

Conservation Behavior: What's the Potential?

*Presentation for the 2019
Central Texas Water Conservation Symposium*

*"Integrated Water:
Keeping Water Conservation at the Forefront"*

January 31, 2019



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Interdisciplinary

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CENTER FOR WATER-EFFICIENT LANDSCAPING

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RESEARCH PROGRAM AREAS
Irrigation, Water Use & Drought
Water/Water & Native Plants
Sustainable Turfgrass Research
Urban Water Conservation

WATERCHECK
A Uyo EXTENSION PROGRAM

WaterMAPS
Water Management Analysis and Planning Software

EXTENSION IMPACTS

UPCOMING EVENTS

Wednesday, January 30, 2019
2019 Master Gardener Class: Enjoy Gardening and Working with Good People!
Master Gardener Volunteers receive a special award...

Wednesday, February 6, 2019
2019 Master Gardener Class: Enjoy Gardening and Working with Good People!
Master Gardener Volunteers receive a special award...

Thursday, February 7, 2019
Spring Garden Series: Join Uyo Extension Horticulturist - Sheridan Hansen to learn all of the ins and outs of designing...

View Calendar

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CENTER FOR WATER-EFFICIENT LANDSCAPING

Monthly Webinar: Water Well With CWEL
Miss any of webinars? Catch up here! [Join Our Webinar List](#)

TAKE THE HEALTH AND HELP Uyo WIN \$5,000
CONTEST FOR SUSTAINABLE LANDSCAPING

COMBINATIONS FOR CONSERVATION

Latest News

'Combinations for Conservation' Book Awarded 2018 Outstanding Book Award by ASHS Extension Division
CWEL's recent book, 'Combinations for Conservation: Recommended Plant Groupings for Low-Water Landscapes' was awarded the 2018 Outstanding Book Award by the American Society for Horticultural Science Extension Division. CWEL faculty, Youping Sun accepted the award for the group at the ASHS annual conference August 2nd 2018 in Washington D.C. [Read More](#)

CWEL Works with Eagle Mountain City for Weather Stations and Free Water Checks
Eagle Mountain City is now home to two highly advanced weather stations paid for and maintained by Utah State University. These two stations, located near the Rodeo Grounds and Nolan Park will collect very precise weather data for the City of Eagle Mountain to use in coordination with the Uyo WaterMAPS and WaterCheck programs. [Read More](#)

Trialing Low-Input Grasses
The Center for Water Efficient Landscaping has joined a nation-wide research study evaluating the social, economic, and environmental barriers and benefits of transitioning from high input to low input grasses. The goal is to understand how different campus members evaluate the opportunities and barriers for utilizing low-input grasses in their efforts for more sustainable land management -- meeting environmental, economic, and social objectives. [Read More](#)

Dr. Joanna Ender-Wada Receives AWRA award
Dr. Joanna Ender-Wada received the 2018 Award for Outstanding Service in the Academic Sector from the American Water Resources Association Utah Section. The award was presented at the section's 48th Annual Water Resources Conference, which was held in Salt Lake City at the S.J. Cuney School of Law, University of Utah on May 16, 2018. [Read More](#)

Paige Boyle Earns Presidential Doctoral Research Fellowship
Ms. Paige Boyle, recently admitted to Uyo as a Center for Water Efficient Landscaping Fellow, has also earned a Presidential Doctoral Research Fellowship from the university. [Read More](#)

View More

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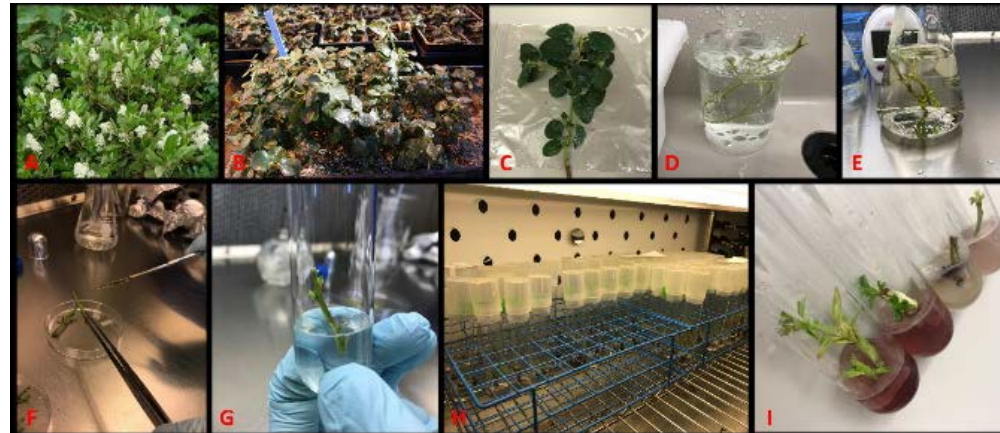
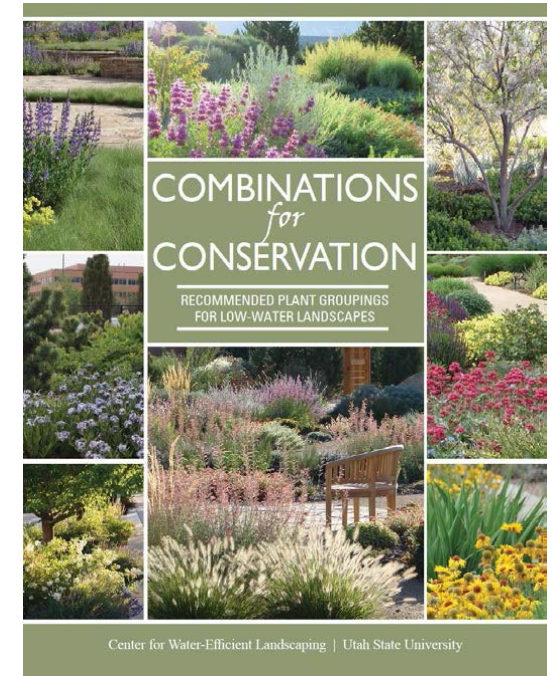
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<https://cwel.usu.edu/>



Research
Education
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The mission of the Center for Water Efficient Landscaping (CWEL) is
“to sustain the quality of life enjoyed from landscaping while conserving water.”

