


CALIFORNIA CENTER FOR URBAN HORTICULTURE
UC DAVIS


"Doing More with Less" Workshop

Water Use Classification of Landscape Species IV: What is it and How Do I Use it?

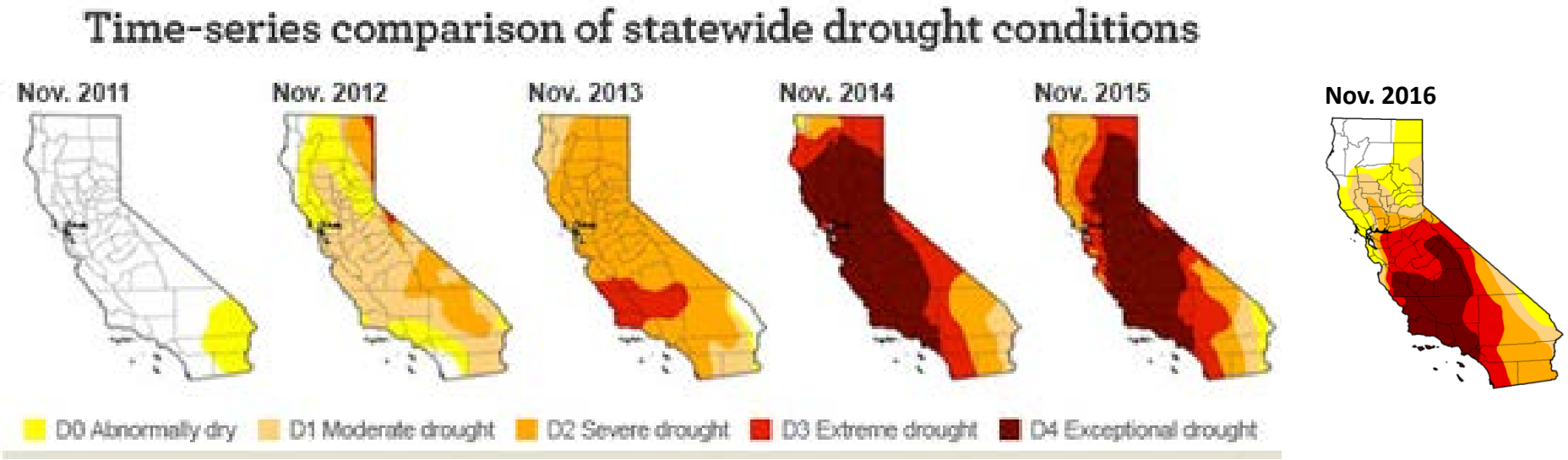
Robert J. Cabral Agricultural Center

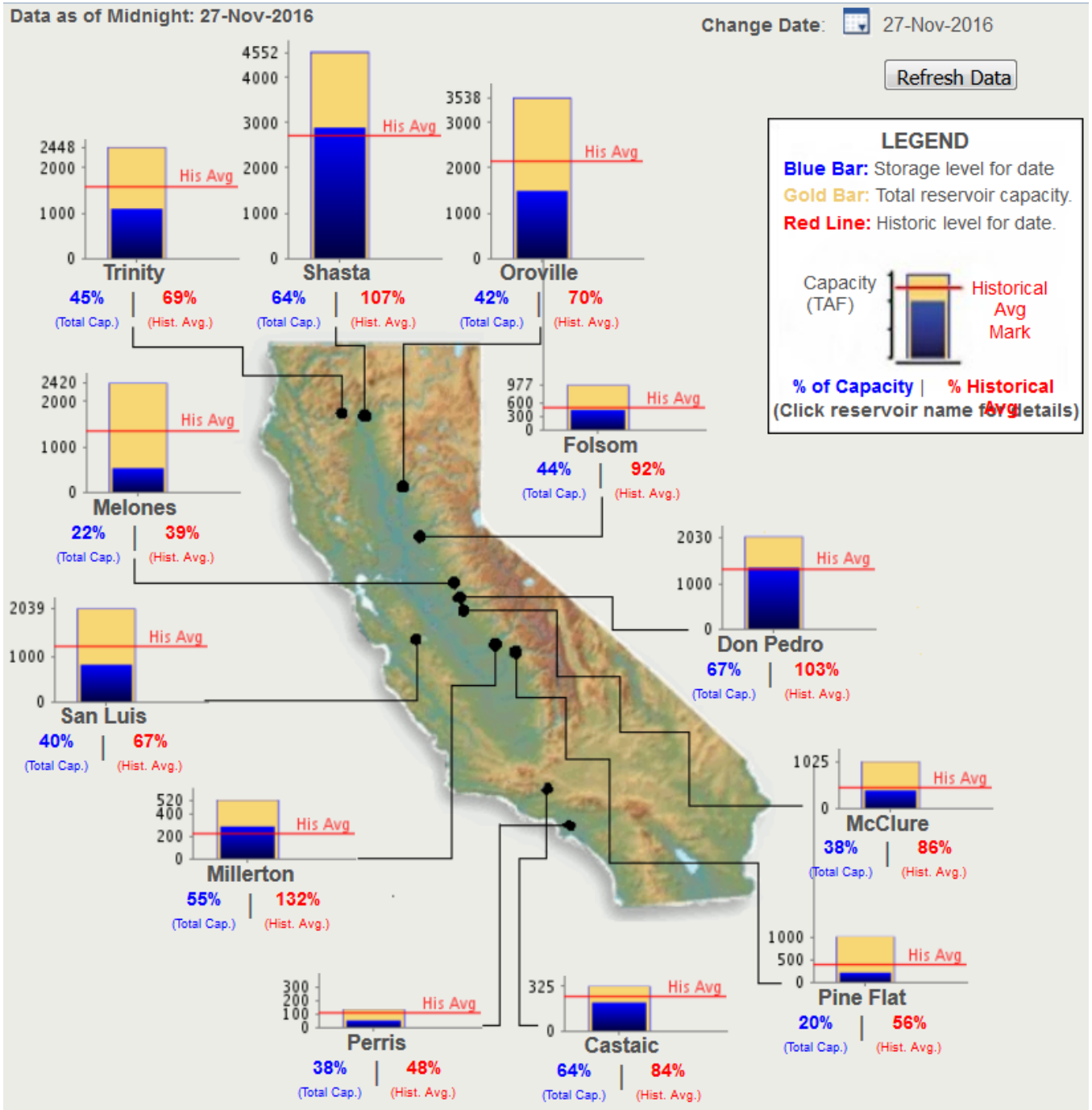
Stockton, CA

December 2, 2016


SERIOUS DROUGHT
HELP SAVE WATER

U.S. Drought Monitor - California




Data as of Midnight: 27-Nov-2016
Change Date: 27-Nov-2016
Refresh Data
LEGEND
Blue Bar: Storage level for date
Gold Bar: Total reservoir capacity.
Red Line: Historic level for date.
Capacity (TAF)
Historical Avg Mark
% of Capacity | % Historical Avg
(Click reservoir name for details)
Trinity
45% (Total Cap.) | 69% (Hist. Avg.)
Shasta
64% (Total Cap.) | 107% (Hist. Avg.)
Oroville
42% (Total Cap.) | 70% (Hist. Avg.)
Folsom
44% (Total Cap.) | 92% (Hist. Avg.)
Melones
22% (Total Cap.) | 39% (Hist. Avg.)
Don Pedro
67% (Total Cap.) | 103% (Hist. Avg.)
San Luis
40% (Total Cap.) | 67% (Hist. Avg.)
McClure
38% (Total Cap.) | 86% (Hist. Avg.)
Millerton
55% (Total Cap.) | 132% (Hist. Avg.)
Pine Flat
20% (Total Cap.) | 56% (Hist. Avg.)
Perris
38% (Total Cap.) | 48% (Hist. Avg.)
Castaic
64% (Total Cap.) | 84% (Hist. Avg.)



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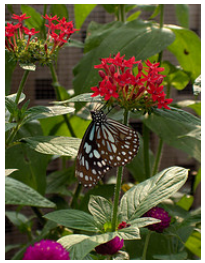

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

U.S. Winter Outlook predicts warmer, drier South and cooler, wetter North

Drought expected to persist in California and expand in the Southeast

- Drought will likely persist through the winter in many regions currently experiencing drought, including much of California and the Southwest
- Drought improvement is anticipated in northern California, the northern Rockies, the northern Plains and parts of the Ohio Valley.



