0	4	77	70	1	2	1	15	27	24	7	110	52	58
Georgia	130	53	29	3	1	4	9	12	0	24	36	33	1	1	1	5	17	8	3	41	22	19
Hawaii	20	10	4	1	0	0	1	2	0	6	6	6	0	0	0	2	3	1	0	4	3	1

- As of 2016 - there are 4,583 higher education institutions in the U.S.
- Includes degree-granting postsecondary institutions (2- and 4- year, and private and public institutions)
- Most in CA (448) then NY (304).

Review of why the group formed

1. Water Savings:

- ✓ Need to optimize available water supplies in many water scarce regions of the United States
- ✓ Reach individual campus goals to reduce water use
- ✓ Example:
  - ✓ 20% water demand reduction by 2020 *California reduction goals* – Water Utilities
  - ✓ 20% water demand reduction by 2020 *individual campus goals* – University of California campuses

2. Implementation Strategies:

- ✓ Overcome past struggles with efficiency projects on campuses
- ✓ No single dedicated campus position for water resources

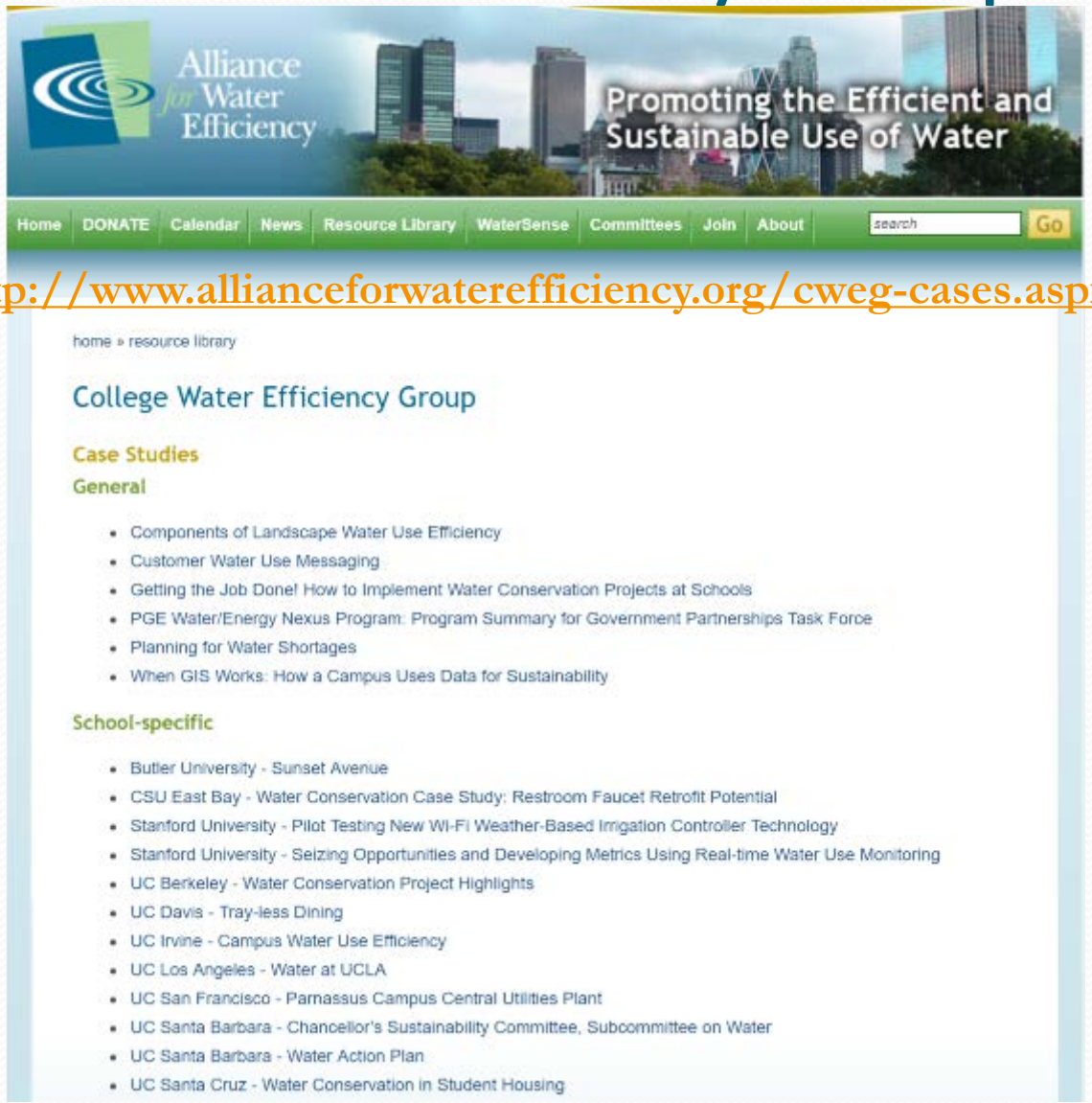
3. Funding:

- ✓ Lack of dedicated funding source for water conservation projects
- ✓ Gain support by showing that conservation is a good & sustainable idea, and "proving it"
- ✓ Potential for combined funding/grant/rebate/bulk purchases

Current Group Vision and Goals

- Focus on “implementation” to obtain water savings
- Provide a forum to share ideas and learn from others
- Expand knowledge of best available technology
- Provide success stories – case studies
- Water/Energy Nexxus - projects in North / South California
- Create a list of best management practices for campuses
- Consider “bulk purchases” or large “grant” applications
- Continue to add case studies to website hosted by Alliance for Water Efficiency

College Water Efficiency Group Website



http://www.allianceforwaterefficiency.org/cweg-cases.aspx

home » resource library

College Water Efficiency Group

Case Studies

General

- Components of Landscape Water Use Efficiency
- Customer Water Use Messaging
- Getting the Job Done! How to Implement Water Conservation Projects at Schools
- PGE Water/Energy Nexus Program: Program Summary for Government Partnerships Task Force
- Planning for Water Shortages
- When GIS Works: How a Campus Uses Data for Sustainability

School-specific

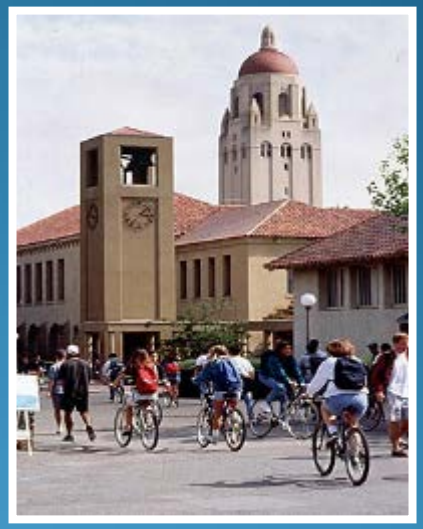
- Butler University - Sunset Avenue
- CSU East Bay - Water Conservation Case Study: Restroom Faucet Retrofit Potential
- Stanford University - Pilot Testing New Wi-Fi Weather-Based Irrigation Controller Technology
- Stanford University - Seizing Opportunities and Developing Metrics Using Real-time Water Use Monitoring
- UC Berkeley - Water Conservation Project Highlights
- UC Davis - Tray-less Dining
- UC Irvine - Campus Water Use Efficiency
- UC Los Angeles - Water at UCLA
- UC San Francisco - Parnassus Campus Central Utilities Plant
- UC Santa Barbara - Chancellor's Sustainability Committee, Subcommittee on Water
- UC Santa Barbara - Water Action Plan
- UC Santa Cruz - Water Conservation in Student Housing

Why would water utilities get involved with this group?