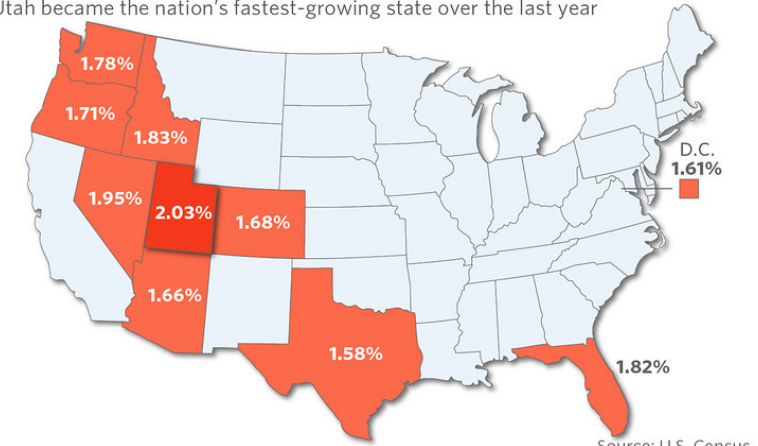
Water Policy Context and Challenges



One of USA's most arid states

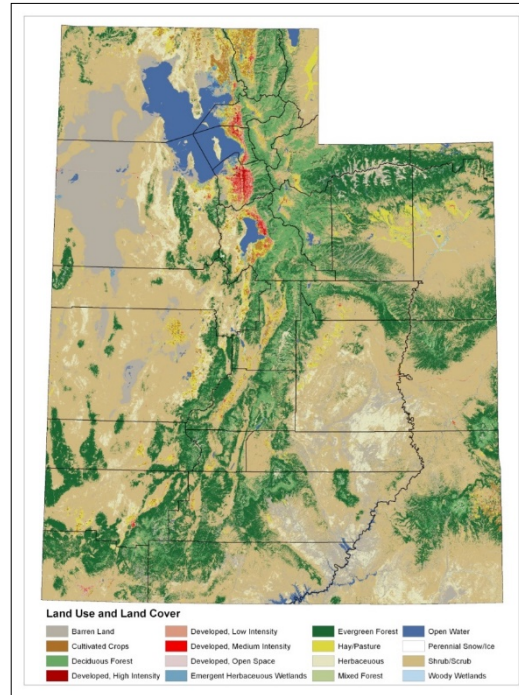
THE NUMBER ONE

Utah became the nation's fastest-growing state over the last year



Source: U.S. Census

Rapid population growth



Map compliments of Shujuan Li

Concentrated urbanization



Major land use transitions

<http://pics4.city-data.com/cpicc/cfiles/7647.jpg>

Conservation Opportunities



Transitioning to or installing new low-water landscapes



Greater efficiency on existing landscapes



Many Decisions & Decision Makers



Public policy and planning decisions



Landscaping decisions



Institutional decisions



Commercial decisions



Consumer decisions



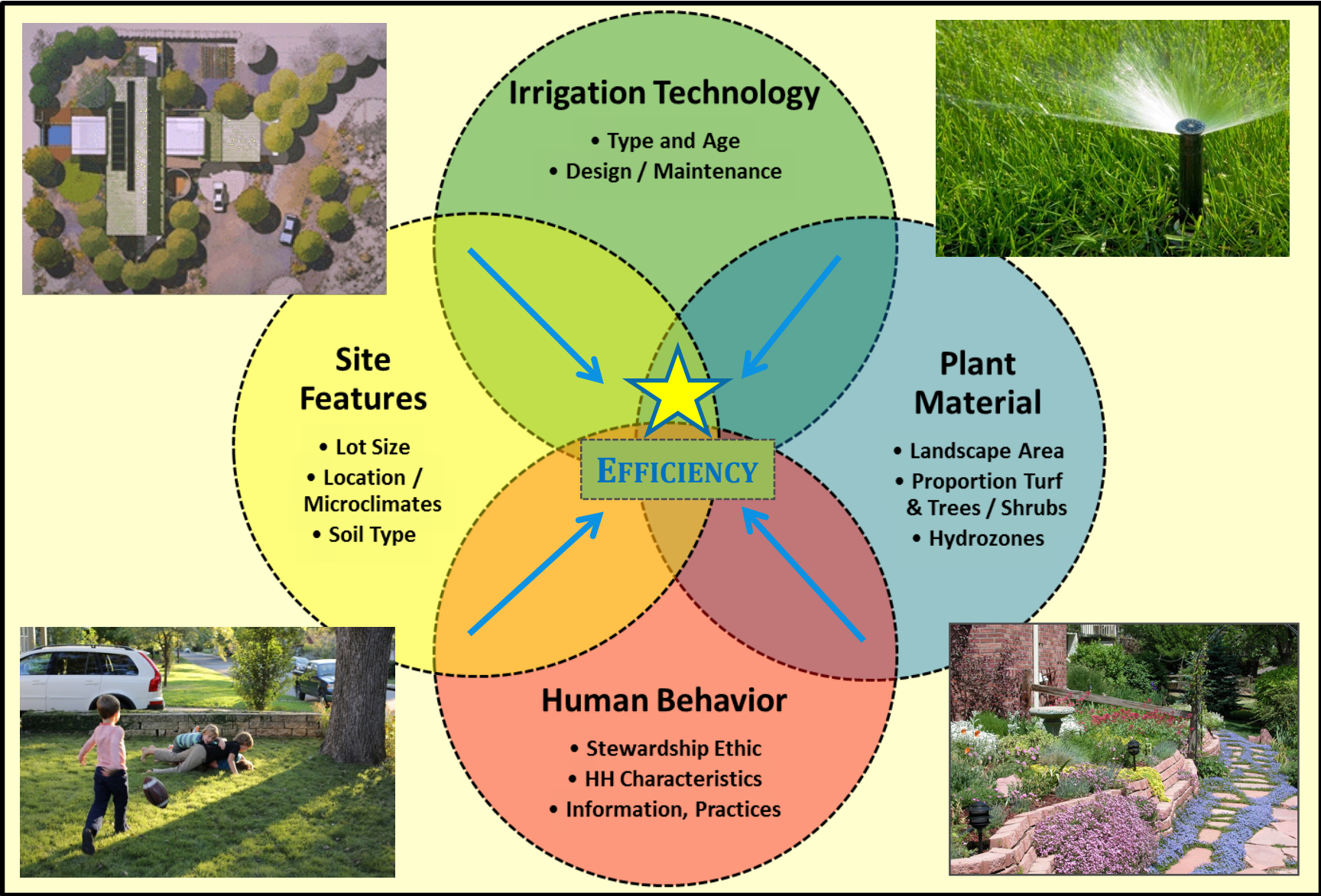
Research Objectives and Methods

- **Scientific Inquiries** related to understanding the human component of urban ecological systems and urban engineered water systems
- **Observational Studies** seeking to explain urban landscape water use patterns (utilizing interviews, focus groups, surveys, water diaries)
- **Intervention Studies:** experiments in trying to alter landscape water use and assess effectiveness of various conservation approaches (interventions)

The journey and perspectives gained

- My role on an interdisciplinary team as the social scientist and policy person working with plant scientists, irrigation engineers and climatologists – assumptions about human behavior to overcome
- Opportunities to gain insights through many face-to-face interactions conducting research on urban landscape water use
- What we have learned about water conservation behavior and the need to better understand the context within which it occurs

Greater efficiency is not as easily engineered in outdoor water use



Requires understanding the human interface with irrigation technologies and plants in urban landscapes with high site variability

Residential and Business Water Use Study

Situational Waste

Joanna Endter-Wada, Judith Kurtzman, Sean Keenan, Roger Kjelgren and Christopher Neale, 2008, *Journal of the American Water Resources Association (JAWRA)*.

Methods:

- 1) determine water needs of landscapes
- 2) categorize water use based on this water budget as “conserving”, “acceptable”, or “wasteful”
- 3) explain variations in water use through surveys with households and interviews with businesses

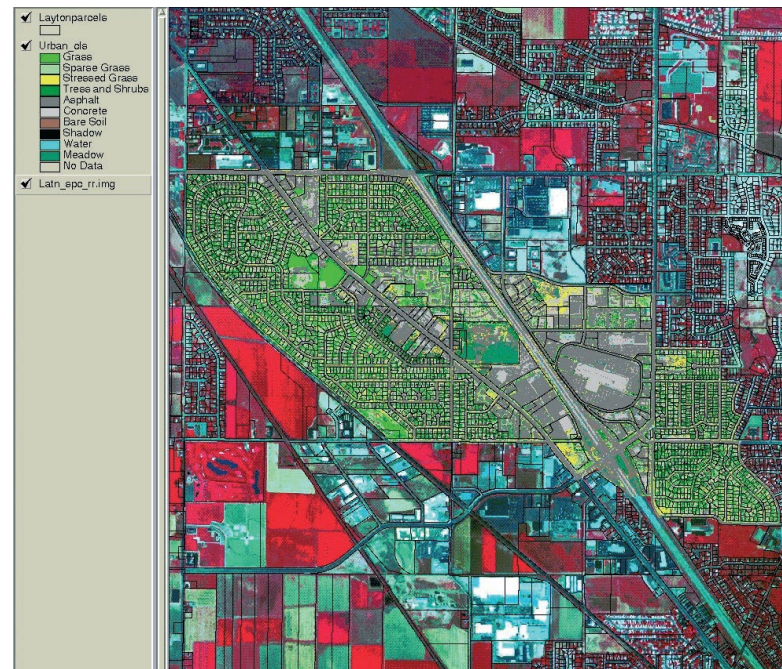


