Welcome to Sacramento State!

OWP at Sacramento State

OWP Sacramento State

https://www.owp.csus.edu

EFC at Sacramento State

ENVIRONMENTAL FINANCE CENTER AT SACRAMENTO STATE

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Campus Low-Impact Development Project

Complex Integrated Water Planning in the 21st Century

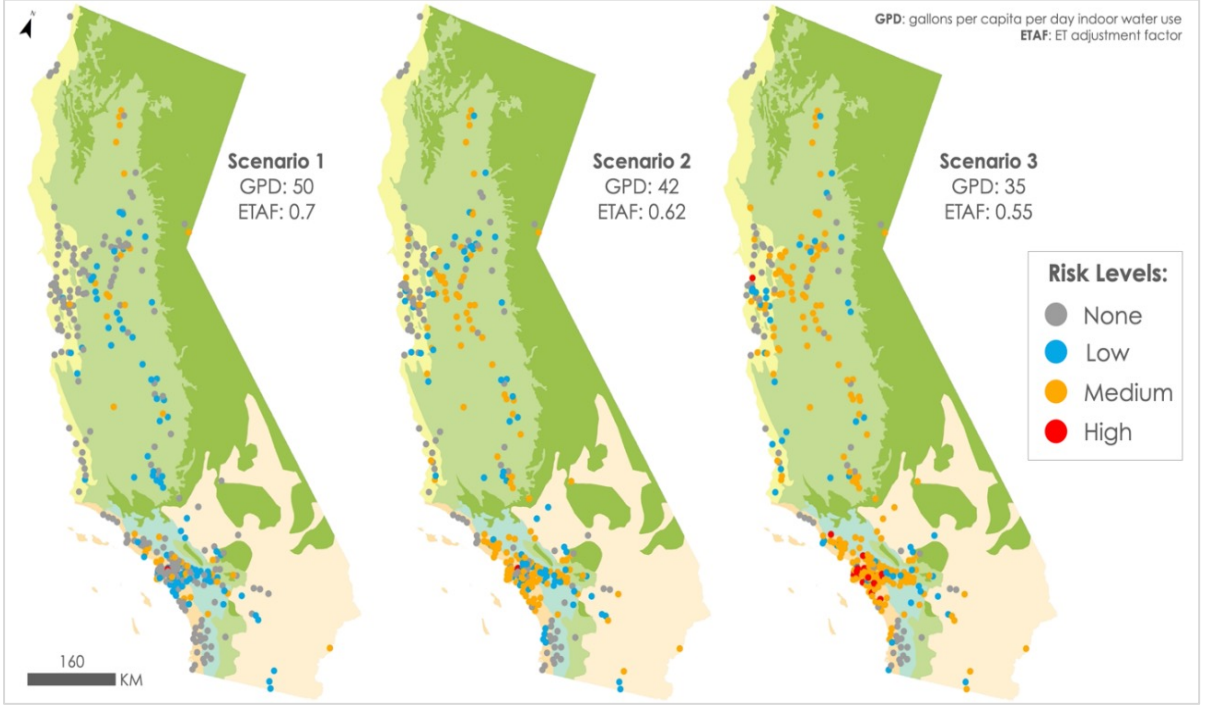
"Unfortunately, in a complex and increasingly interdependent world, issues such as water, energy, agriculture, the environment or rural development are becoming increasingly interrelated and interdependent. Accordingly, integrated management of any one of these resources is not technically possible and institutionally and managerial feasible, because of accelerating overlaps and interlinkages with the other resource and development sectors."

- Asit Biswas, 2008

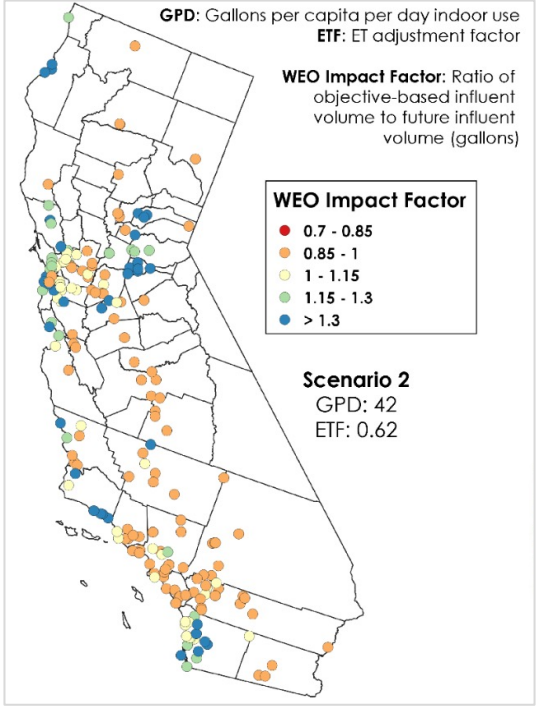
Planning Across Sectors

- How do actions affect other sectors in complex systems?