Many Benefits:

- ✓ Get the College/University perspective
- ✓ Give the Water Agency perspective to College/Universities about available programs
- ✓ Learn about new technology and programs
- ✓ Easy to participate – simply call in

Stanford University: Over 15 Years of Success in Water Conservation



Julia Nussbaum
Stanford University – Utilities Services

Water Efficiency Program at Stanford University (SU) 2000 - 2017

Youth –
Potable only
2.73 mgd
10.33 ML/day

- ✓ Develop Water Conservation and Recycling Master Plan 2000
- ✓ Implement 14 measures
- ✓ Low hanging fruit -
  - ✓ Bathroom, Kitchen fixtures
  - ✓ Once-through cooling
  - ✓ Potable to Non-Potable irrigation conversions
- ✓ Develop Water Efficiency (WE) Goals
- ✓ Set up Project Process
- ✓ Develop database for tracking & analysis

Middle age –
Potable mostly
2.5 mgd
9.46 ML/day

- ✓ Identify more measures
- ✓ Develop SU internal, WE technical external networks, join CUWCC
- ✓ Gain knowledge about WE Technology
- ✓ Start WE Demonstration Program
- ✓ Start campus Water Audits

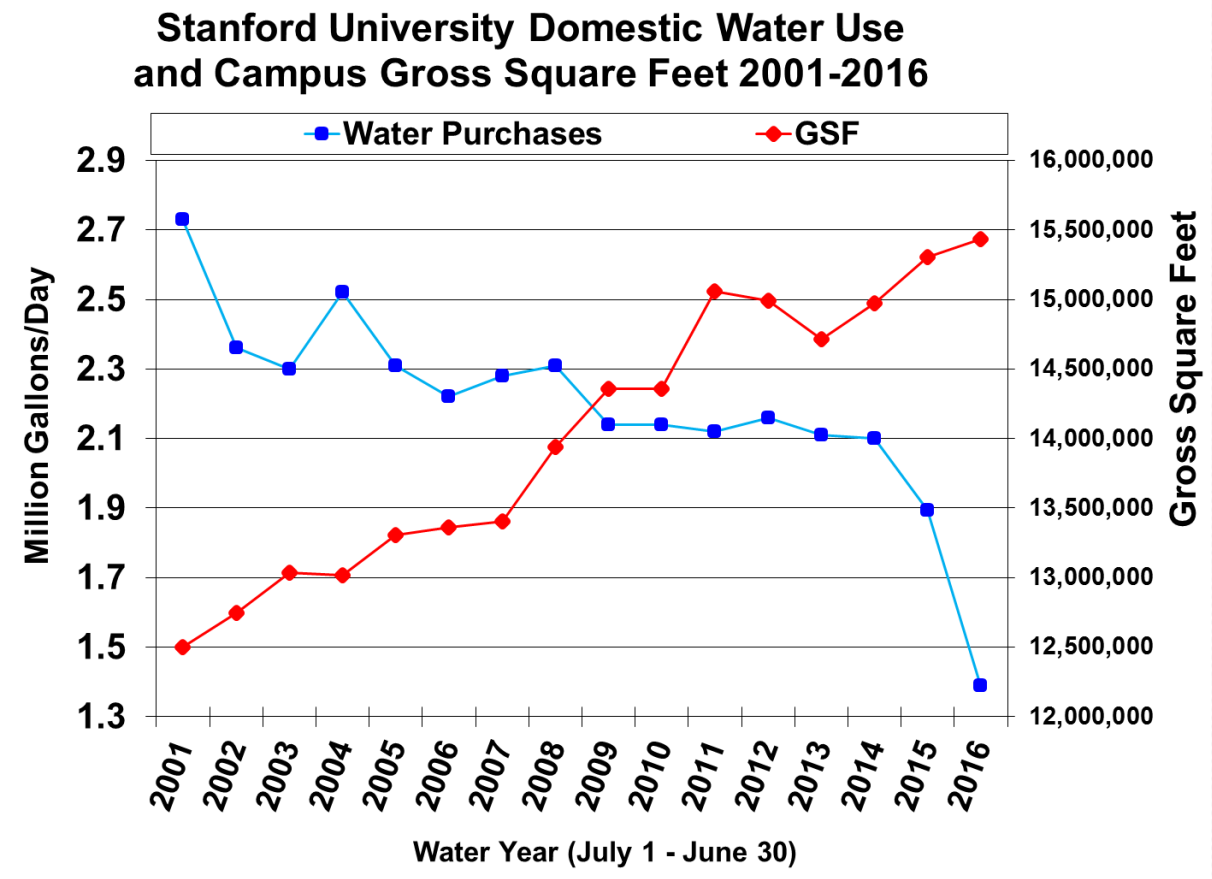
Mature –
Potable & Onsite Lake/Wells
2.15 mgd
8.14 ML/day

- ✓ Integrate Potable and Non-Potable data –
  - ✓ water use metering
  - ✓ benchmarking new facilities
  - ✓ track savings from WC projects
  - ✓ weather and academic calendar impacts
- ✓ Test impact of real-time water use metering, leak alerts

DW – Domestic (potable water)
LW – Lake Water (non-potable water)

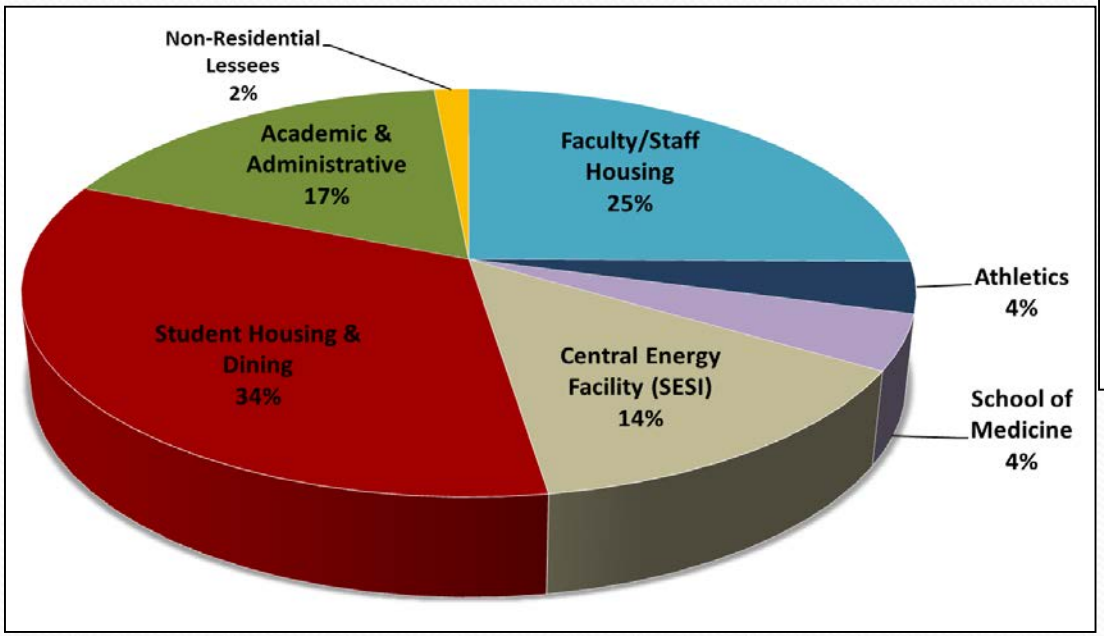
How is Stanford University doing?