TABLE 1. Water Use Thresholds Used in Categorizing Household and Business Water Use, 1997-2001.

	1997	1998	1999	2000	2001
	Millimeters				
Upper Threshold					
ETo, April-October	843	904	912	1062	1080
ETo, May-September	678	719	737	886	904
Rainfall, May-September	183	221	140	152	74
Lower Threshold					
ETo – rain, May-September	495	500	594	734	828

Residential and Business Water Use Study

Situational Waste

Joanna Endter-Wada, Judith Kurtzman, Sean Keenan, Roger Kjelgren and Christopher Neale, 2008, *Journal of the American Water Resources Association (JAWRA)*.

1) “Water waste” is not widespread but is primarily related to automated irrigation systems.

- time saving devices more than water saving devices
- “convenience” as the common underlying human behavior
 - *convenient to save water with a manual system*
 - *convenient to waste water with an automated one*

Table 4: Range of Water Use by Automation of Watering System, All Cases

	Level of automation of watering system ^a (percentages within each category)			All cases
	Low (manual hose watering)	Medium (manual start sprinkler)	High (programmed sprinkler)	
Water use range relative to plant need:				
Low (conserving use)	62.7	29.4	17.5	37.0
Medium (acceptable use)	22.9	17.6	25.9	23.9
High (wasteful use)	14.4	52.9	56.6	39.1
Column percentage totals.....	100.0	99.9	100.0	100.0
Number of total cases	153	34	189	376
Percentage of total cases	40.7	9.0	50.3	100.0
<u>Descriptive statistics:</u>				
Pearson’s chi-square = 88.84 (p < 0.001)				
Gamma correlation coefficient = 0.63				

Residential and Business Water Use Study

Situational Waste

**Joanna Endter-Wada,
Judith Kurtzman, Sean
Keenan, Roger Kjelgren
and Christopher Neale,
2008, *Journal of the
American Water Resources
Association (JAWRA)*.**

- 2) More conserving water use where business owners were also the property owners
- 3) Landscapers had incentives to apply more water but also had professional experience, knowledge and pride in their work to both maintain landscapes in good condition and conserve water simultaneously
- 4) People striving for same green-lawn aesthetic objective varied widely in actual water use – people can have nice landscapes while conserving water
- 5) Efficient water use is not necessarily result of conscious and intentional actions – hard for people to assess results of their own behavioral motivations

Homeowner Knowledge Gaps - study with Salt Lake City (*in submission*)

What specific watering problems are you having?