Water-efficient landscapes and effects on urban trees



Indoor water conservation and wastewater management



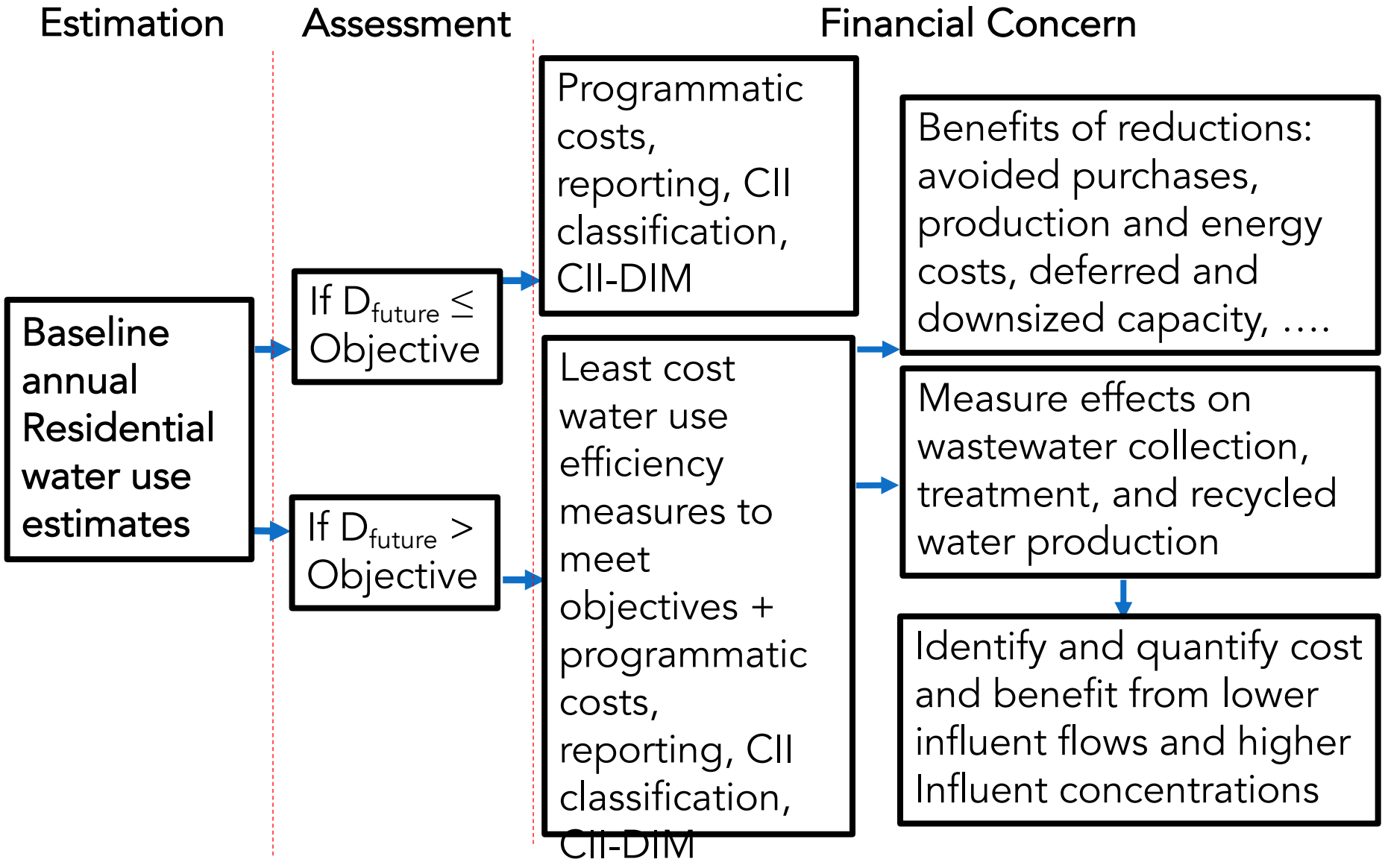
Big Question

What will urban water conservation look like in 15 years?