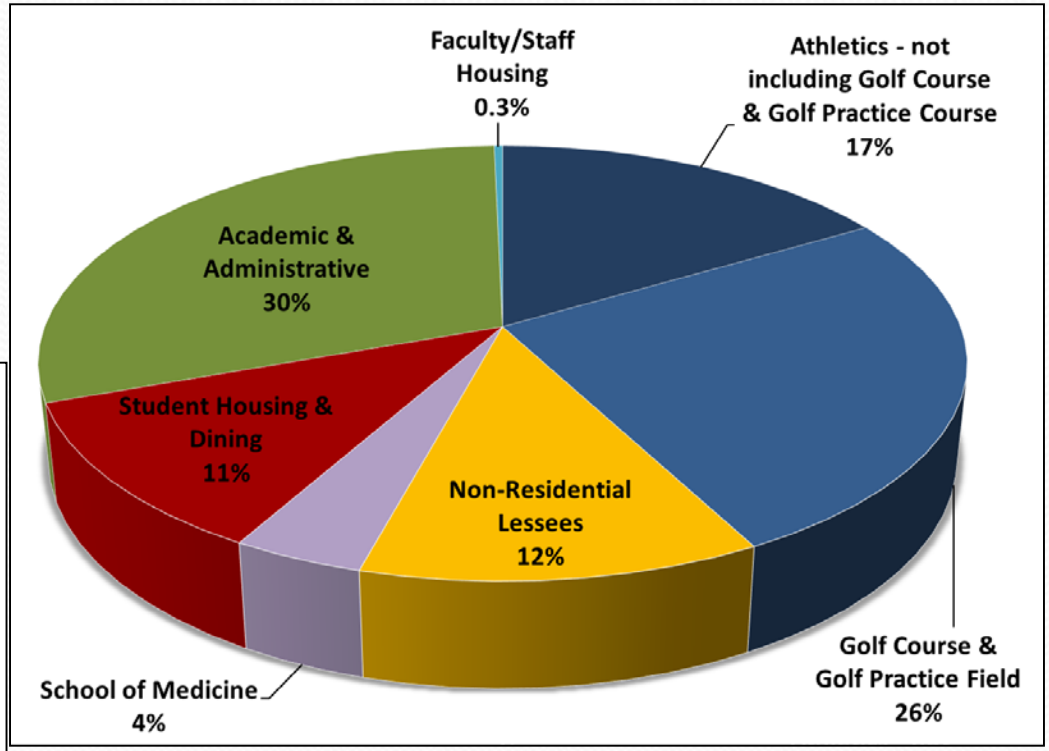
Domestic (Potable) Water Consumption:
2.7 mgd in 2000 to 1.39 mgd in 2016
10.2 ML/day in 2000 to 7.2 ML/day in 2016
(~30%+ reduction in 16 years when account for recent drought)



Categorize Campus Water Uses – Who uses and how much water do they use ?

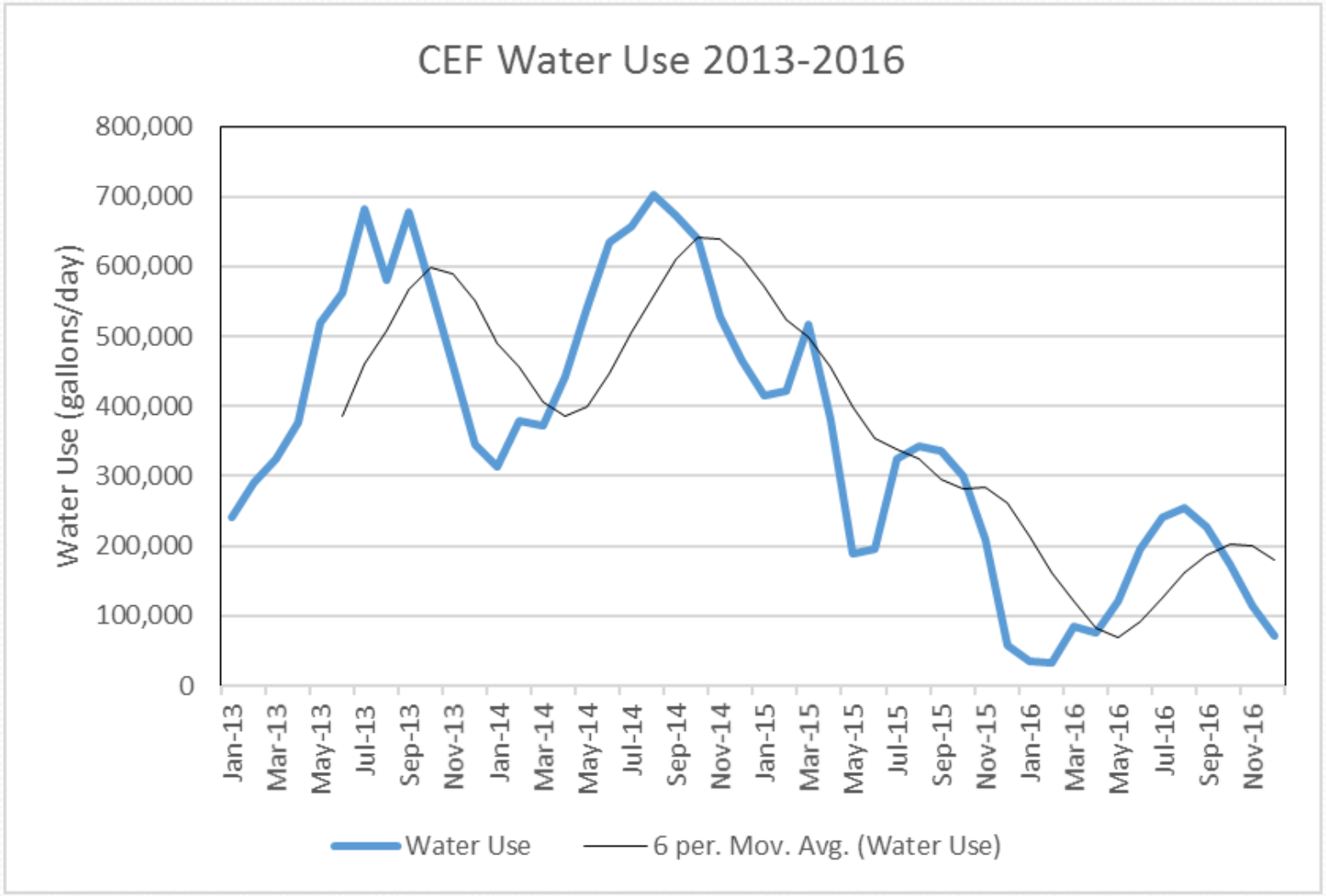
Stanford University Domestic Water (Potable)
Consumption Water Year 2016
1.4 MGD = 5.3 ML/day





Stanford University Lake Water (Non-potable)
Consumption Water Year 2016
0.8 MGD = 3.03 ML/day