<i>Problems Identified (Salt Lake City Study – WSI 2016 presentation)</i>	<i>% Participants Mentioned</i>	<i>% Water Check Evaluation</i>
No problems mentioned	14%	0%
Problem Indicators:		
<i>Dry/brown spots</i>	44%	36%
<i>Overspray</i>	7%	28%
Irrigation System Design Issues:		
<i>Head type, mismatched types on zone</i>	6%	40%
<i>Low head drainage</i>	1%	17%
<i>Valves not separated for plant water requirement</i>	4%	67%
<i>Pressure too high or low</i>	8%	62%

Note: responses were volunteered (not answers to forced-choice questions); more than one answer is possible

Homeowner Knowledge Gaps - study with Salt Lake City (in submission)

What specific watering problems are you having?

<i>Problems Identified (Salt Lake City Study – WSI 2016 presentation)</i>	<i>% Participants Mentioned</i>	<i>% Water Check Evaluation</i>
Landscape Layout:		
<i>Incomplete coverage (head-to-head)</i>	24%	33%
Maintenance Items:		
<i>Broken/leaking/clogged valve, pipe, head, nozzle</i>	33%	58%
<i>Misdirected or blocked head</i>	17%	52%
<i>Sunken or tilted heads</i>	1%	59%
<i>Wrong spray patterns</i>	3%	16%
Miscellaneous sprinkler system problems	10%	N/A

Note: responses were volunteered (not answers to forced-choice questions); more than one answer is possible

Salt Lake City is using this applied scientific information to inform the practice of water conservation programming.

School district (Institutional) Water Use Study

Situational Problem Solving

Douglas Kilgren, Joanna
Endter-Wada, Roger
Kjelgren, Paul G. Johnson,
2010, *Journal of the
American Water Resources
Association (JAWRA)*.

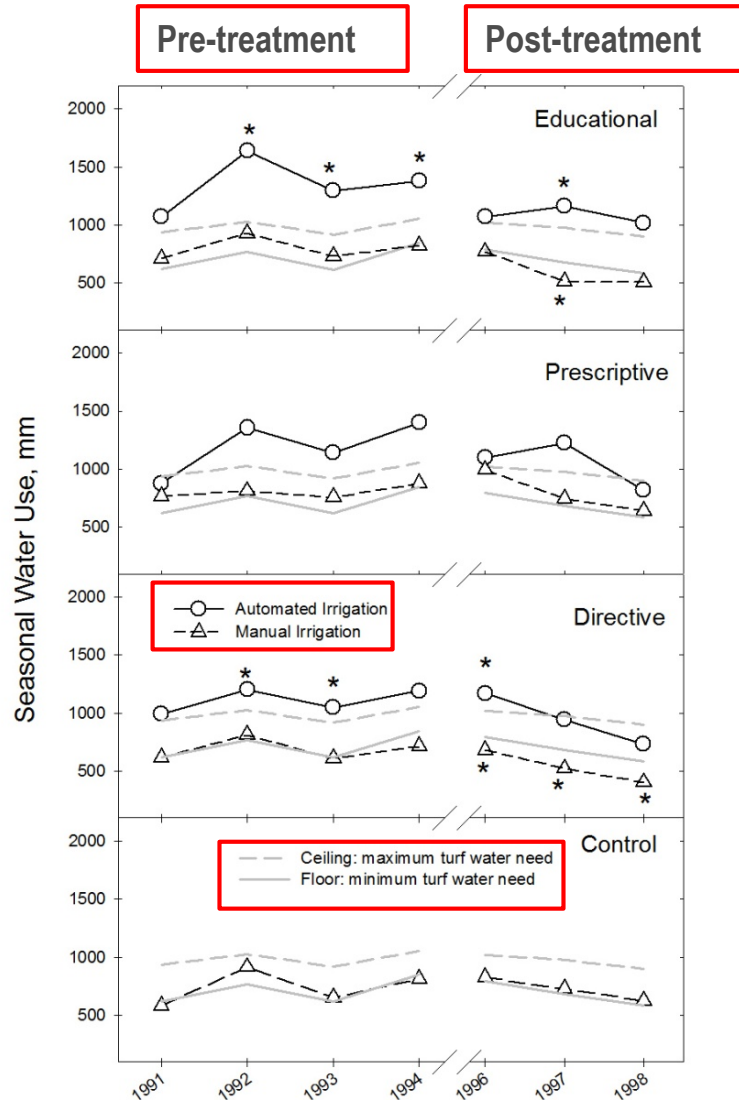
- Experimental intervention study on school grounds
- Controlled for type of irrigation system (manual or automated) and water conservation interventions
- Worked with custodians at elementary schools for 3 summers – used interviews and watering diaries

TABLE 1. Experimental Interventions.

Interven- tions	Experimental Activities			
	Letter About Conserving Water	ETo-Based Watering Schedule	Water Conservation Workshop	Interviews/ Water Diaries
[Control Group]				
Directive	X			X
Prescriptive	X	X		X
Educational	X	X	X	X

Note: Cumulatively combined experimental activities defined the interventions for 35 elementary schools in suburban Salt Lake City, with the effects of the interviews and water diaries (data collection activities) recognized as part of the overall experimental design.

