This presentation premiered at WaterSmart Innovations

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Can Smart Meters be Used To Encourage Water Conservation?

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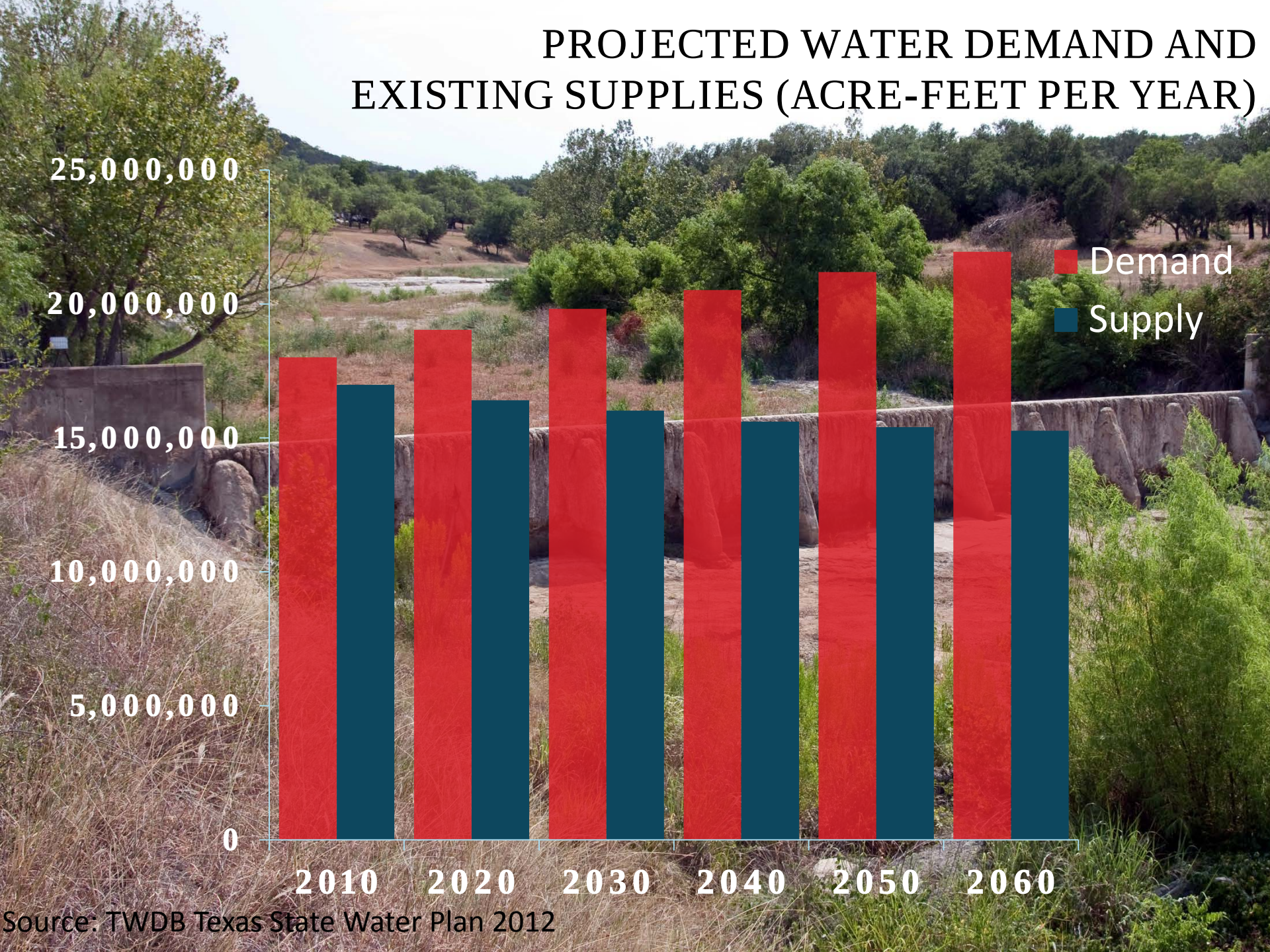
Texas A&M AgriLife, Texas Water Resources Institute