Central Energy Facility Replacement 2013 - 2016

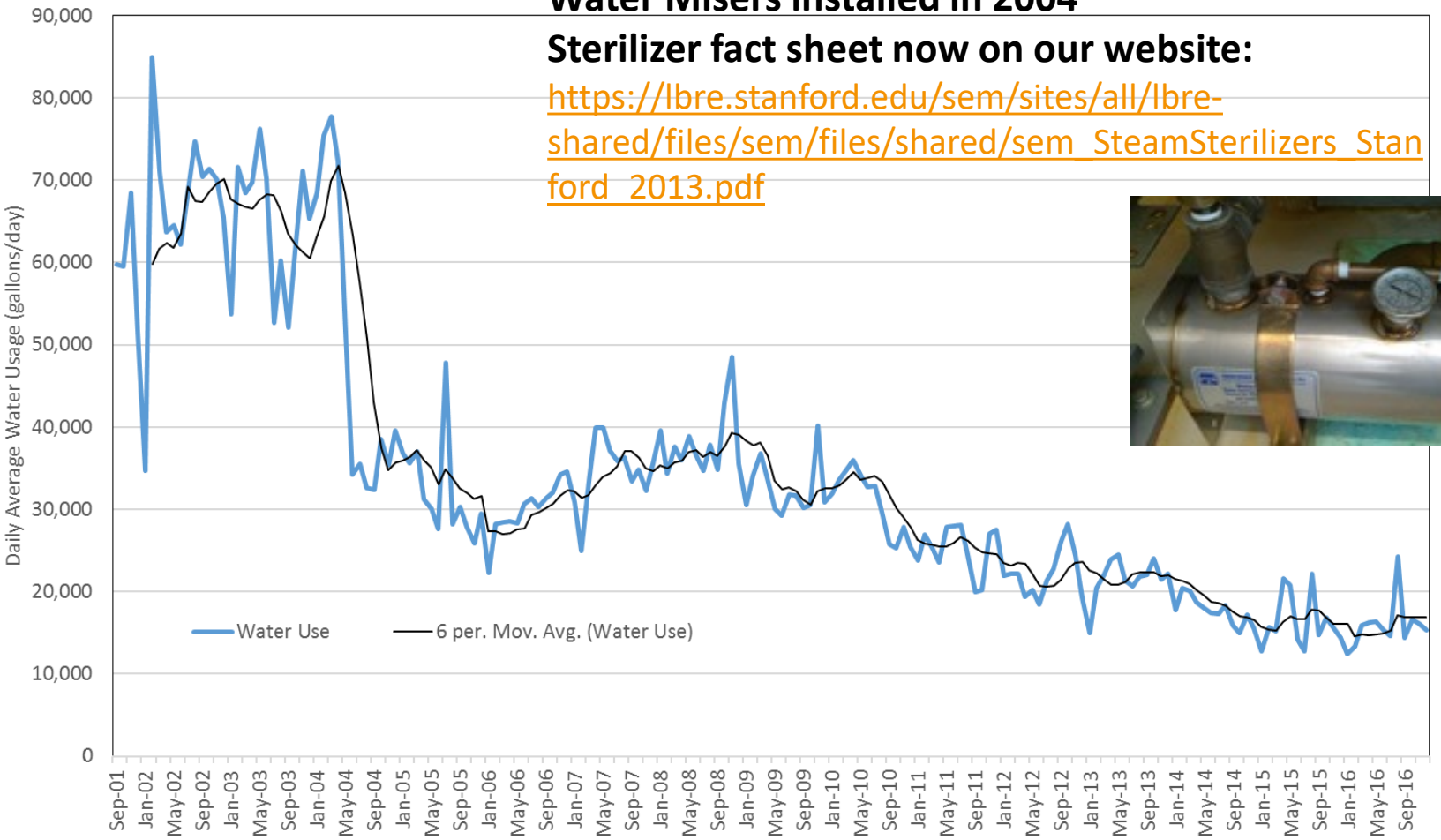


Beckman Building: 2004 - 2016 Water Miser Retrofits

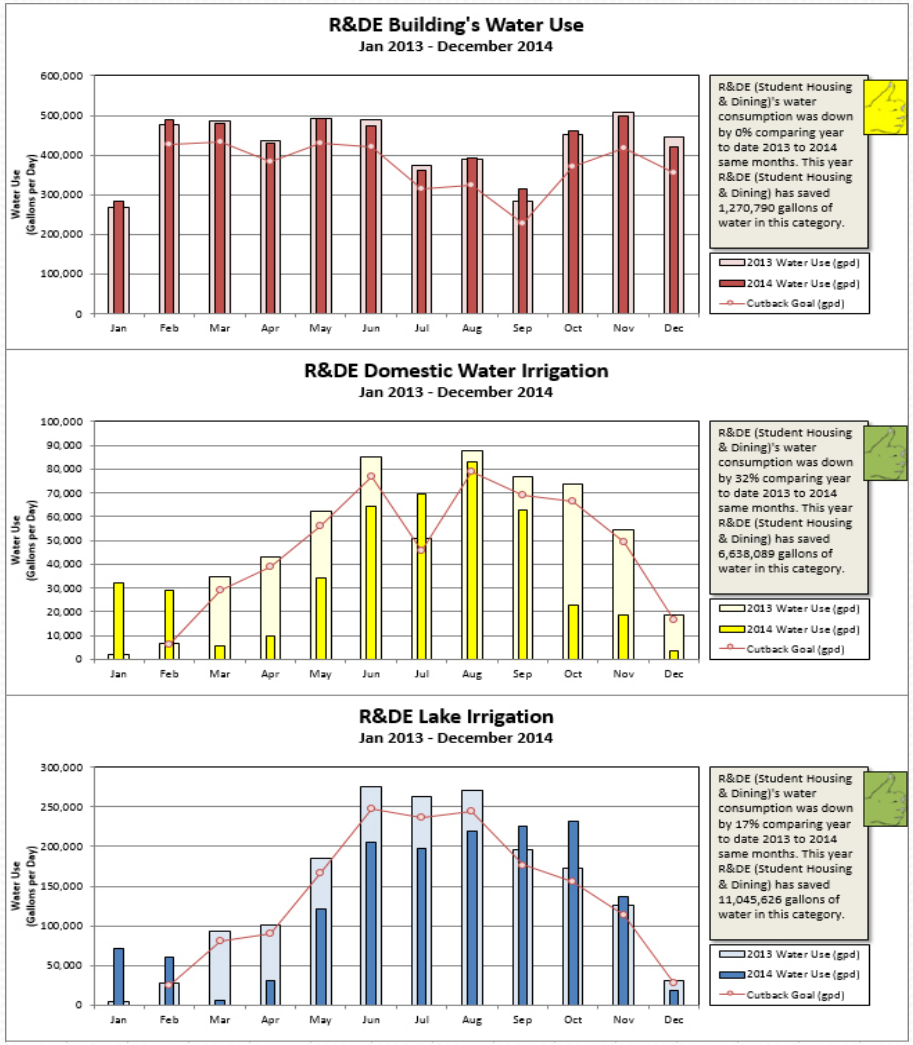
Water Misers installed in 2004

Sterilizer fact sheet now on our website:

https://lbre.stanford.edu/sem/sites/all/lbre-shared/files/sem/files/shared/sem_SteamSterilizers_Stanford_2013.pdf