Influence of irrigation system and site factors



- Differences between automated and manual irrigation systems overshadowed the impact of the interventions on school water use

- Other site factors played a role too

Less water use:

manual system
large landscape
poor water pressure

= convenient to conserve

More water use:

automated system
small landscape
good water pressure

= convenient to overwater

Conservation success is related to initial capacity to conserve and is not easily characterized or promoted

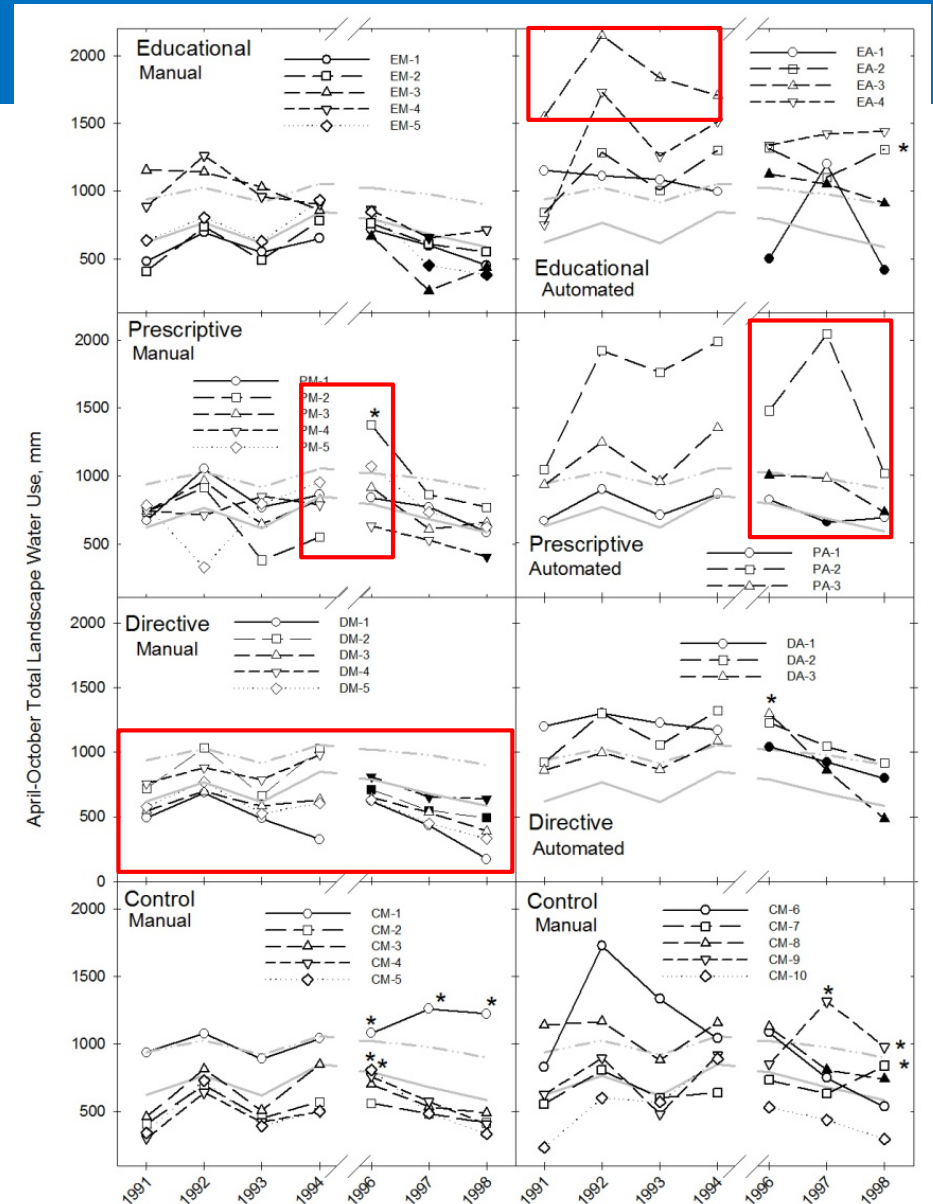
Nature of success:

- successful at reducing and sustaining effort (had pre-intervention capacity to conserve)
- successful at remaining conserving (little pre-intervention capacity to conserve)

Elements of success related to:

- favorable site characteristics
- knowledge, experience, skill of irrigator
- new information

➤ **Situational waste requires situational problem solving**



Study/program participants vary (finding across many studies)

- **Volunteers and “recruits” are different:**
 - Motivations, Needs
 - Responses
- **Participants need different kinds of help based on:**
 - Their own past efforts and experiences with conservation
 - Level of sophistication in the information they are seeking and the detail they expect
 - Whether they can make changes (“do-it-yourselfers”) or need help (“hand holders”)

Volunteers are more conserving - so need to recruit high-end users

Logan Study

Categorical Benchmarks based on ranges of Landscape Irrigation Ratio (LIR)

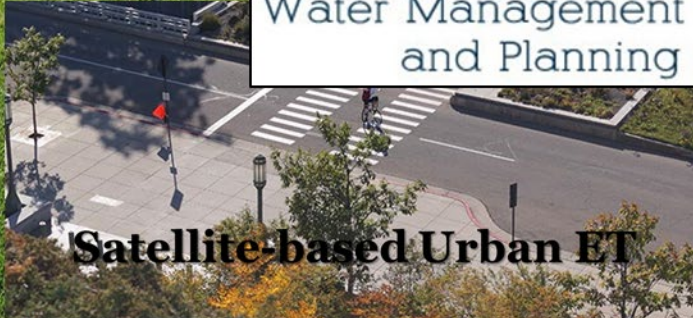
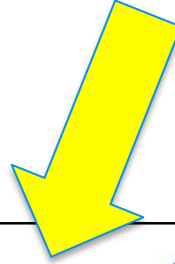
Benchmark LIR Category	Mean Water Use ^a (mm/day)	Distribution of Cases ^c		
		2004 Volunteers (percentage)	2005 Recruits (percentage)	All Cases (percentage)
<i>Justifiable Water Use:</i>				
Efficient: $LIR \leq 1$	2.01	30	3	19
Acceptable: $1 < LIR \leq 2$	4.99	35	22	30
<i>Unjustifiable Water Use:</i>				
Inefficient: $2 < LIR \leq 3$	7.72	24	48	34
Unnecessary: $3 < LIR$	12.20 ^b	11	27	17
Total %		100	100	100
N		(148)	(101)	(249)

^a Compared to the 2004 baseline ET_o of 4.56 mm/day and 2005 baseline ET_o of 4.28 mm/day.

^b 2 outlier cases with greater than 30 mm/day were excluded, 1 case in each year

^c Pearson's $\chi^2 = 45.479$, $p \leq .000$ (indicative of inherent differences in recruitment methods)

Urban Water Conservation Tools developed by



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Google Custom Search

CENTER FOR WATER EFFICIENT LANDSCAPING

Urban Water Conservation

Where does it go? COOKING FLUSHING SHOWERING
LANDSCAPES

Utahns use more culinary/potable water to irrigate landscapes than they use for cooking, flushing and cleaning combined.