TEXAS A&M AGRILIFE RESEARCH | EXTENSION

Texas Water Resources Institute
make every drop count

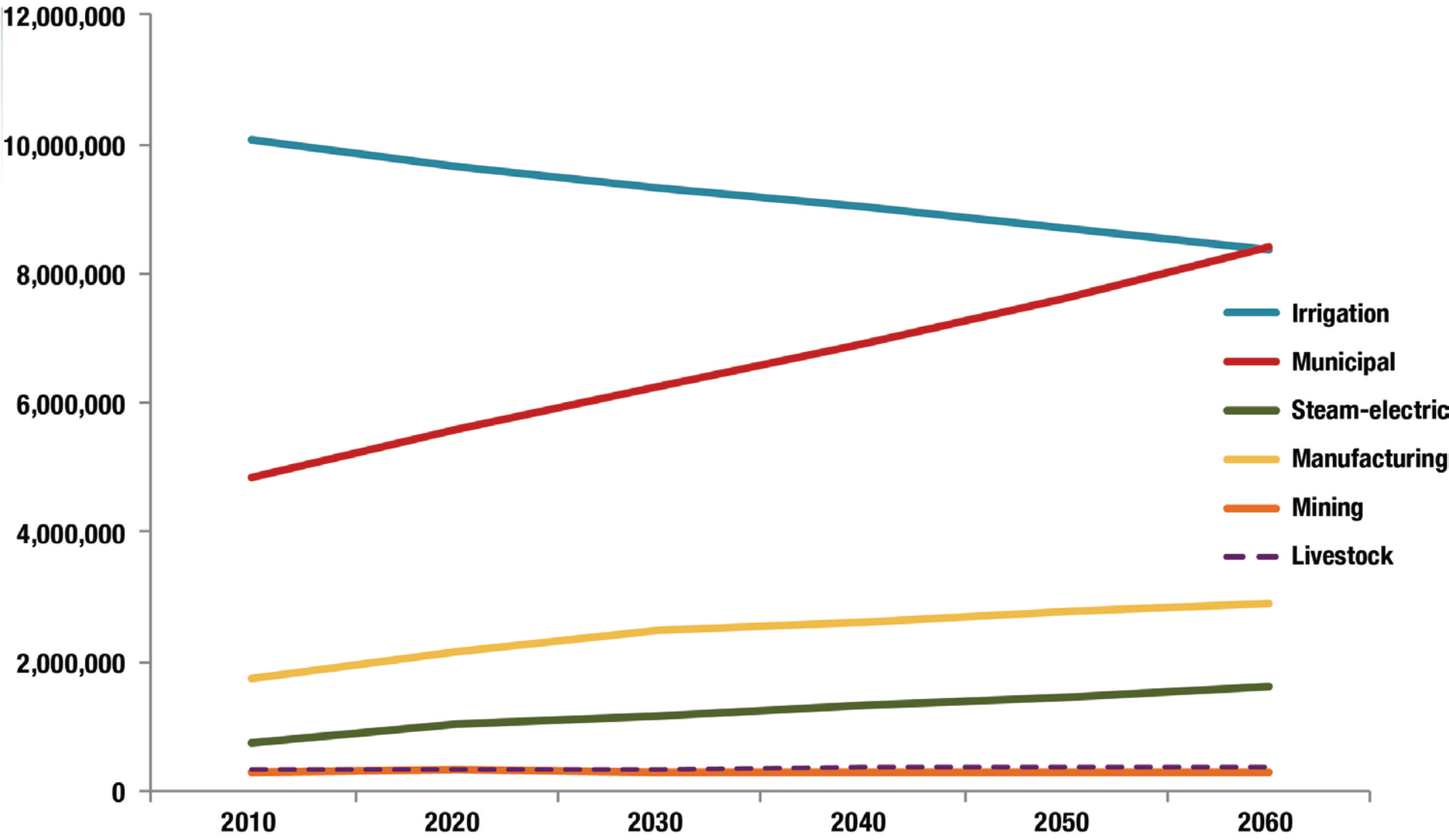
TEXAS A&M UNIVERSITY

PROJECTED WATER DEMAND AND EXISTING SUPPLIES (ACRE-FEET PER YEAR)



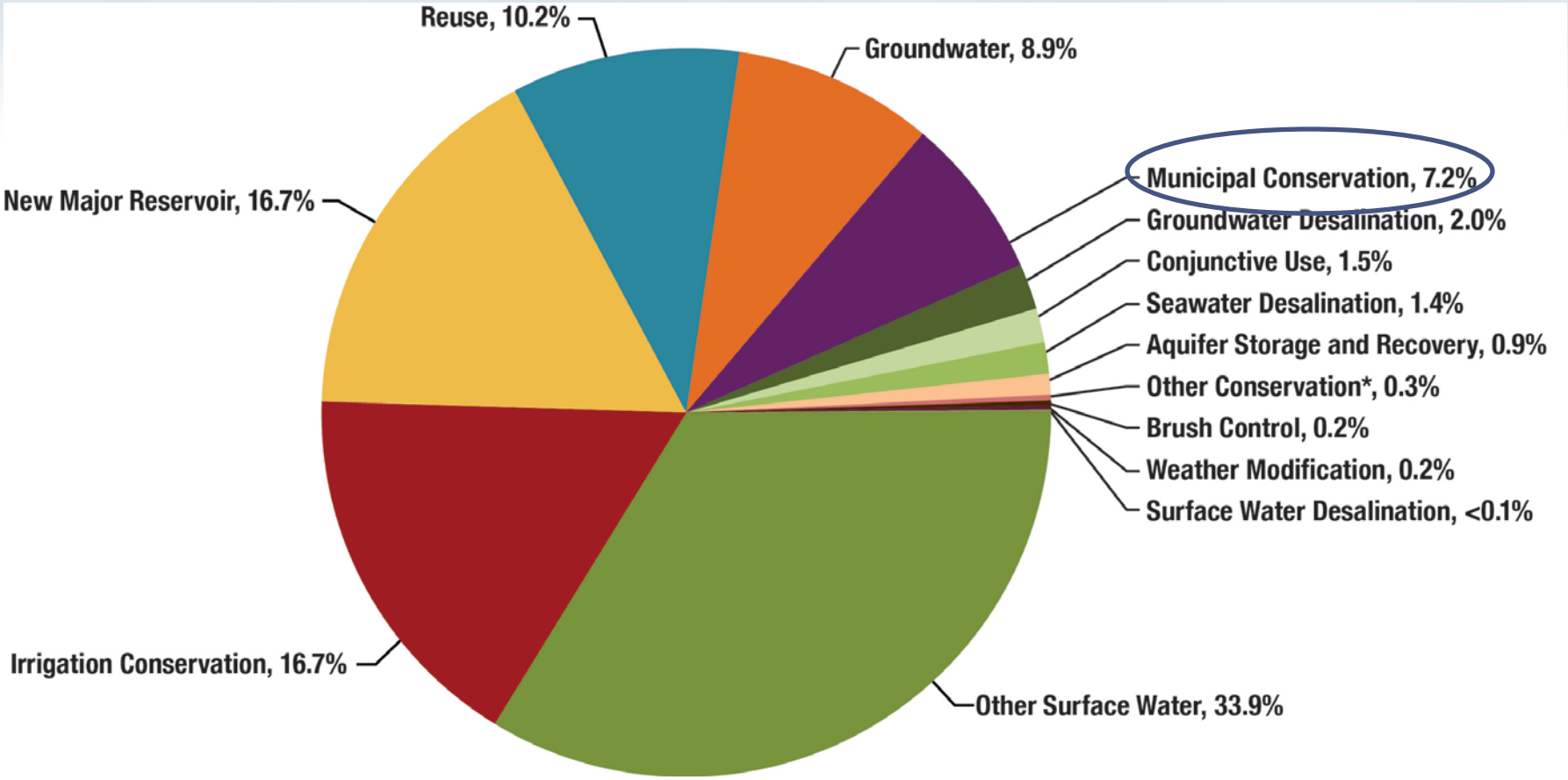
Source: TWDB Texas State Water Plan 2012