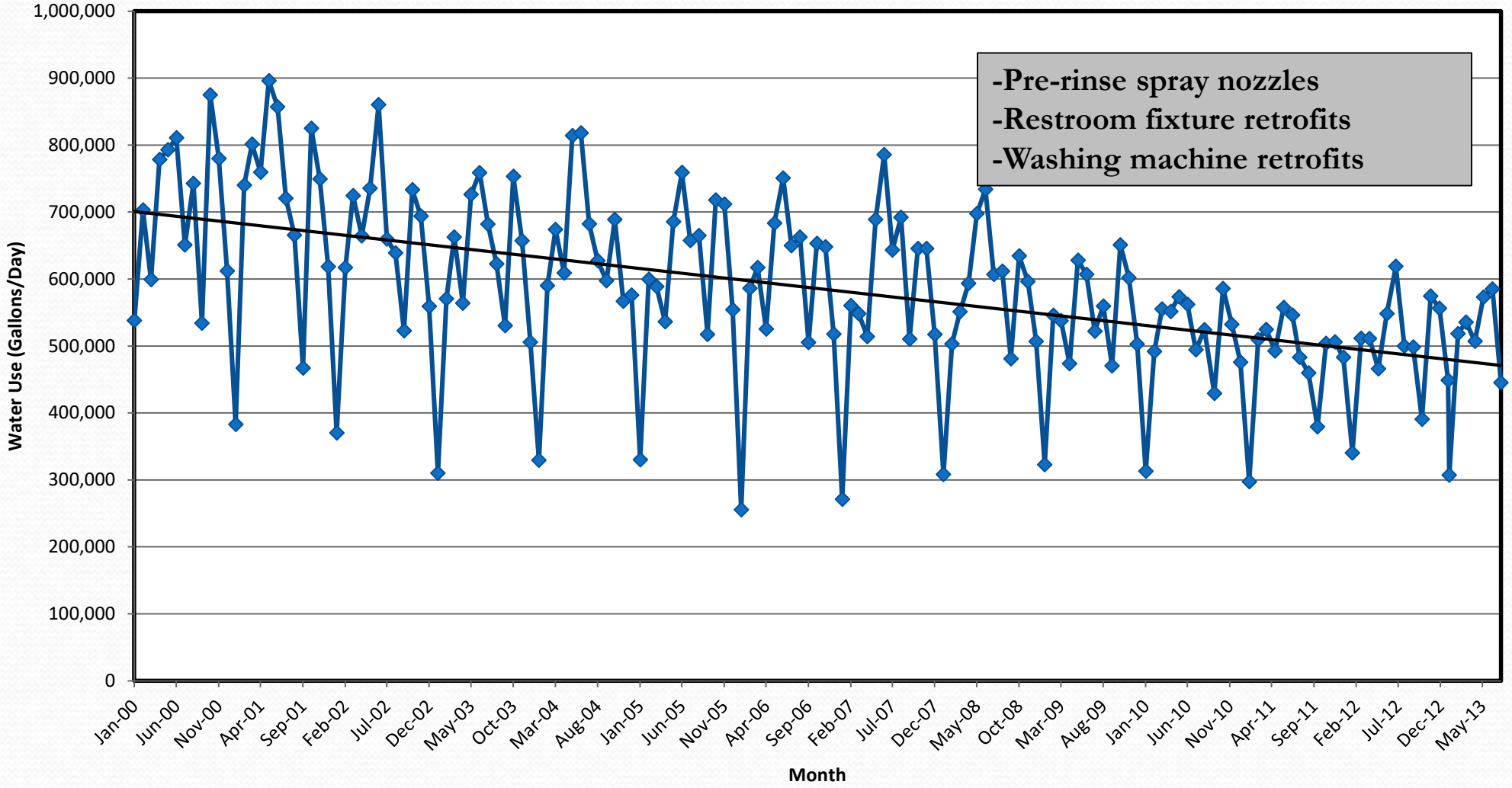


Sample Report Cards Graphs Generated by Report Card Software Provided to All Departments on Campus