Promoting urban water conservation is an important element of managing Utah's scarce water resources in this rapidly growing and urbanizing state. Careful use of urban water supplies will help to reduce pressures to transfer water from agricultural to municipal and industrial uses and will aid in avoiding negative environmental consequences from removing too much water from streams and aquifers. Water applied to landscapes constitutes approximately 65-75% of urban water demand. Reducing water used on established landscapes and promoting greater use of low-water plant material and landscape designs offer the greatest opportunities for reducing urban water demand.

Urban landscapes contribute to the health of urban environments and their residents. Yet, they are often watered in excess of the actual water needs of the vegetation. Our urban water conservation research investigates people's watering behaviors and how those behaviors are shaped by their preferences, knowledge, and experiences as well as by site-specific characteristics of their landscapes (soil properties, plant characteristics, and irrigation systems). We have developed a water use analysis and assessment tool, **WaterMAPS**™, to help municipal water managers identify locations with the greatest capacity to conserve water applied to landscapes and enable managers to direct and tailor their water conservation programs to those locations and users.

CWEL's urban water conservation research integrates social and policy science with the plant and irrigation science of other research areas to provide an integrated approach to promoting water-efficient landscaping.

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RESEARCH & PROGRAM AREAS

- Irrigation, Water Use & Drought
- Water-Wise & Native Plants
- Sustainable Turf Research
- Dendroclimatology
- Urban Water Conservation

WaterMAPS™ Urban ET Water Check Program

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Program Areas: Ag & Natural Resources, Gardening, Home, Family & Food, Utah 4-H & Youth

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IDENTIFYING CAPACITY TO CONSERVE UTILIZING LANDSCAPE IRRIGATION RATIO (LIR)

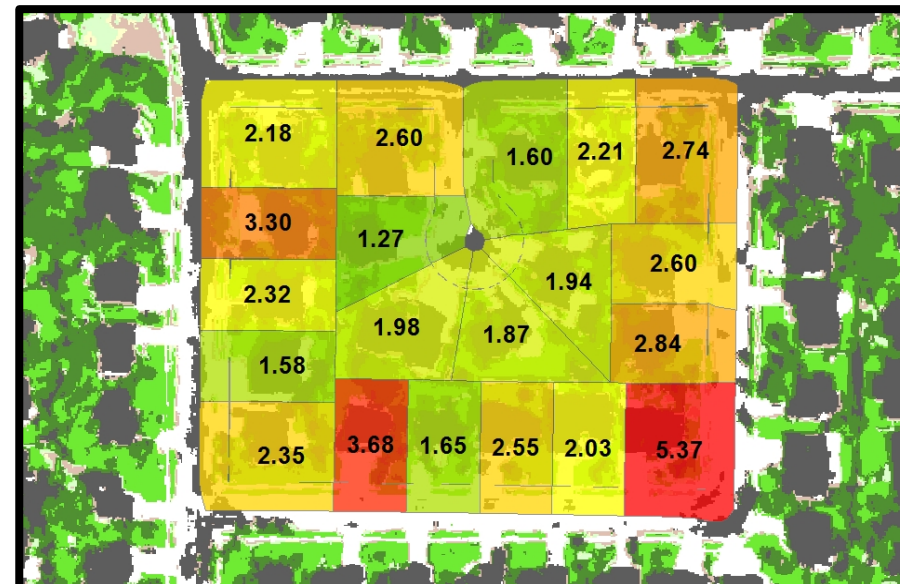
Landscape Water Use *estimated*
(derived from analysis of municipal or water provider meter data)

LIR=

Landscape Water Need *estimated*

(derived from the classification of remotely-sensed airborne multispectral imagery and localized reference ET_o rates)

(per unit of landscaped area)

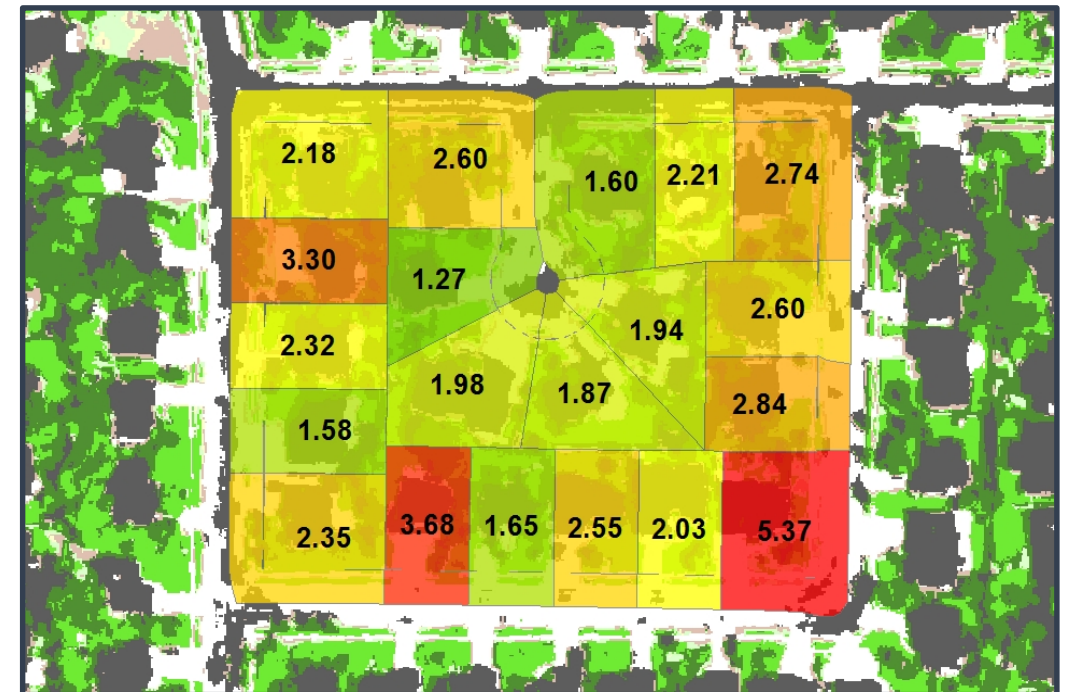


LIR less than 1	=	Efficient
Between 1 and 2	=	Acceptable
Between 2 and 3	=	Inefficient
Greater than 3	=	Excessive