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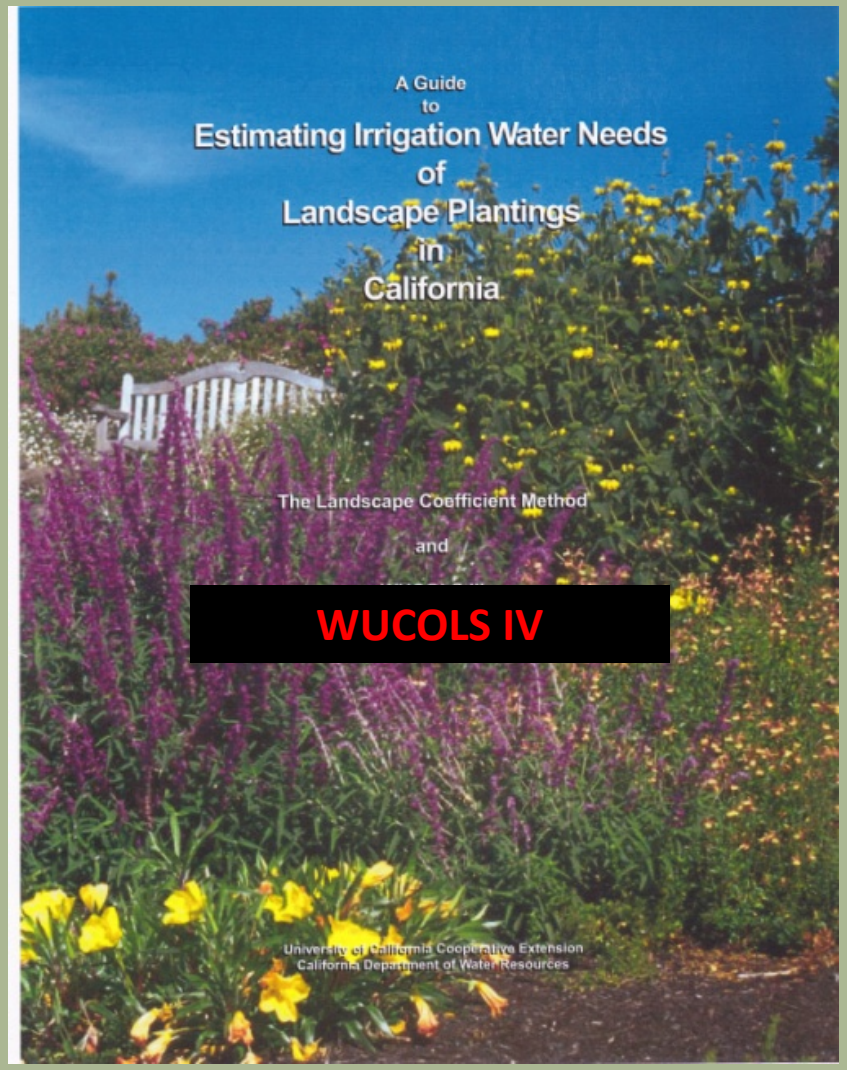





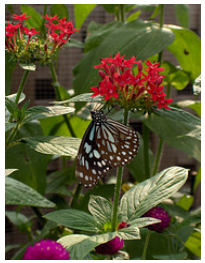

Drivers for converting landscapes to low water use

- Regulatory mandate: April 2015…replace 50M ft.^{2} of turfgrass
- Turfgrass removal incentives
- Regulatory amendments: December 2015…changes to MWELO



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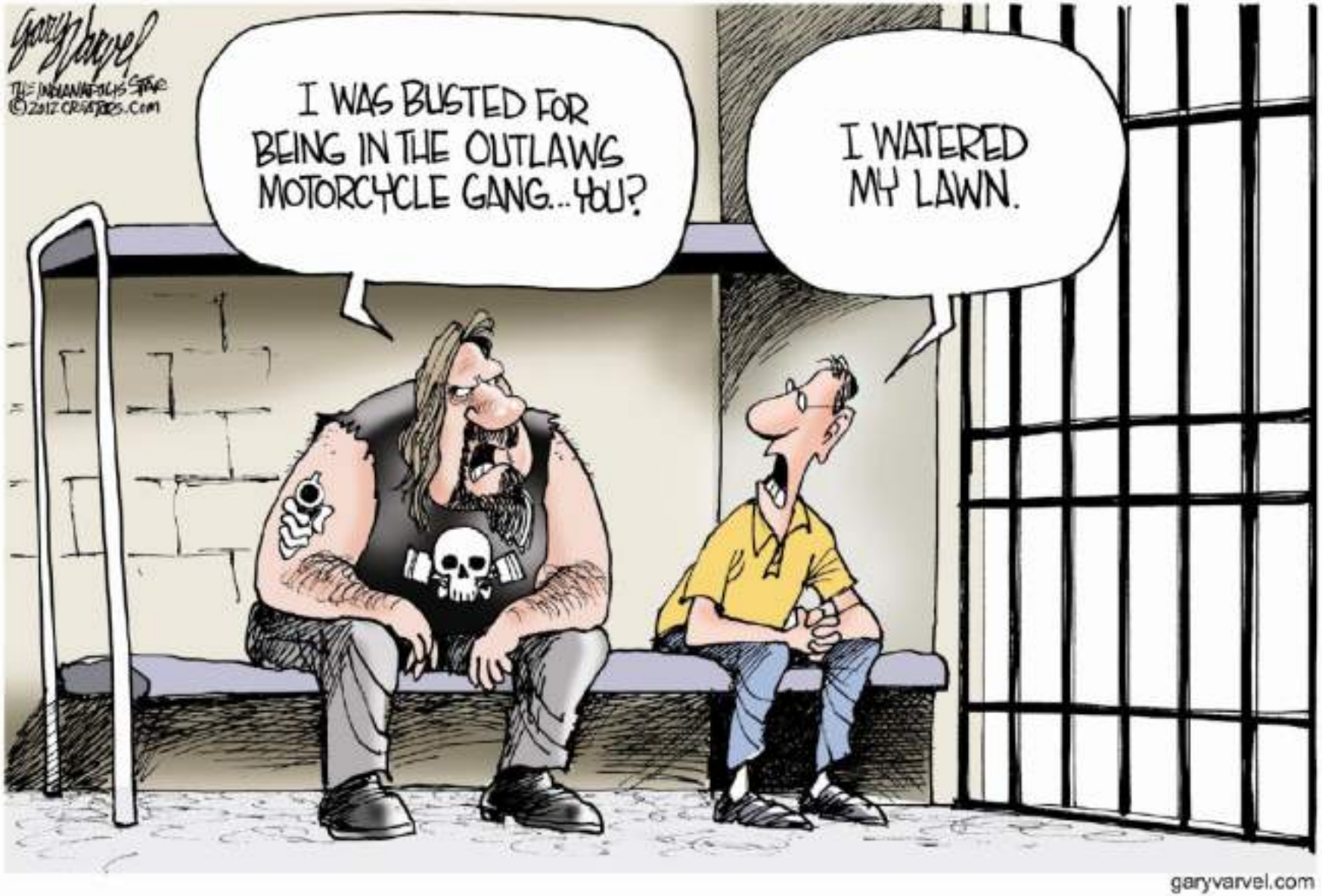
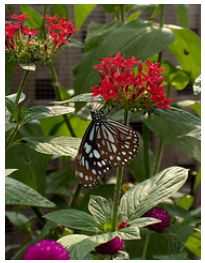
AFTER: Photo from the same vantage point after the project is completed. Turf has been replaced with California Friendly plants.