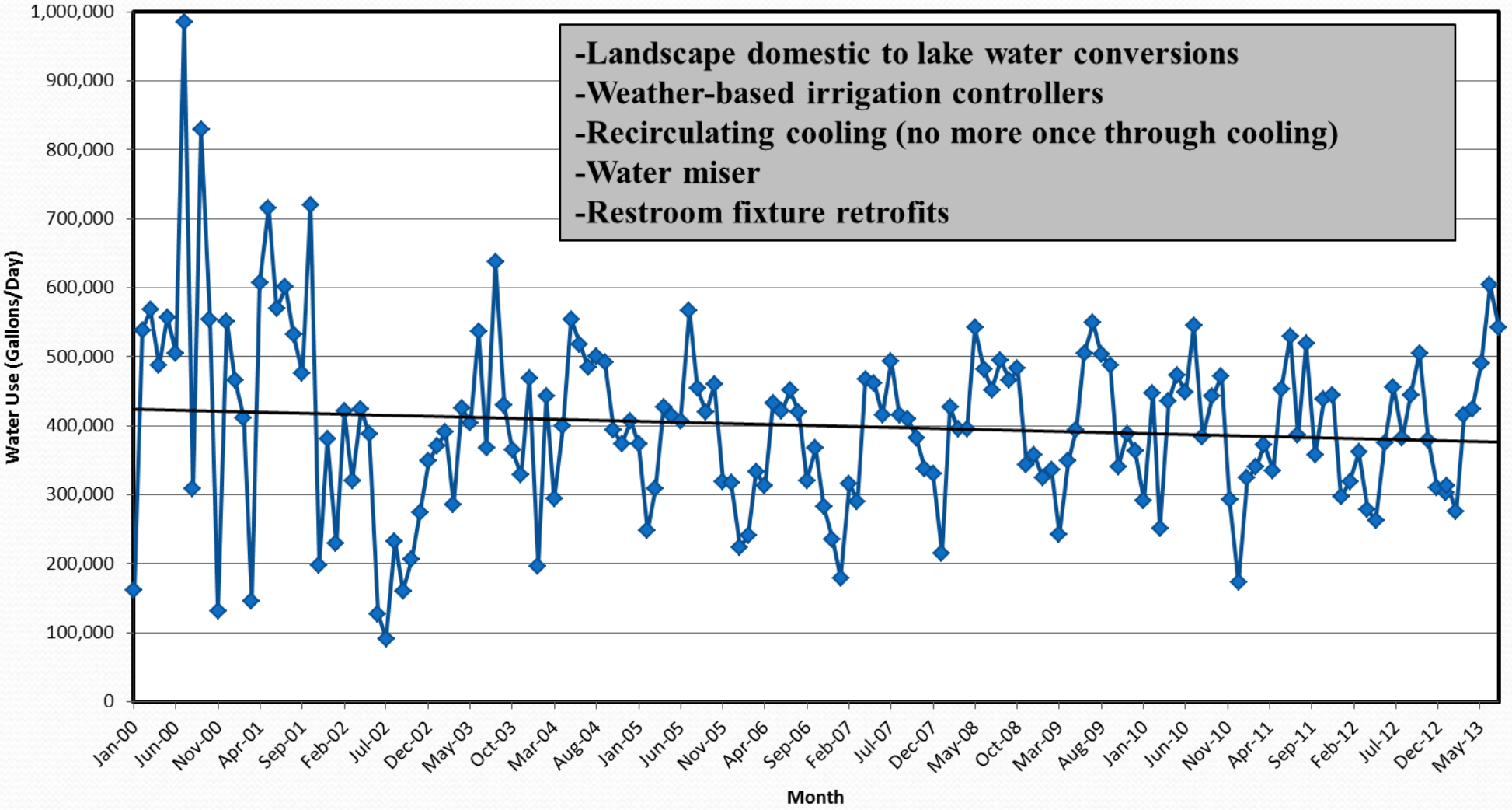


Domestic Water Consumption

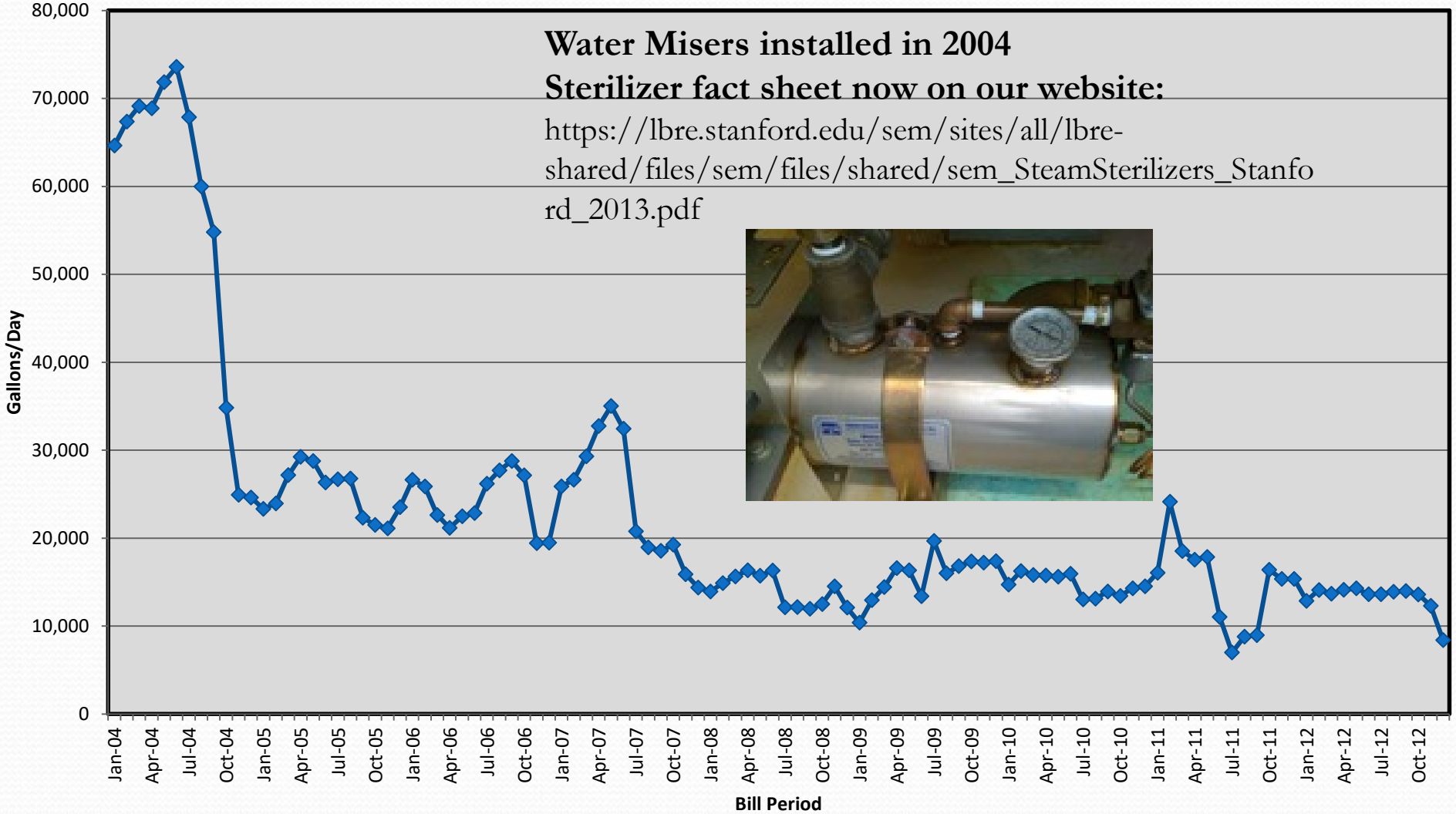
Student Housing & Dining 2000 – 2013



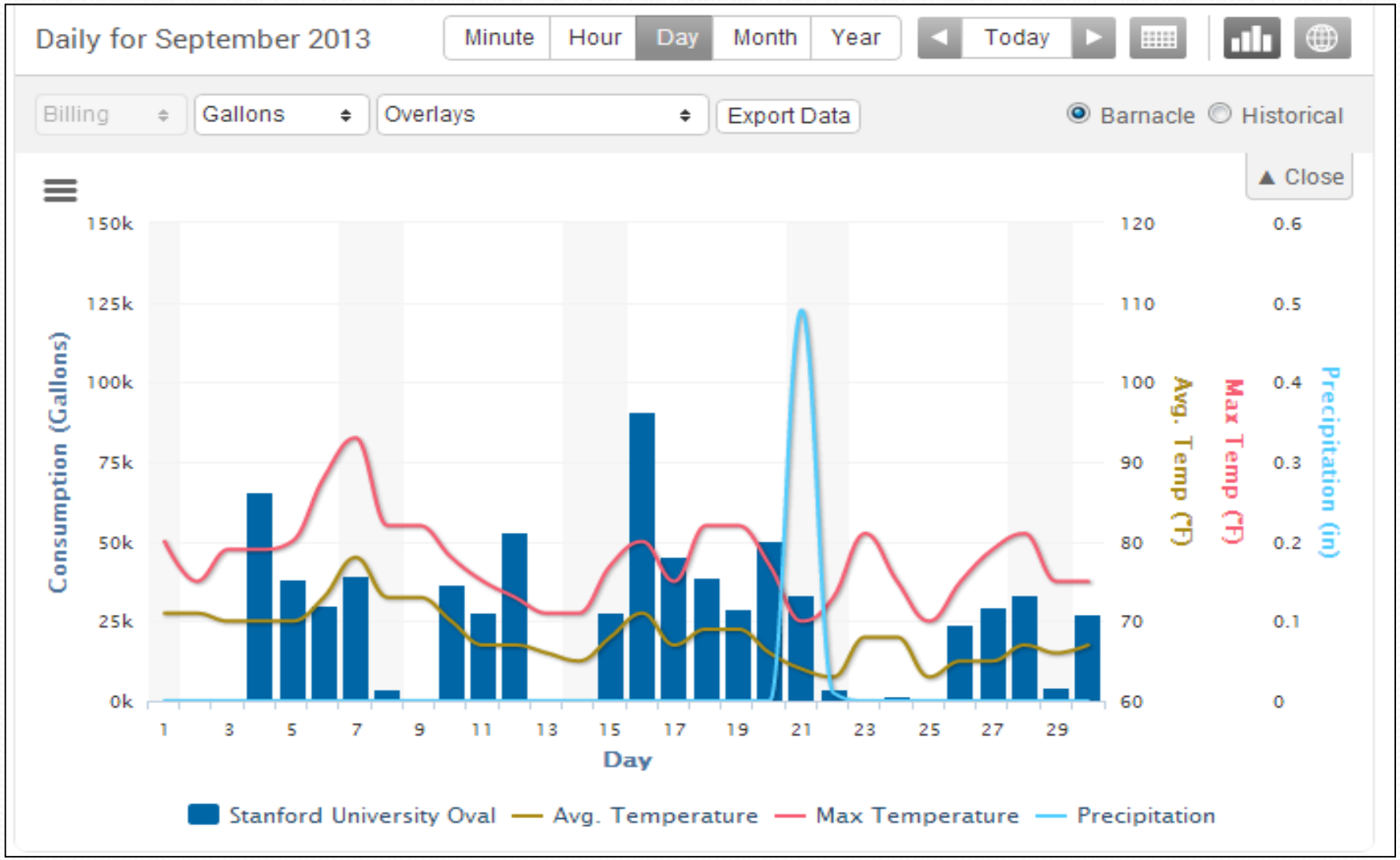
Domestic Water Consumption
Academic 2000 - 2013



Water Miser Retrofits
Fairchild Science: 2004 - 2012



Real-time Water Use Dashboard



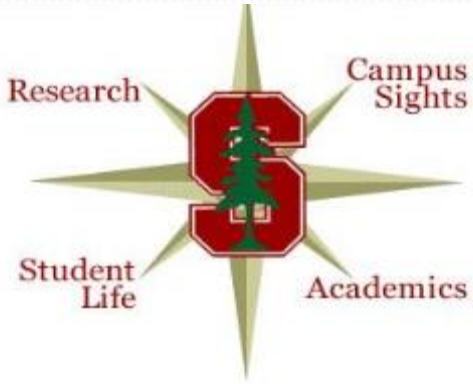
Source: Badger Meter (Aquacue) – WAVE Dashboard

Stanford's Water Efficiency Program –

What Next? Are We Done Yet?