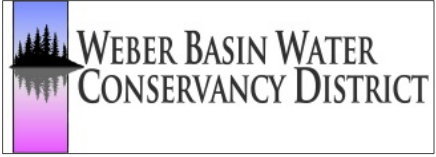
Designed to help water agencies:

- Develop benchmarks for water consumption comparisons
- Identify locations with capacity to conserve water
- Direct conservation program outreach to those locations
- Design more sophisticated conservation pricing structures
- Interpret and communicate feedback to individual customers about their specific situation

WaterMAPS[™]
Water Management Analysis
and Planning Software



PROJECT GOALS



WBWCD MANAGEMENT GOALS:

- Work to meet state and district water conservation goals
- Promote individual water use accountability
- Determine if secondary water use is within water allocations



USU RESEARCH GOALS:

- Investigate human behaviors and perceptions related to meters
- Analyze urban landscape irrigation in relation to plant water need using USU WaterMAPS™ (software)
- Design innovative strategies for interpreting and sharing meter data with users to motivate conservation absent a price signal
- Encourage people to monitor their own water use by reinforcing conservation through information feedback mechanisms

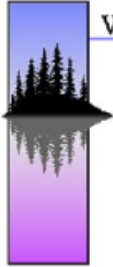
CONSERVATION STRATEGY

Water meter data interpretation and sharing through Secondary Water Use Reports

Not a bill.

People pay for secondary water in connection with property taxes.

Sample 2012 Secondary Water Use Report



WEBER BASIN WATER CONSERVANCY DISTRICT
2837 East Highway 193 • Layton, Utah 84040 • Phone (801) 771-1677 • (SLC) 359-4494 • Fax (801) 544-0108

10/17/2012 September 16 through October 15, 2012

WBWCD hopes these reports have helped you track and assess your secondary water use. We encourage you to complete the USU survey.

SECONDARY WATER USE REPORT

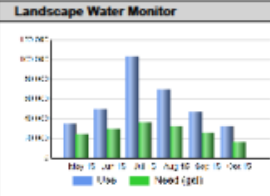
For more information on interpreting your Secondary Water Use Report, refer to the double-sided information sheet sent with this report or also available online at: www.weberbasin.com/conservation/

Landscape Water Use				
Last Meter Reading	Current Meter Reading	Number of Days	Your Landscape Water Use	31,858 gal
510,604	542,522	30		

Landscape Water Need				
Landscape Area (sq. ft.)	Turf LA (%)	Non-Turf LA (%)	Your Landscape Water Need	16,500 gal
7,871	50	50		

Landscape Water Management				
Water use is:	when LIR is:	Your Landscape Irrigation Ratio (LIR)	Landscape Water Use	402% = 331% = 202% = 102% = 1% =
Efficient	less than 1	1.93	1.93	
Acceptable	between 1 and 2			
Inefficient	between 2 and 3			
Excessive	greater than 3			

Landscape Water Monitor		Weather Data: Sep 16 - Oct 15		
Period	Min	Mean	Max	
2012				
ET (in)		3.62		
Precip. (in)		0.53		
Temper. (F)		59.53		
1982-2011				
ET (in)	2.67	3.33	3.79	
Precip. (in)	0.11	1.68	5.48	
Temper. (F)	44.18	52.54	62.97	



The chart in this section graphs your landscape water use (blue bars) for each metered monthly period and compares it to the estimated landscape water need (green bars) for that same time period. For current and previous periods, blue and green bars provide a graphical representation of your landscape irrigation ratio (LIR). Future periods (reddish-brown bars) show projections of your landscape water need based on an historical 30-year (1982-2011) average ET.

We encourage you to visit Weber Basin's Learning Garden at our Layton headquarters (address above) or participate in landscape classes, water checks, and other events. All classes and programs are free. For a full water conservation schedule, visit Weber Basin's website: www.weberbasin.com/conservation/


If you would like to receive this report by email or have questions about the meter project, please contact David Rice, Weber Basin's Water Conservation Coordinator: dave@weberbasin.com or (801) 771-1677.

If you have questions or comments about your Secondary Water Use Report or if you are willing to participate in a USU research focus group or interview, please contact Diana Green at the USU Urban Water Conservation Research Lab: diana.green@aggiemail.usu.edu or (435) 797-9044.

Developed from research at UtahStateUniversity

Reports are based on defining appropriateness of landscape water use relative to plant water need (landscape water budgeting)

Sample 2013-2016 Secondary Water Use Report



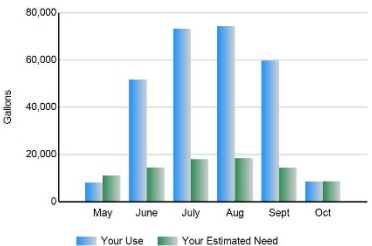
WEBER BASIN WATER CONSERVANCY DISTRICT
2837 East Highway 193 • Layton, Utah 84040 • Phone (801) 771-1677 • (SLC) 359-4494 • Fax (801) 544-0108

Report Date: 10/19/2016

SECONDARY WATER USE REPORT

Usage period: 9/15/2016 through 10/17/2016

Previous Meter Read		Current Meter Read		Water Used This Month	Elapsed Days	Average Daily Use This Month	Year to Date Use
Date	Reading	Date	Reading				
09/15/16	266,399	10/17/16	274,803	8,404 gal.	32	263 gal.	274,793 gal.



Legend: ■ Your Use ■ Your Estimated Need

Your Landscape Area (sq ft)


4,873

Your Water Need Based on Your Landscape Area This Month

8,641 gal.

This Month's % of Use to Est. Need

97




Your landscape area is derived from aerial imagery and encompasses your entire lot according to county records, excluding your home and driveway footprint. Estimated need is calculated from 30-year average evapotranspiration values for each month.