Photos courtesy of Los Angeles Department of Water and Power


I WAS BUSTED FOR BEING IN THE OUTLAWS MOTORCYCLE GANG... YOU?
I WATERED MY LAWN.
garyvarvel.com







SoCal Water$mart: "Cash for Grass"

1. In 2015, MWD allocated $340M funding "Cash for Grass" programs
2. Goal was to remove approximately 170M ft.^{2} of turfgrass
3. Allocation of funds ran out in 5 – 6 weeks.
4. Limited funding for future turfgrass replacement programs

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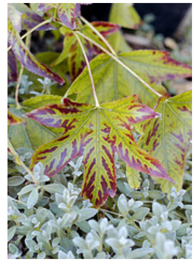
MWELO Amendments (December 2015)

Description	MWELO 2009	MWELO 2016
New development projects requiring a building or landscape permit	2,500 sf or greater	**500 sf or greater**
Rehabilitated landscape requiring a building or landscape permit	2,500 sf or greater	**2,500 sf or greater**
Require dedicated water meter for landscapes	5000 sf	**5,000 sf for residential and 1,000 sf for commercial**
Flow sensor	None	**Required for 5,000 sf or larger**
ET adjustment factor (ETAF) for new landscapes	0.7	**0.55 for residential and 0.45 for commercial**







What is the "opportunity" in times of adversity?

- What is replacing the turf in these landscapes?

  WATER CONSERVING PLANTS

- Landscape water conservation strategy
  - Improve irrigation efficiency
  - Match water supply to plant needs (maintain landscape health and appearance) by creating "hydrozones"