Some Themes for Future Urban Water Conservation

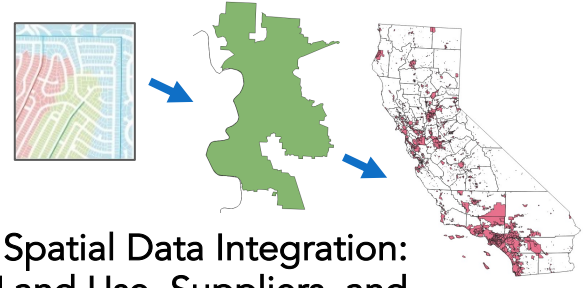
- **What demand management strategies are cost-effective?**
  - Landscape transformation, household leak detection, new indoor fixture technologies
- **Beyond technology**
  - Outreach, education, behavior change, and social attitudes
  - Linking drought effects with fiscal planning
- **Using data, but not swimming in it**
- **Planning across "full cycles" of water management**
- **Uncertainty in policies, technology, and drought**

Source: Forbes.com

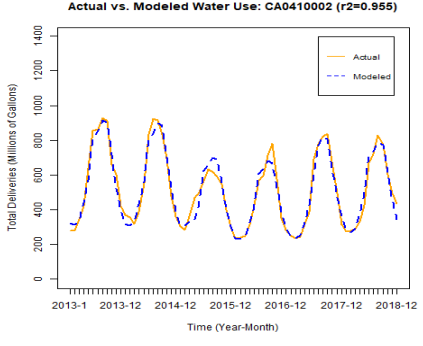

Estimation
Assessment
Financial Concern
Baseline annual Residential water use estimates
If $D_{future} \leq$ Objective
If $D_{future} >$ Objective
Programmatic costs, reporting, CII classification, CII-DIM
Least cost water use efficiency measures to meet objectives + programmatic costs, reporting, CII classification, CII-DIM
Benefits of reductions: avoided purchases, production and energy costs, deferred and downsized capacity, ….
Measure effects on wastewater collection, treatment, and recycled water production
Identify and quantify cost and benefit from lower influent flows and higher Influent concentrations

Integrating Data and Methods

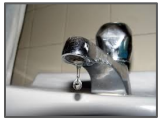
Modeling future water demand for water suppliers in California based on multiple methods



Spatial Data Integration: Land Use, Suppliers, and Statewide Data

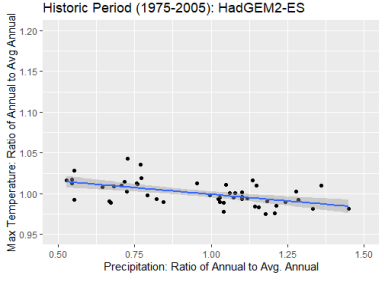


Regression Modeling



Time Intervals		Appliances					
Years	Reason	Bath Faucet	Kitchen Faucet	Toilet	Clothes Washer	Dishwasher	Shower
pre-1980	Toilets (6 gpf)[1]			Y			
1981-1993	Toilets (3.5 gpf)[2]			Y			
1994-2006	U.S. Energy Policy Act	Y	Y	Y			Y
2007-2009	Washers[3]				Y		
2010	Toilets			Y		Y	
2011	EISA 2007 (42 U.S.C. 6295(g)(9))				Y		
2014	Title 20 & 24 (CalGreen)	Y	Y	Y			Y
2015	Clothes Washers					Y	
2016-2018	Title 20	Y					Y
2018-present	Title 20 &[77] FR 32307 (2012)				Y		Y