GOAL – long-term, sustained efficient water use

- ✓ Testing new water-efficient technology including campus research with professors on treatment of black water/gray water
- ✓ Communicate consumption using real-time water use monitoring (Automated Meter Infrastructure – AMI)
- ✓ Maintain existing fixtures; indoor, outdoor equipment



University of California, San Francisco

Steaven Campbell
Facilities Analyst with UCSF Facilities Services,
Engineering & Energy Services

University of California, San Francisco

CAMPUS OVERVIEW

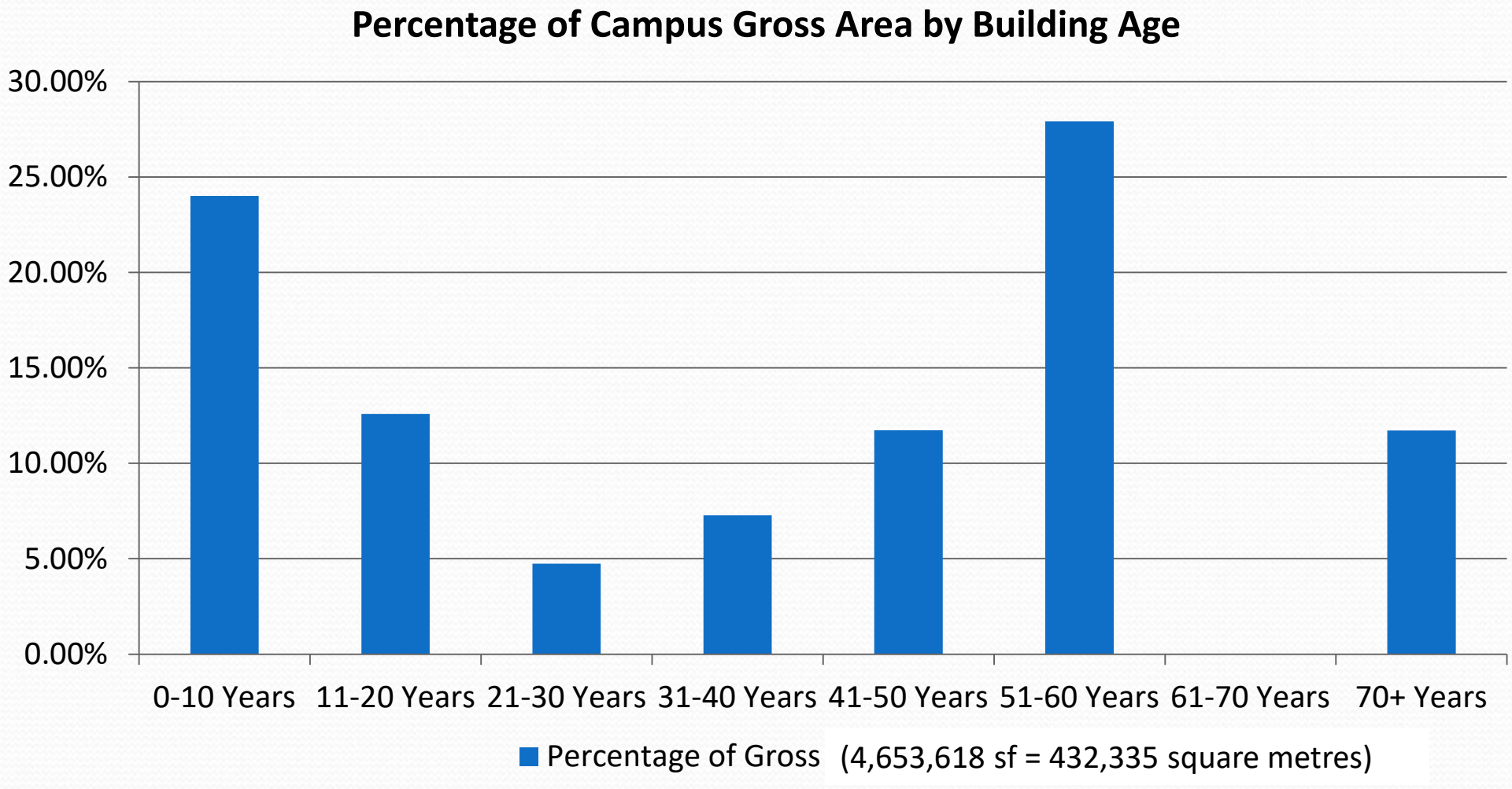
- Founded 1864
- Faculty and staff of 22,800 people
  - Second largest employer in San Francisco
- Parnassus Campus (of 4 major campuses) average daily population of 16,000 consisting of patients, visitors, faculty, students, and staff

University of California, San Francisco

Exclusively focused on health sciences with four professional schools:

- School of Medicine
- School of Dentistry
- School of Pharmacy
- School of Nursing
- Graduate programs, UCSF Medical Center, UCSF Benioff Children's Hospital

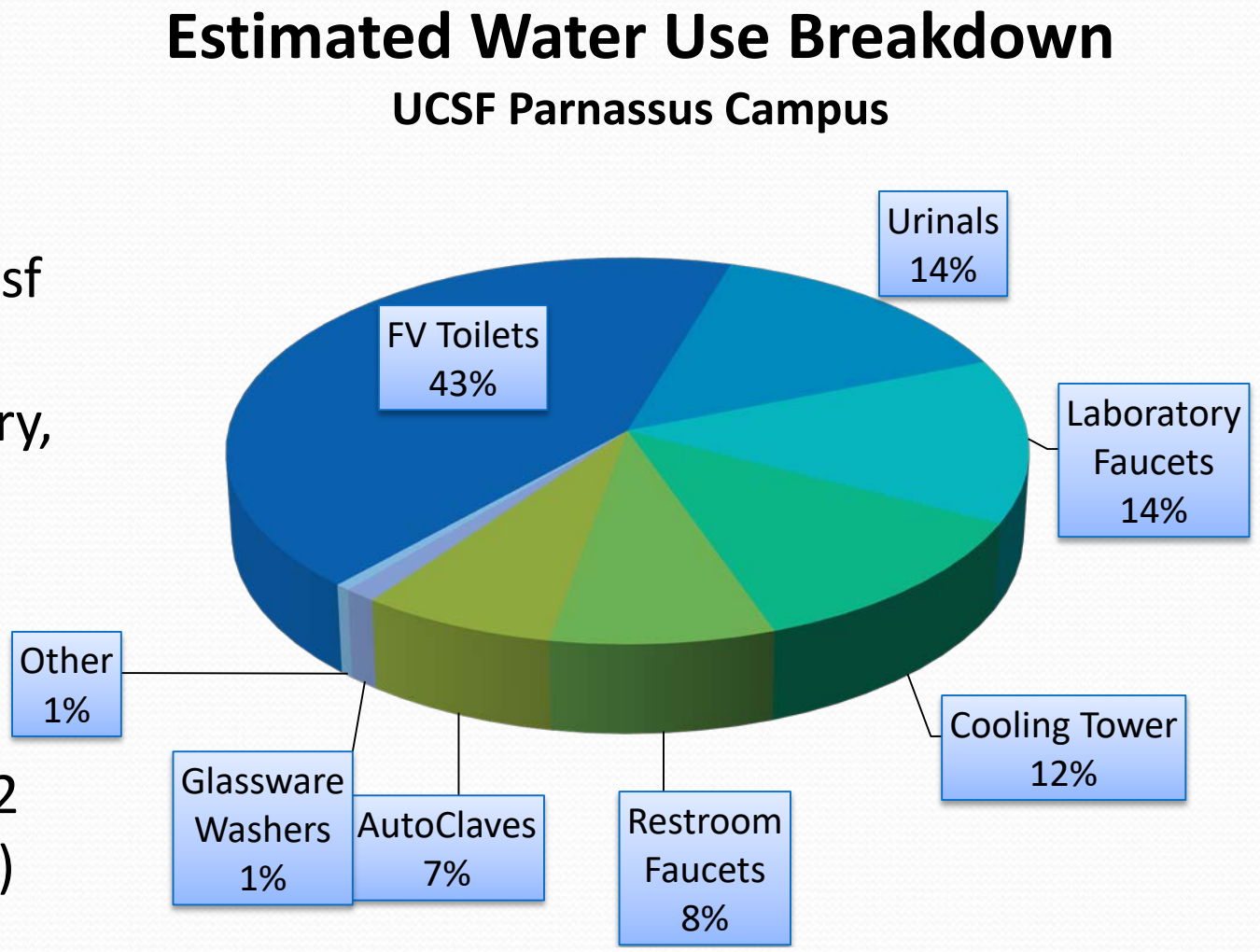
Water Efficiency Improvement Projects



Determining Water Use on Campus through Audit

Parnassus Campus Water Audit

- 15 buildings (2,654,288 gross sf = 246,591 sq metres) laboratory, academic and clinical uses
- In 2011, water consumption averaged 240,682 gpd (911,080 lpd)