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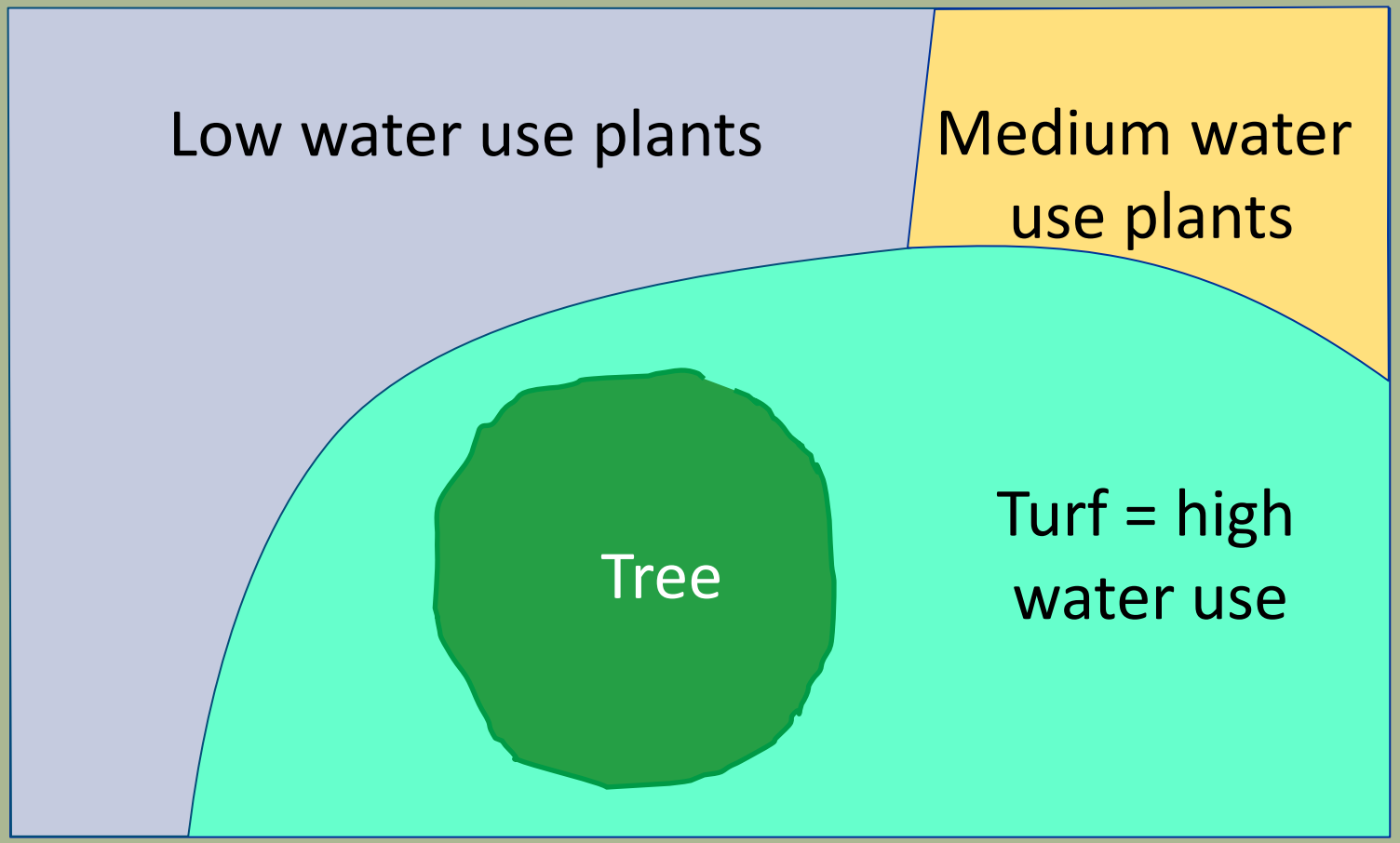
Water Conservation Strategy = “hydrozone”



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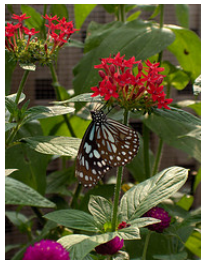

WUCOLS IV "Key" Points

1. A **guide** to plant water needs and is **not** a method for estimating landscape water needs.

2. Review process based on Qualitative Research approach

3. Plant water use assignments (plant factors) were made by **consensus agreement** of leading horticultural professionals representing 6 different climatic regions in California. If a committee did not know a plant, it was not evaluated

4. Reviewed and updated to 3,546 taxa. Less than 5% of species have been evaluated through field research and have been included

5. The "PLANT FACTOR" for MWELO water budget calculation **shall** be from WUCOLS.



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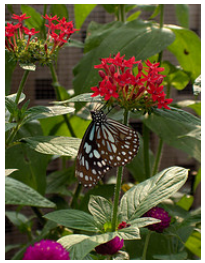


"Simplified" Water Budget Equation for MWELO

Maximum Applied Water Allowance (MAWA) = (ETo) (0.7) (LA) (0.62)

ETo = Reference Evapotranspiration (inches per year)
0.7 = ET Adjustment Factor
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons)

Maximum Applied Water Allowance = _____ gallons/year

Estimated Total Water Use (ETWU) = ((Eto x PF) – Re) x (LA) x (0.62) / IE

ETo = Reference ET data (inches)

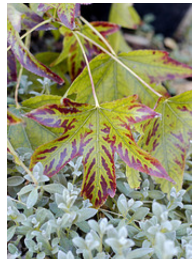
PF = Plant Factor
Re = Effective rainfall (inches)
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons)
IE = Irrigation Efficiency (dependent on irrigation equipment)

WUCOLS

Estimated Total Water use = _____ gallons/year

To be in compliance with MWELO, ETWU must < MAWA.

If not, adjustments to the landscape design or irrigation scheduling is required.