Texas Water Demand Projections (acre-ft per year)



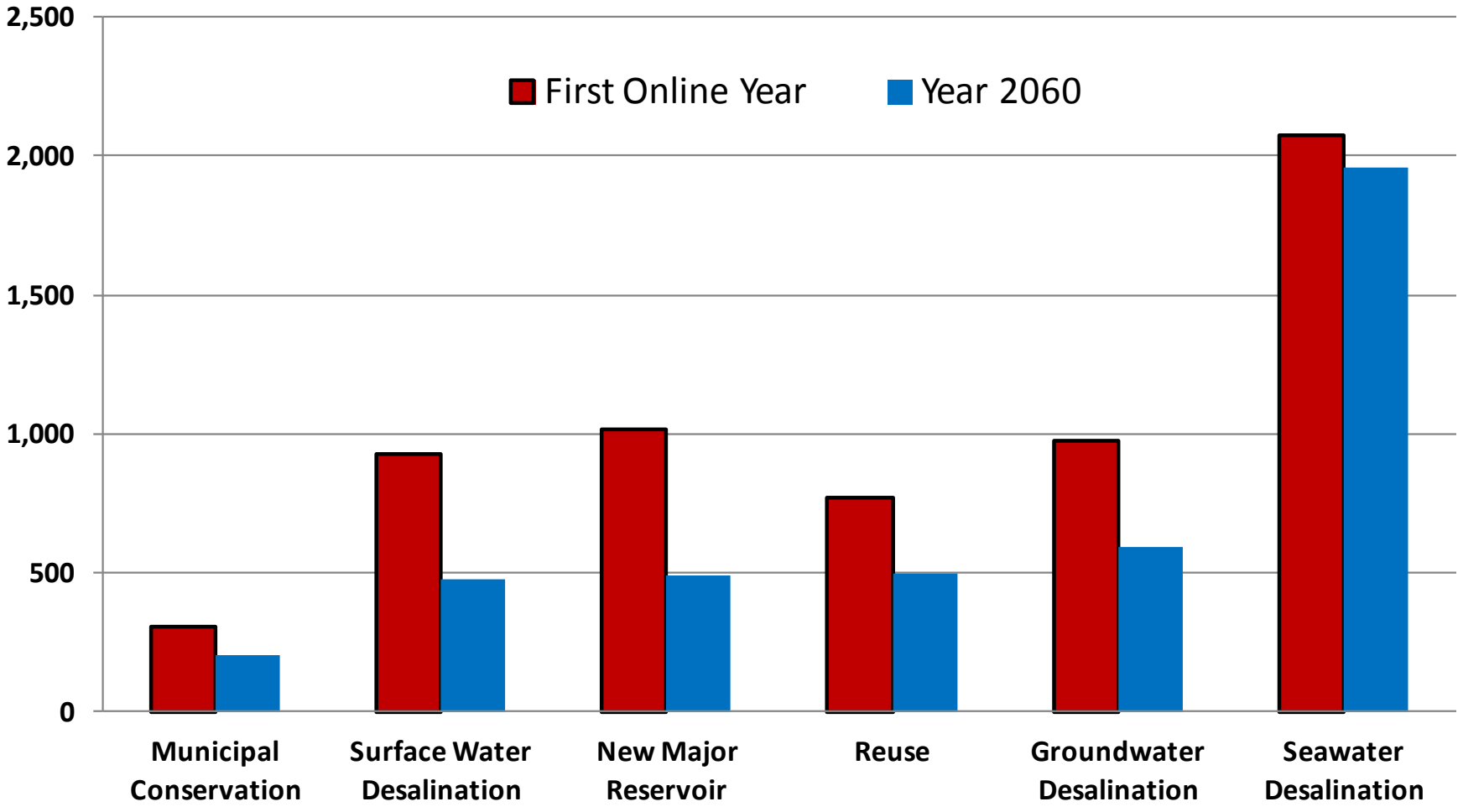
Source: TWDB Texas State Water Plan 2012