Note – water use for Parnassus only. Total campus survey included in Phase 1 and Phase 2 with 31 buildings and 5,400,000 sf (501,676 sq metres)

Water Efficiency Improvement Projects

- **Cold Rooms** – 22 units once through continuous flow conversions
  - Solenoid valve installation would ensure zero water flow when the system is cycled off.
  - Previously a pressure controlled valve determined the flow rate. Since the control valve is adjustable, it can drift from its setting and allow water to flow needlessly.
  - The solenoid water valve would prevent this.
  - Cost of $500.00 each to install includes labor & materials.
  - Saves 968,000 gallons per year (3,664,279 litres per year).
- **Meters:** Using "Barnacle" meters to convert standard meters to providing "real time data" for the meters
  - Allows ability to detect leaks and get them fixed.

Water Efficiency Improvement Projects

Projects underway following results of Fixture Survey

- Affects 65% of water consumption:
  - Replace all less efficient water closets for an estimated savings of 4,279 gpd (16,198 lpd)
  - Replace all less efficient urinals for an estimated savings of 864 gpd (3,271 lpd)
  - Replace all missing and broken aerators
- Other pending projects:
  - Autoclaves – working with SF Public Utilities Commission for a pilot project
  - Retrofit irrigation system at our Laurel Heights Campus
  - On-site recycled water for large buildings working with SF Public Utilities Commission

Recording equipment data on a tablet software so water use efficiency can be determined

University of California Santa Cruz

Conducted whole campus plan 2007

Completed 19 projects and saved 15% in 5 years by 2012

Sonoma State University

Completed campus audit in 2015

Looking to improve toilet, urinal and overall campus efficiency

Brand new facility for large concerts which have high efficient fixtures

Emory University, Georgia

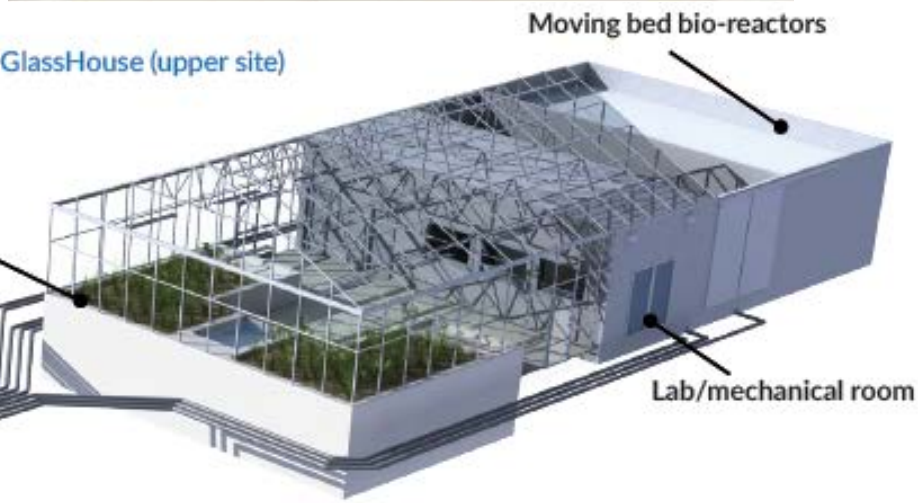
WATER HUB

EMORY UNIVERSITY

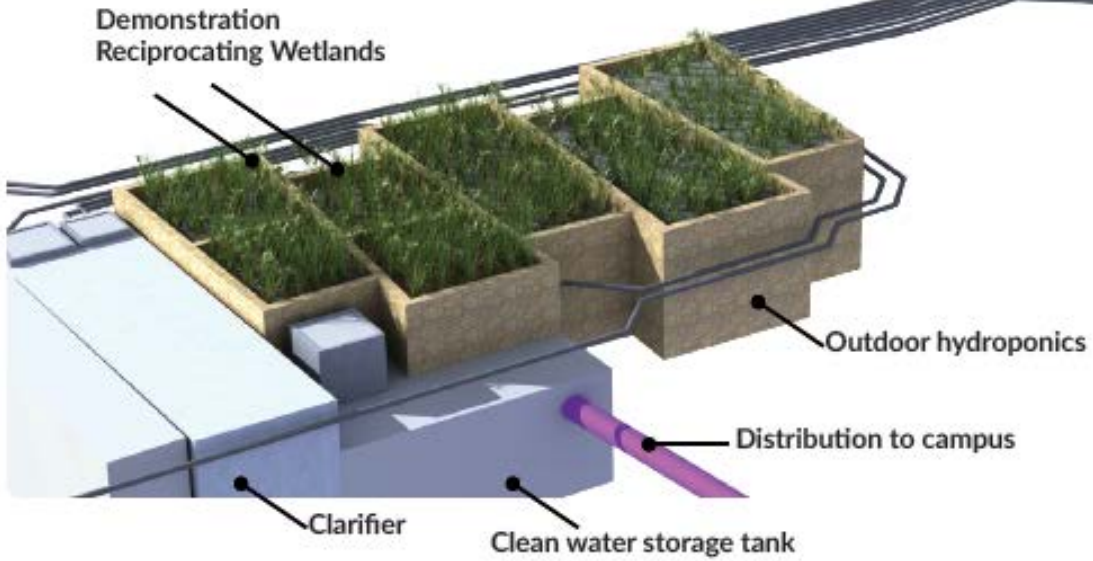
"The region has committed to a very robust plan for water conservation, water efficiency and reuse. This project clearly demonstrates how recycling our treated wastewater and appropriately reusing it will extend our resilience and free up water for future generations and other beneficial purposes."

Douglas Hooker
Executive Director
Atlanta Regional Commission

GlassHouse (upper site)



Outdoor Reactors (lower site)



WaterHub Design Parameters

Parameter	Influent (mg/L)	Effluent (mg/L)
BOD	266	<5
Turbidity	n/a	<3
TSS	350	<5
TKN	65	<5

Cooling towers at Michael St. Chiller Plant now receive reclaimed water

Lower Site: outdoor hydroponics and demonstration reciprocating wetlands

4860 Cox Road, Suite 120
Richmond, VA 23060

Office: 804.965.5590

www.sustainablewater.com

SUSTAINABLE WATER
EXTENDING THE LIFE CYCLE OF WATER

Summary for College Water Savings

- HUGE Water Savings Potential
  1. Billions of gallons of water used on campuses
     - UC system alone uses 4.9 billion gallons per year
  2. Universities are often in the top 10 customers of the local water utility
  3. Water rates planned to increase in future making projects more attractive
  4. Millions of inefficient fixtures can be replaced across a state!
  5. Synergy with mutually beneficial “goals” to save water
     - Campus can be “sustainable” and save water
     - Water utility can help meet rebate targets and water saving goals
     - Colleges are researching and piloting alternative water sources!

Future Opportunities for Support

- The College Group is unique in that we can do studies with:
  - University location
  - Water Utility / Energy Utility support and participation
- Analysis of data
  - Water Use
  - Energy Use
  - GHG
- Challenge is funding – need resources for the equipment and/or analysis of study data

For more information on College Water Efficiency group, please contact:

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Water is a precious resource!