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CCUH Role in the WUCOLS Update Process

- Gain DWR & horticultural industry support
- Hire former WUCOLS authors as consultants, Larry Costello and Katherine Jones
- Six regional meeting process began late 2012 and ended one year later
- WUCOLS IV plant database live in 2014



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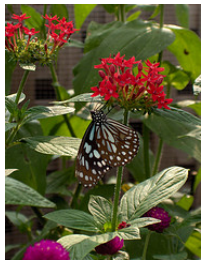
WUCOLS IV Sponsors

- *Regional Water Authority (Northern California)*
- *American Society of Landscape Architects (CCASLA)*
- *Association of Professional Landscape Designers (APLD)*
- *American Society of Irrigation Consultants (ASIC; north and south)*
- *Cagwin & Dorward (N. Calif. landscape construction & maintenance)*
- *California Association of Nurseries and Garden Centers (CANGC)*
- *California Landscape Contractors Association (CLCA State)*
- *California Landscape Contractors Association (San Diego Chapter)*
- *San Diego County Water Authority*
- *Water Forum*
- *Glenn Schmidt Landscaping, Inc.*
- *Department of Water Resources, Water Use Efficiency*







Qualitative Research Process – Focus Groups

- Data collected through a semi-structured group interview process
- Moderated by a group leader
- Emphasis on a specific topic
- Impressions are collected rather than numbers



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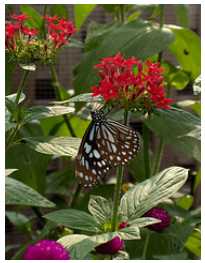

WUCOLS IV Regions

North Central

Members	Affiliation
Barrie Coate	Coate and Associates
Nelda Matheny	HortScience
Don Mahoney	Strybing Arboretum
Dick Turner	Pacific Horticulture
Nevin Smith	Suncrest Nursery
Lori Palmquist	Irrigation and Design Consultation
James MacNair	MacNair & Assoc.

Central Valley

Members	Affiliation
Lance Walheim	L. Walheim Assoc.
Ellen Zagory	UCD Arboretum
Karrie Reid	UCCE
Cheryl Buckwalter	Landscape Liasons
Taylor Lewis	Cornflower Farms
Missy Gable	CCUH

South Inland

Members	Affiliation
Bob Perry	B. Perry Assoc.
Bart O'Brien	Rancho Santa Ana BG
Ken Kammeyer	KK Associates
Pam Pavela	Western Municipal Water District
Ron Kammeyer	KK Associates
Marilee Kuhlman	Comfort Zones Garden Design
Dave Giddens	Giddens Irrig. Design



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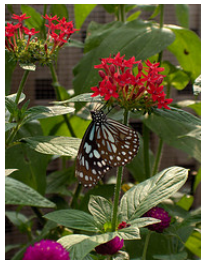

WUCOLS IV Regions

South Coastal

Members	Affiliation
Randy Baldwin	San Marcos Growers
Carol Bornstein	LA Nat'l History Museum
Kathy Musial	Huntington BG
Don Hodel	UC Cooperative Ext.
Mike Evans	Tree of Life Nursery
Kathy Copley	Lightfoot Planning Planning Group

South Coastal (San Diego)

Members	Affiliation
Paul Redeker	Cuyamaca College
Megan Allison	Mira Costa College
Nan Sterman	Garden Writer
Dave Ehrlinger	San Diego BG
Jim Bishop	SD Hort Soc.
David Reed	ASLA

High/Low Desert

Members	Affiliation
Spencer Knight	Palm Desert
Diane Hollinger	Palm Desert
Randy Meyers	RG Meyers & Nurseries
Ray Lopez	Ray Lopez and Associates
Jeff Place	College of the Desert
Hudson Hale	Horttech Landscape Construction
Bob Perry	B. Perry Associates



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Selection Criteria

- Professional diversity (disciplines including nursery professionals, landscape contractors, landscape architects, botanical garden/arboreta staff members, consultants, and academics)
- “Must have” is that we select only the very best "plants people" --- this is crucial to the success of this work
- Availability to meet in person (flexible)
- Team size = 6 – 9 reviewers



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WUCOLS IV Sample Work Sheet

Additions	TYPE	Botanical Name	Common Name	1	2	3	4	5	6
X	B	Albuca juncifolia	rush leaved albuca						
X	B	Albuca nelsonii	natal albuca						
X	B	Albuca shawii							
	B	Alstroemeria spp.	Peruvian lily	M	M	M	M	?	M
X	B	Amarcrinum memoria-corsii	crinodonna						
X	B	Amarygia hybrids	amarygia						
	B	Amaryllis belladona	naked lady	VL	VL	VL	L	L	L
X	B	Anemone coronaria	poppy-flowered anemone				VL		
	B	Arthropodium cirrhatum	star lily	M	?	M	?	/	/
X	B	Babiana spp.							
	B	Babiana stricta hybrids	baboon flower	L	L	L	?	/	/
X	B	Baeometra uniflora	beetle lily						
X	B	Bloomeraia crocea	golden stars						
X	B	Boophone disticha	oxbane						
	B	Bravoa geminiflora (See Polyanthes geminiflora)							
	B	Bulbinella robusta	bulbinella	L	?	?	L	?	?
X	B	Calochortus spp.	Mariposa lily						
	B	Calostemma purpureum	garland lily	M	?	?	?	?	?
X	B	Camassia cusickii	Cusick's Quamash						
X	B	Camassia quamash	camas						
	B	Canna spp.	canna	M	M	M	H	M	M
X	B	Chlorogalum pomeridianum	soap plant						
X	B	Clintonia andrewiana	red clintonia						
	B	Colchicum agrippium	autumn crocus	VL	VL	M	M	M	M
	B	Crinum spp.	crinum lily, spider lily	M	M	M	M	M	?