Recommended Water Management Strategies



Source: TWDB Texas State Water Plan 2012

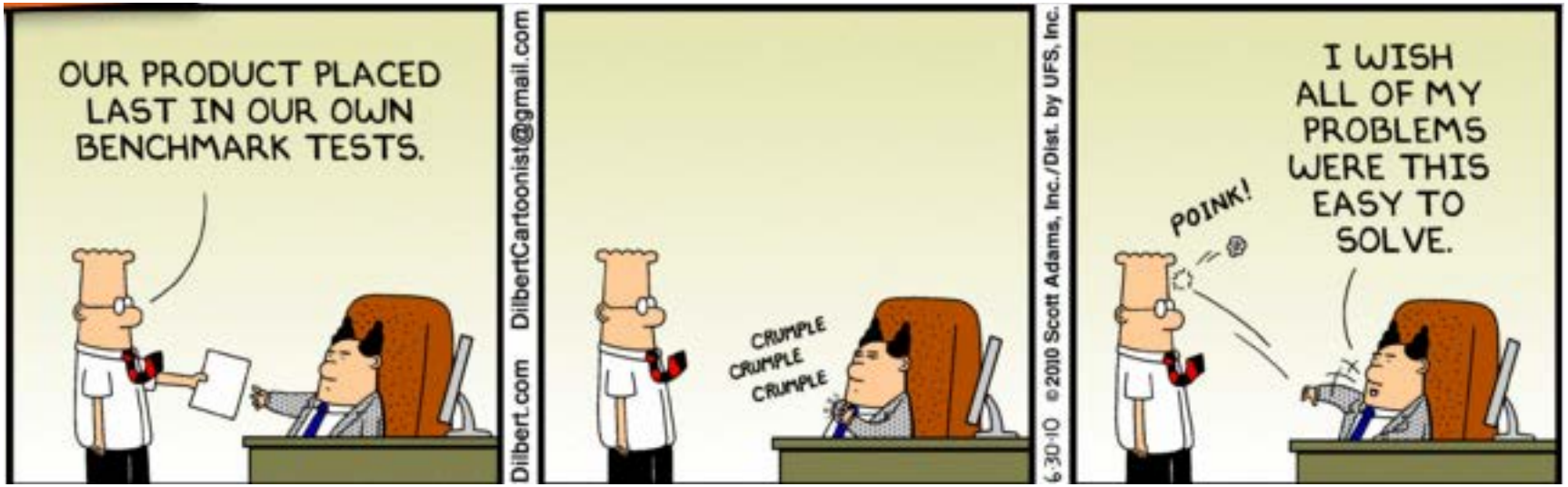
Annual average unit costs by strategy *(dollars per acre-foot)*



Source: TWDB Texas State Water Plan 2012

Municipal Conservation Concerns

- Conservation before Revenue
  - Need to maintain water supplies
- Revenue before Conservation
  - Need to sell water to maintain revenue



Benefits to Municipal Conservation

- Less need to search for new sources of water
- Can delay expensive infrastructure projects
- Reduce the treatment (water and wastewater) and conveyance costs
- Reduced energy usage
- Addressing community values and expectations of managing natural resources
- Increased supply reliability
- Improved perception that utility is taking all steps necessary
- Demonstrating water-use efficiency to regulatory agencies

Source: Water Conservation for Small and Medium Sized Municipalities: Green, 2010

Drawbacks to Municipal Conservation

- Reduced revenues
  - When revising future rates, account for lost revenue through conservation
- Could threaten “use it or lose it” water rights
- Conservation (e.g. rebate) programs can be expensive
- Low flows can cause maintenance problems at WWTF from decreased flow

Source: Water Conservation for Small and Medium Sized Municipalities: Green, 2010

Ongoing Municipal Conservation

- Inclining Conservation Water Rates
- Customer Education (bill inserts, social media, public presentations, free landscape classes, make a rain barrel class, demonstration gardens at city facilities, Water Wise school program, shared regional Lawn Whisperer campaign, Reverse Litter campaign)
- Rebates (Residential Toilet Distribution Program/Showerhead Exchange Program, Smart Yard Irrigation Rebates)
- Irrigation Rules (Year round 10am to 6pm spray irrigation restriction, rain/freeze sensor requirement for commercial properties, adopted above minimum state irrigation system rules)
- Drought Contingency Measures (education, enforcement)
- Automatic Metering Infrastructure (aka smart meters)

Using Available Technology for Conservation - AMI

- Provider
  - Reduced meter reading costs
  - Detect and reduce customer leaks
  - Reducing/eliminating bill adjustments
  - Reduce water theft
  - Detect meter tampering
  - Improve billing efficiency
  - Improved meter accuracy
  - Used administratively to see demands across city
  - Customer service
- Residential
  - Know how much water is being used
  - Set goals to reduce
  - See changes over time
  - Compare usage with others based on similar characteristics
  - Lower water bills
  - Identifying leaks

Current Project

- Funding – State of Texas to Texas A&M AgriLife
- Project Duration – two years, ends August 2015
- Team members:
  - Texas A&M University
  - City of Round Rock
  - City of Georgetown
  - City of Arlington