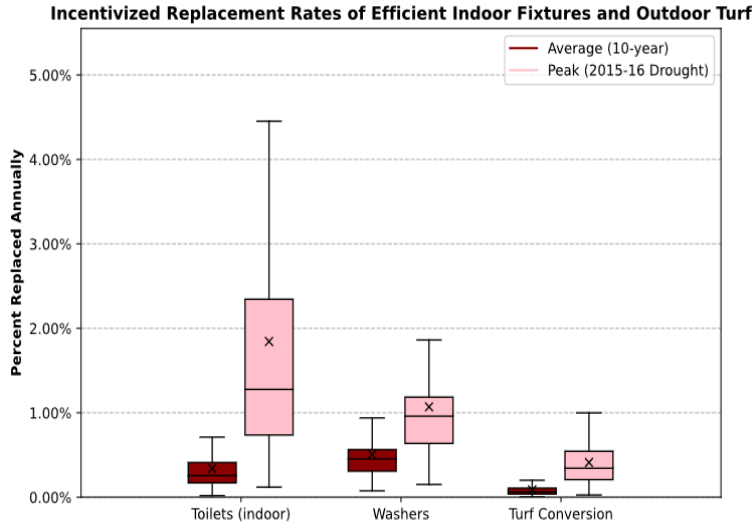
Indoor Fixture Efficiency



Climate and Drought Effects

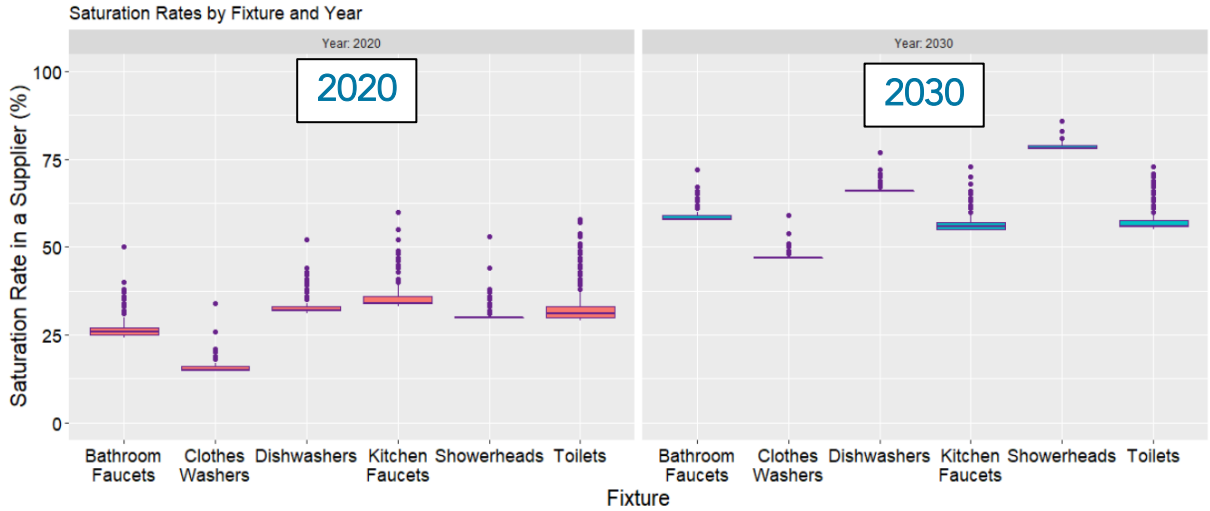
Efficient Fixtures and Saturation

Include incentives and rebates in demand forecasting



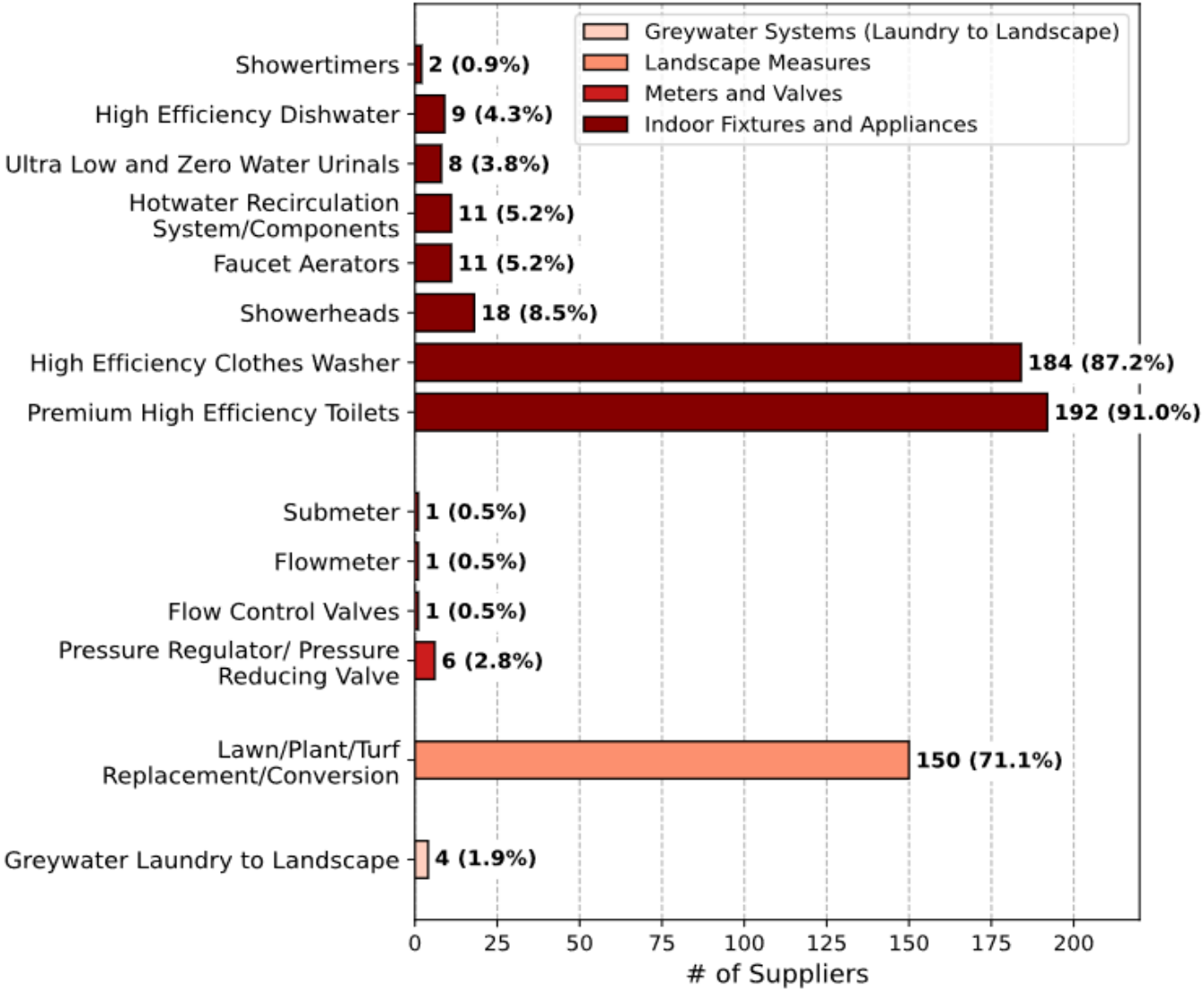
Annual replacement rates of fixtures through utility rebate programs (2010-2020)

Estimating change in saturation of efficient fixtures through 2030



Source: Author analysis, compiled from multiple sources

Conservation rebate program offerings in California in 2019



Source: Analysis of State Water Board eAR reports

Implications

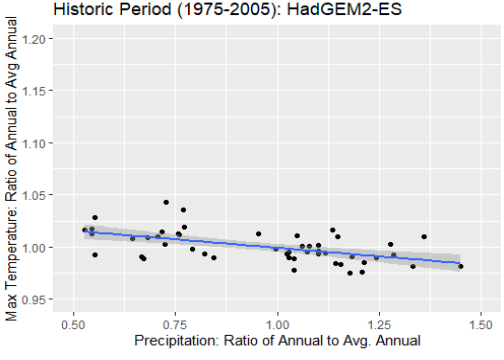
- Fewer toilets or washers to replace to meet compliance reductions
- Comes down to leaks and lawns
- Uncertainty makes it difficult to read the tea leaves

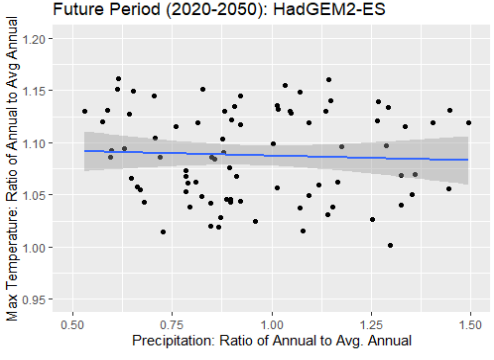
Sources of Uncertainty

- Policy
- Technology
- Climate

Will fixture efficiency improvements be cost-effective?
(Photo credit: wayfair.com)

Climate modeling demonstrates a future of more extreme heat and dry periods





Mitigation and adaptation actions with policy changes (photo credit: KTLA)

Tour of the Sacramento State Campus LID Project

Special Thanks:

CalWEP, Alliance for Water Efficiency
Urban retail water supply community
Wastewater management community
Urban parkland management community

Data (still being populated):

Project Reports & Links

Data on Hydroshare

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Rio Hondo Spreading Grounds, Los Angeles, CA
Source: E. Porse

URWS Residential Mitigation and Adaptation Actions

Evaluated what "will" happen with no regulations as part of a baseline, then evaluate the future impact of regulations