WUCOLS list divided into plant categories:

Bamboo
Bulb
Grass
Groundcover
Perennial
Palm and Cycad
Shrub
Succulent
Tree
Vine
California native




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Searchable Database Requirements

1. WUCOLS IV designated website (http://ucanr.edu/sites/WUCOLS)
2. Print entire plant list (all regions)
3. Search by region by selected city
4. Search:
    a. Botanical name
    b. Common name
    c. Plant Type
    d. Water Use
5. Create “your own” list
6. Save to an Excel file

wucols iv

Web Shopping Videos Maps News More Search tools

About 1,630 results (0.36 seconds)

WUCOLS IV - University of California Cooperative Extension

ucanr.edu/sites/**WUCOLS**

Water Use Classification of Landscape Species (**WUCOLS IV**) - Home Page.

Plant Search Database

... Species (WUCOLS IV) - Plant Search Database. ... Plant ...

Download WUCOLS IV Use…

... of Landscape Species (WUCOLS IV) - Download ...

Download WUCOLS IV Plan…

Click to download the WUCOLS IV Plant List Adobe ...

Dr Dave Fujino

Water Use Classification of Landscape Species (WUCOLS ...

User Manual

User Manual. cover page. Page Last Updated: January 2, ...

Using WUCOLS Evaluations

WUCOLS Evaluations and Plant Cultural Requirements.

More results from ucanr.edu »

WUCOLS IV

Water Use Classification of Landscape Species

Home Page

GETTING STARTED

If you are using the WUCOLS list for the first time, it is essential that you read the *User Manual*. The manual contains very important information regarding the evaluation process, categories of water needs, plant types, and climatic regions. It is necessary to know this information to use WUCOLS evaluations and the plant search tool appropriately. To access the *User Manual*, click on the tab (on left) and view specific topics.

Water conservation is an essential consideration in the design and management of California landscapes. Effective strategies that increase water use efficiency must be identified and implemented. One key strategy to increase efficiency is matching water supply to plant needs. By supplying only the amount of water needed to maintain landscape health and appearance, unnecessary applications that exceed plant needs can be avoided. Doing so, however, requires some knowledge of plant water needs.

WUCOLS IV provides evaluations of the irrigation water needs for over 3,500 taxa (taxonomic plant groups) used in California landscapes. It is based on the observations and extensive field experience of thirty-six landscape horticulturists (see the section "Regional Committees") and provides guidance in the selection and care of landscape plants relative to their water needs.

WUCOLS IV provides an assessment of irrigation water needs for over 3,500 taxa. Photo by Ellen Zagory.

Plant Search Database

Select a City by Region

- North Central Coastal - Submit
- Central Valley - Submit
- South Coastal - Submit
- South Inland Valley - Submit
- High and Intermediate Desert - Submit
- Low Desert - Submit

See WUCOLS List for All Regions

Plant Search Database

Select a City by Region

- North Central Coastal - Submit

Stockton Submit

- South Coastal - Submit

- South Inland Valley - Submit

- High and Intermediate Desert - Submit

- Low Desert - Submit

See WUCOLS List for All Regions

Plant Search Database

Plant Search

Stockton, CA

Botanical Name

Search by Botanical Name

Common Name

Search by Common Name

Plant Type

- **Gc** (Ground Cover)
- **P** (Perennial)
- **S** (Shrub)
- **T** (Tree)
- **V** (Vine)
- **Ba** (Bamboo)
- **Bu** (Bulb)
- **G** (Grass)
- **Pm** (Palm and Cycad)
- **Su** (Succulent)
- **N** (California Native)
- **A** (Arboretum All-star)

Water Use

- Very Low
- Low
- Moderate/Medium
- High
- Unknown
- Not Appropriate for this Region

Search By Plant Type and/or Water Use

All Plant Data for the Central Valley Region

Plant Search Database

Plant Search

Stockton, CA

Botanical Name

Search by Botanical Name

Common Name

Search by Common Name

Plant Type

- [x] **Gc** (Ground Cover)
- [x] **P** (Perennial)
- [x] **S** (Shrub)
- [x] **T** (Tree)
- [x] **V** (Vine)
- [ ] **Ba** (Bamboo)
- [ ] **Bu** (Bulb)
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- [x] **A** (Arboretum All-star)

Water Use

- [ ] Very Low
- [x] Low
- [ ] Moderate/Medium
- [ ] High
- [ ] Unknown
- [ ] Not Appropriate for this Region