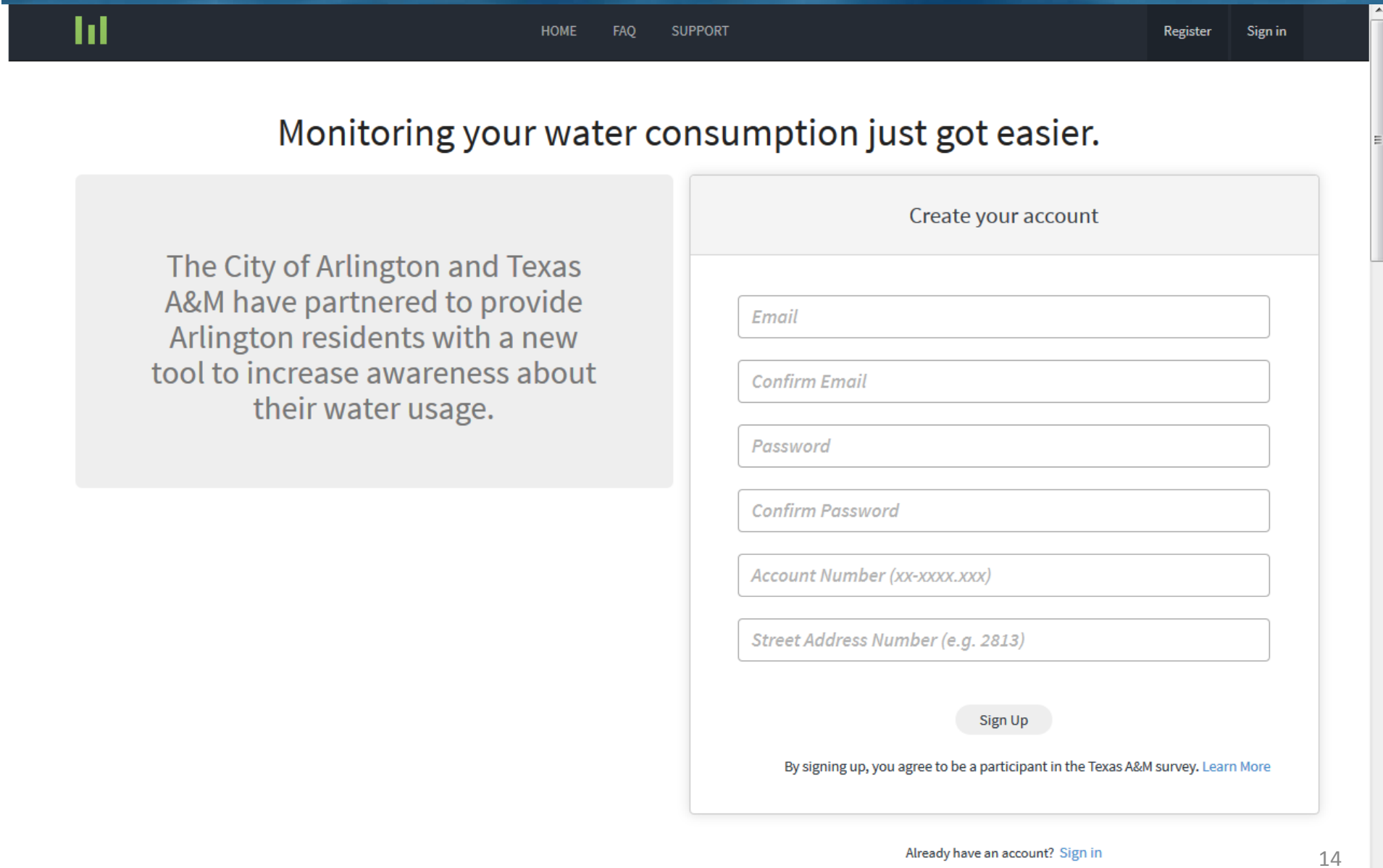
Current Project

- Research question:
  - Can providing user feedback encourage water conservation
- Web portal with existing/upcoming features
  - Daily/weekly emails
  - High usage alters
  - Leak alerts