If you would like to receive this report by email, contact us at conservation@weberbasin.com with your name and account number, or call us at 801-771-1677.

Secondary water is now off for the year. We thank you for your efforts to conserve water and only water when needed. We ask that you close your own user valves before the lines are changed again next April. There are a lot of resources available to help you have a green, healthy lawn, while reducing total water applied. Visit the District's Learning Garden or www.weberbasin.com for information and programs. A schedule of next year's free classes and events will be available in February 2017.

Estimated grass/turf water needs throughout the District have been adjusted to 28 inches/year. This adjustment is based on the analysis of long-term weather and historical evapotranspiration losses. If you have questions or comments concerning this report, please contact us @ 801-771-1677



2837 E. Hwy 193, Layton Utah



WEBER BASIN WATER CONSERVANCY DISTRICT

2837 East Highway 193 • Layton, Utah 84040 • Phone (801) 771-1677 • (SLC) 359-4494 • Fax (801) 544-0103

10/17/2012

September 16 through October 15, 2012

WBWCD hopes these reports have helped you track and assess your secondary water use. We encourage you to complete the USU survey.

SECONDARY WATER USE REPORT

For more information on interpreting your Secondary Water Use Report, refer to the double-sided information sheet sent with the May report or also available online at: www.weberbasin.com/conservation/

Landscape Water Use				
Last Meter Reading	Current Meter Reading	Number of Days	Your Landscape Water Use	31,858 gal
510,864	542,522	30		

Landscape Water Need				
Landscaped Area (sq. ft.)	Turf LA (%)	Non-Turf LA (%)	Your Landscape Water Need	16,500 gal
7,871	50	50		

Landscape Water Management				
Water use is:	when LIR is:	Your Landscape Irrigation Ratio (LIR)	Landscape Water Use	1.93
Efficient	less than 1		402%	
Acceptable	between 1 and 2		50%	
Inefficient	between 2 and 3		20%	
Excessive	greater than 3		5%	

Landscape Water Monitor		Weather Data: Sep 16 - Oct 15			
Period	Min	Mean	Max	ET (in)	Precip. (in)
2012		3.62			0.53
1982-2011	2.67	3.33	3.79		
	0.11	1.68	5.48		
	44.18	52.54	62.97		

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Customer name, address, account (not shown)

Landscape water use: secondary meter readings and landscape water use in gallons

Landscape water need: estimated landscape water need in gallons based on landscaped area and weather data

Watering appropriateness: reported as a landscape irrigation ratio (LIR) and/or a %

Landscape water monitor: graph of monthly landscape water use compared to need

Information & messaging: weather data, conservation programs, contact information



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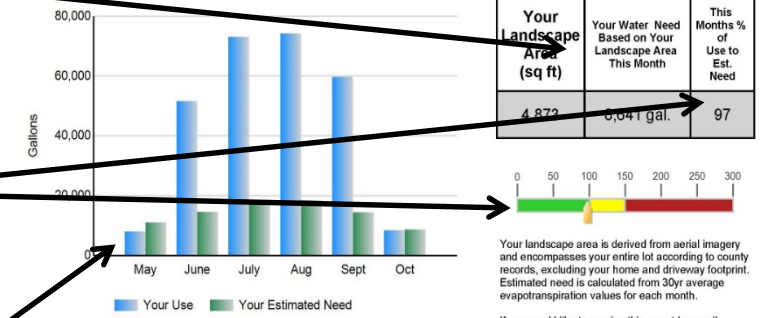
Report Date: 10/19/2016



SECONDARY WATER USE REPORT

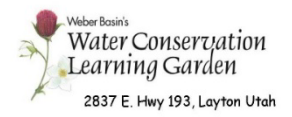
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2837 E. Hwy 193, Layton Utah

Developed from research at UtahStateUniversity



Elements of Secondary Water Use Reports



RESULTS:

Water Use Trends 2012-2016

- Households use, on average, 160% (LIR=1.6) of the water that their landscapes need
- Seasons unfold differently, requiring adaptability for maximum efficiency
- More overuse tends to occur later in the irrigation season

Average LIRs for months and seasons by year						
	2012	2013	2014	2015	2016	5-year average
April 15-May 15	1.2	1.0	0.5	0.5	0.3	0.7
May 16-June 15	1.9	1.5	1.8	0.7	1.2	1.4
June 16-July 15	2.2	1.9	1.6	1.6	1.9	1.8
July 16-Aug. 15	2.1	1.7	1.6	1.3	2.0	1.7
Aug. 16-Sept. 15	2.1	1.4	1.4	1.7	1.9	1.7
Sept. 16-Oct. 15	2.4				1.3	1.9
Sept. 16-Oct. 1		2.0	2.0	2.0		
Seasonal	2.0	1.6	1.5	1.3	1.4	≈ 1.5

OBSERVATIONS ABOUT HUMAN BEHAVIOR AND WATER CONSERVATION

- ❑ **Good Intentions:** people are generally willing to conserve water and motivated to do so for a variety of reasons
- ❑ **Innocent Overwatering:** people don't know how much water landscapes actually need in the context of weather/climate variability
- ❑ **“Situational Waste”:** role of site specific constraints and opportunities for efficient water use (great variability in residential parcels)
- ❑ **Conservation programs:** often attract people who are already efficient and seeking information to increase their conservation skills
- ❑ **Conserving water is a *process*:** involving many actions of change, monitoring, adjustment, and reinforcement; it is *iterative* over time

IMPLICATIONS FOR CONSERVATION POLICY AND PLANNING

- ❑ **Broaden influence of conservation programs:** reach the “information receivers” as well as the “information seekers”
- ❑ **Identify conservation opportunities:** find locations with inefficient landscape water use and direct conservation efforts to those locations
- ❑ **Provide relevant information:** help people understand water needs of *their* landscape and how to maintain it while saving water
- ❑ **Promote long-term habit change:** provide consistent and repeated messaging to aid people’s decision making and help them monitor their own progress toward conservation goals
- ❑ **Prepare for droughts and growing scarcity:** fine-tune people’s ability to water appropriately during droughts with less consequence

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Conservation Behavior: What's the Potential?

DISCUSSION



Thank you!

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