Search By Plant Type and/or Water Use

All Plant Data for the Central Valley Region

Plant Search Database

Results

Stockton, CA

679 results

Start Over | Search Again | Export List

Type	Botanical Name	Common Name	Water Use	Export
T	Abies pinsapo	Spanish fir	Low	☐
S N	Abutilon palmeri	Indian mallow	Low	☐
S	Acacia aneura	mulga	Low	☐
T	Acacia baileyana	Bailey acacia	Low	☐
S A	Acacia boormanii	Snowy River wattle	Low	☐
T	Acacia cognata (A.subporosa)	bower wattle	Low	☐
S T	Acacia constricta	whitethorn acacia	Low	☐

Plant Search Database

Results

Stockton, CA

679 results

Start Over | Search Again | Export List

Check All

Type	Botanical Name	Common Name	Wate Use	Export
T	Abies pinsapo	Spanish fir	Low	
S N	Abutilon palmeri	Indian mallow	Low	
S	Acacia aneura	mulga	Low	
T	Acacia baileyana	Bailey acacia	Low	
S A	Acacia boormanii	Snowy River wattle	Low	
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S T	Acacia constricta	whitethorn acacia	Low	

Plant Search Database

Results

Stockton, CA

679 results

Start Over | Search Again | Export List

Uncheck All

Add Selections to Export List

Type	Botanical Name	Common Name	Water Use	
T	Abies pinsapo	Spanish fir	Low	☑
S N	Abutilon palmeri	Indian mallow	Low	☑
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Plant Search Database

Export List

Stockton, CA

679 result

Start Over | Search Again | Export List

Export to Excel

Uncheck All

Type	Botanical Name	Common Name	Water Use	
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Example of low water use plant list for Stockton

WUCOLS - Stockton

Type	Botanical Name	Common Name	Water Use
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S	Acacia aneura	mulga	Low
T	Acacia baileyana	Bailey acacia	Low
S A	Acacia boormanii	Snowy River wattle	Low
T	Acacia cognata (A.subporosa)	bower wattle	Low
S T	Acacia constricta	whitethorn acacia	Low
S	Acacia covenyi	blue bush	Low
S	Acacia cultriformis	knife acacia	Low
T	Acacia dealbata	silver wattle	Low
T	Acacia decurrens	green wattle	Low
T	Acacia erioloba	camel thorn	Low
S T N	Acacia greggii	catclaw acacia	Low
S	Acacia iteaphylla	willow wattle	Low
S T	Acacia longifolia	Sydney golden wattle	Low
T	Acacia melanoxylon	blackwood acacia	Low
T	Acacia pendula	weeping acacia	Low
T	Acacia pravissima	ovens wattle	Low
T	Acacia rigidula	rigidula acacia	Low
S T	Acacia saligna	blue leaf wattle	Low




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    b. Common name
    c. Plant Type
    d. Water Use
5. Create “your own” list of “low” water use plants for Sacramento
6. Save to an Excel file

WUCOLS IV

Water Use Classification of Landscape Species

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WUCOLS IV provides an assessment of irrigation water needs for over 3,500 taxa. Photo by Ellen Zagory.

Water Requirements for Turfgrasses

Warm-season and cool-season turfgrasses were not reviewed by the WUCOLS IV regional committees. Data here is from Harivandi, et. al., 2009 publication, *Managing Turgrasses During Drought*. The complete publication is cited below.

Water requirements for Warm-season and Cool-season Turfgrasses

Type	Common name	Optimal Irrigation* (% ET_0)	Deficit Irrigation** (% ET_0)
Warm season	Common bermudagrass	60	40
	Hybrid bermudagrass	60	40
	St. Augustinegrass	60	40
	Seashore paspalum	60	40
	Zoysiagrass	60	40
	Buffalograss	60	40
	Kikuyugrass	60	40
Cool Season	Tall fescue	80	60
	Perennial ryegrass	80	60
	Kentucky bluegrass	80	60
	Fineleaf fescues	80	60
	Creeping bentgrass	80	60
	Rough bluegrass	80	60

* Optimum irrigation is the amount of water needed for most efficient growth, maximum quality, and best appearance.

** Deficit irrigation provides sufficient water to maintain adequate appearance with less growth (relative to optimum irrigation).

Note: For turfgrass blends, the species with the highest water requirement will generally determine the irrigation level for the blend. For instance, if a blend contained perennial ryegrass and common bermudagrass, then it would be irrigated at 80% ET_0 for optimal performance. If the sward appears to be overwatered, however, then a downward adjustment in irrigation level would be warranted.

Harivandi, A. M. 2009. *Managing Turfgrass During Drought.* Oakland: University of California Agriculture and Natural Resources Publication 8395, http://anrcatalog.ucdavis.edu/pdf/8395.pdf.

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