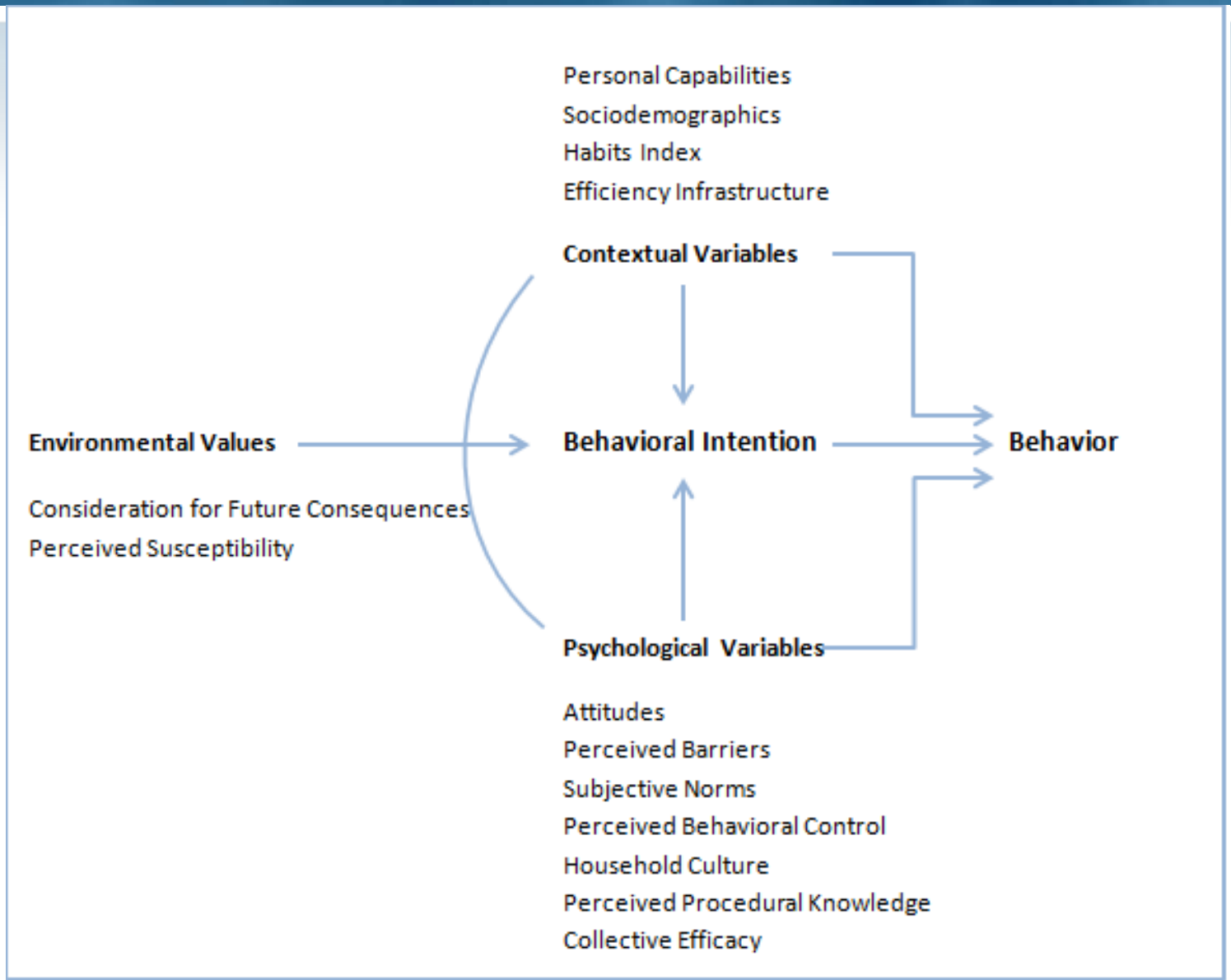
Development Challenges

- Proprietary vendor software
- Up front database setup
  - Important to get all fields
    - Data off by hour (daylight savings time)
    - “Read date” of meter for each “bill date”
  - Missing data
    - Calculate cost for each reading during the daily import so backfilling is difficult
    - Causes confusion for users
- Upload/download times being synchronized

Sign-In Page


HOME
FAQ
SUPPORT
Register
Sign in
Monitoring your water consumption just got easier.
The City of Arlington and Texas A&M have partnered to provide Arlington residents with a new tool to increase awareness about their water usage.
Create your account
Email
Confirm Email
Password
Confirm Password
Account Number (xx-xxxx.xxx)
Street Address Number (e.g. 2813)
Sign Up
By signing up, you agree to be a participant in the Texas A&M survey. Learn More
Already have an account? Sign in

Survey Theoretical Framework



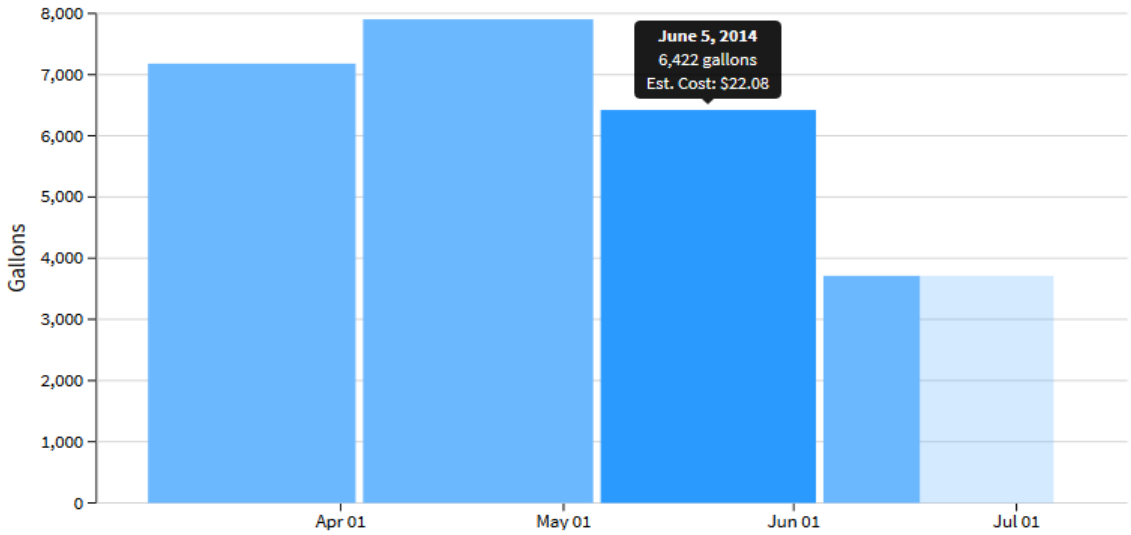
Billing Period – Home Screen

HOME FAQ SUPPORT meterstudy@tamu.edu

View Cost | Change Accounts | Download

Help

Billing Periods for 999999990-S075468625



Date	Usage (gallons)
March 6, 2014	129
April 4, 2014	7,179
May 6, 2014	7,904
June 5, 2014	6,422
July 7, 2014	3,712

Current Billing Period

$15.90	3,712
EST. ACTUAL COST	GALLONS USED
$25.44	7,895
PROJ. COST	PROJ. GALLONS

How is my bill estimated?

Please take a few minutes to take a survey about your water consumption.

Conserve!

Based on usage since March 5, 2014, saving 5% would save:

1,267

GALLONS

Did you know?

A hose left on over night could use

Daily Usage

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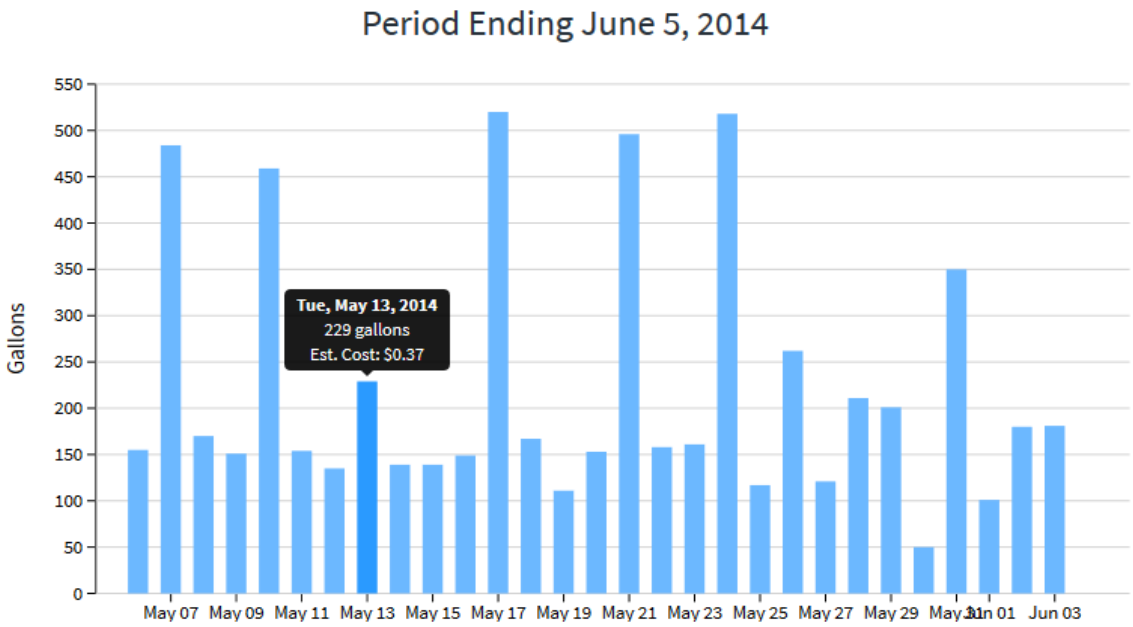
Billing Periods | View Cost | Change Accounts | Download | Help



Date	Usage (gallons)
May 6, 2014	155
May 7, 2014	484
May 8, 2014	170
May 9, 2014	151
May 10, 2014	459
May 11, 2014	154

Current Billing Period

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Hourly Usage

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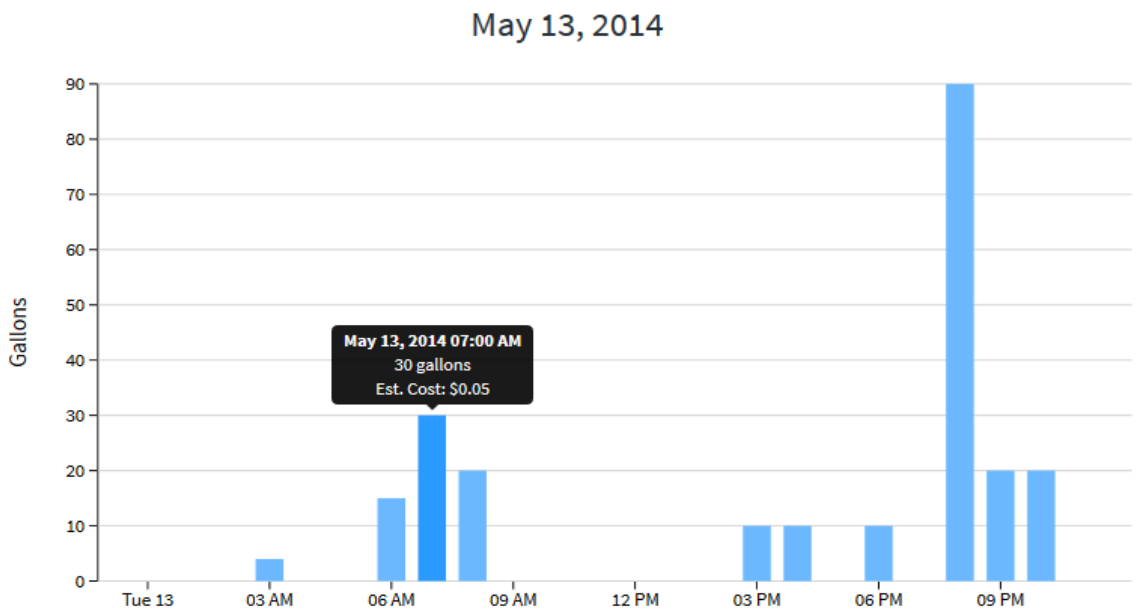
June 5, 2014 Bill | View Cost | Change Accounts | Download



Date	Usage (gallons)
May 13, 2014 12:00 AM	0
May 13, 2014 01:00 AM	0
May 13, 2014 02:00 AM	0
May 13, 2014 03:00 AM	4
May 13, 2014 04:00 AM	0
May 13, 2014 05:00 AM	0

Help

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A leaking toilet could use water at a

My Profile

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Profile

Monthly Limit (gallons)

Daily Limit (gallons) 60

Notification Frequency

Save

Change Password

Password:

New Password:

Confirm New Password:

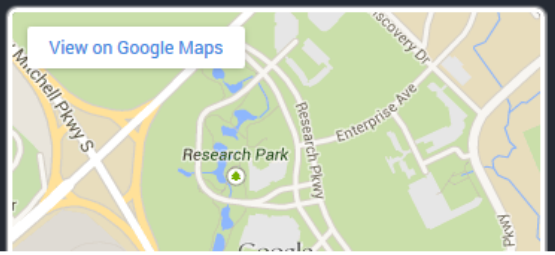
Change Password Cancel

Accounts

Account ID	Address	Delete
999999990-S075468625	6810 WATERING DAYS	Delete
999999991-S073657270	1408 WATERING DAYS	Delete
999999996-S074042359	2009 MARCH 27 HIGH	Delete
999999997-S073655121	1000 PRICING TIER	Delete
999999998-S073654963	1000 HIGH USAGE	Delete
999999999-S073290765	705 BILL SPIKE	Delete
999999988-S073652994	3400 MULTIPLE METER 2	Delete
999999988-S073655445	3400 MULTIPLE METER 1	Delete
999999986-S077025513	715 INCOMPLETE BILLS	Delete
999999985-S076799421	620 MODERATE USAGE	Delete

Add Account

Texas Water Resources Institute
1500 Research Parkway A110
2260 TAMU
College Station, TX 77843-2260
meterstudy@tamu.edu



High Usage Alert

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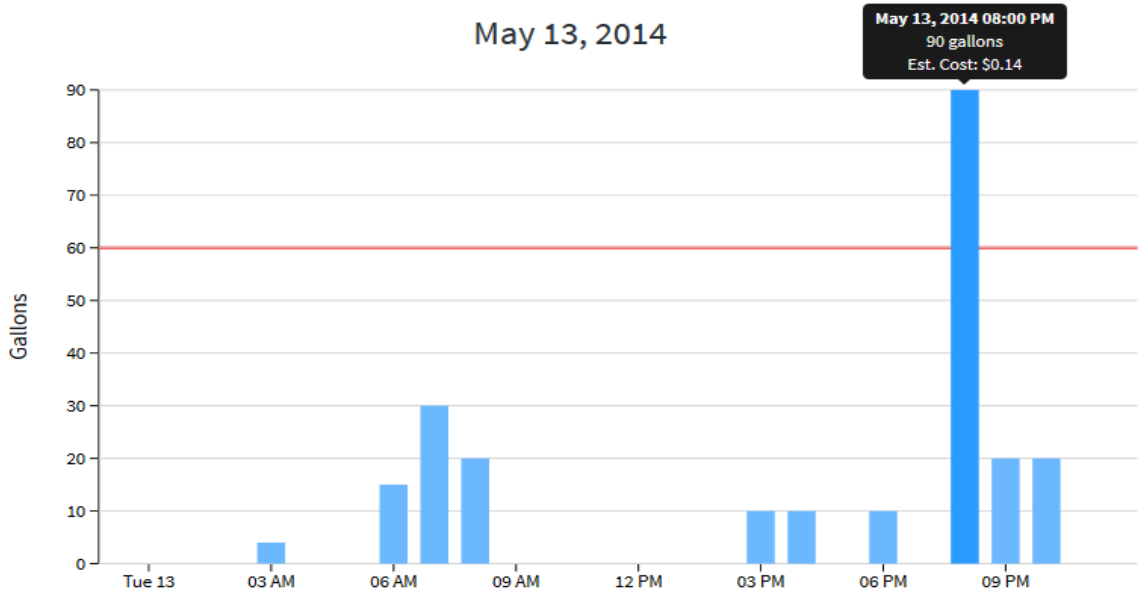
June 5, 2014 Bill | View Cost | Change Accounts | Download



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May 13, 2014 05:00 AM	0

Help

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Current Project

- ~780 current users
  - signed up at various times since 6-18-14
- Identifying differences in treatment and control groups
- Identifying differences in usage amongst participants
  - N = 142 for July, N = 231 for August
  - Comparison of July, August, and Combined Historical Use

Preliminary Results – Treatment vs Control

- Population comparison since Jan 1 – p=.001
  - Control – M=50,757, SD=111,692
  - Treatment – M=70,829, SD=54,758
- Treatment to Control Comparison
  - July 2014 – 17,873 users
    - 3 random selections of 4,468 Control and 700 Treatment
    - F(3,20,146)=37.35, p=.001 (M of Control=9,440, 9,576, 9,601, M of Treatment=13,645)
  - August 2014 – 18,784 users
    - 3 random selections from 4,696 Control and 713 Treatment
    - F(3,14,797)=29.22, p=.001 (M of Control=10,616, 10,859, 11,002, M of Treatment = 15,064)

Preliminary Results – Historical Use Comparison

	Total Usage (gallons)	M	SD	t	df	p
July Historic	2,683,019	18,762	17,361			
July Current	1,676,821	11,726	11,726			
Difference	**1,006,198**			**6.18**	**142**	**.001**
August Historic	3,711,444	15,998	12,693			
August Current	3,172,084	13,673	11,010			
Difference	**539,360**			**5.07**	**231**	**.001**
July and August Historic	4,944,159	34,575	21,644			
July and August Current	3,618,061	25,301	16,066			
Difference	**1,326,098**			**7.29**	**142**	**.001**

- 1,326,098 gallons / 143 households = 9,273 gallons per household

Limitations

- Only 2 months of data to date
- Analysis does not control for weather and other variables
- Limited to voluntary usage of web portal
- Confusion of participants between usage portal and billing portal
- Challenges obtaining formatted data
- Only 2 years total for project

Next Steps

- Continue data collection, analyze water and survey results
- Begin publishing results
- Continue expanding research with interested water providers
- Produce Extension Guidebooks
  - Adopting AMI
  - Developing Conservation Programs
- Host AMI workshops across Texas
- Develop Administrative Dashboard

Questions?

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Texas A&M AgriLife, Texas Water Resources Institute