UC Landscape Plant Irrigation Trials

The quest for the best low-water plants

Karrie Reid
Environmental Horticulture Advisor
UC Cooperative Extension, San Joaquin Co.

University of California
Agriculture and Natural Resources


People want this


Or this
But…

Water Issues in California

- Constantly ↑ population
- Limited storage capacity
- No summer rainfall
- Recurring winter drought
- LARGE agricultural H_20 demand
  - $56.6B industry in 2015- 5th year of drought!

$5.3B

California's response: MWELO

Model Water Efficient Landscape Ordinance

- **Water budgets**
- **Combined plant water use ≤ 50% of local ET_0**
- **Uses online database *Water Use Classification of Landscape Species***
  - **3500 taxa categorized**

Problem?

New cultivars may not match old taxa.


The only university-run ornamental plant trials in California

UC Landscape Plant Irrigation Trials

- 2005- Present
- 2 years in-ground
- Perennials- woody and herbaceous
- ET_0-based irrigation


UC Davis Arboretum All-Stars


Grower/Breeder Selections

Full Sun

12/15 Species/Year

50% Shade

4 Species/Year

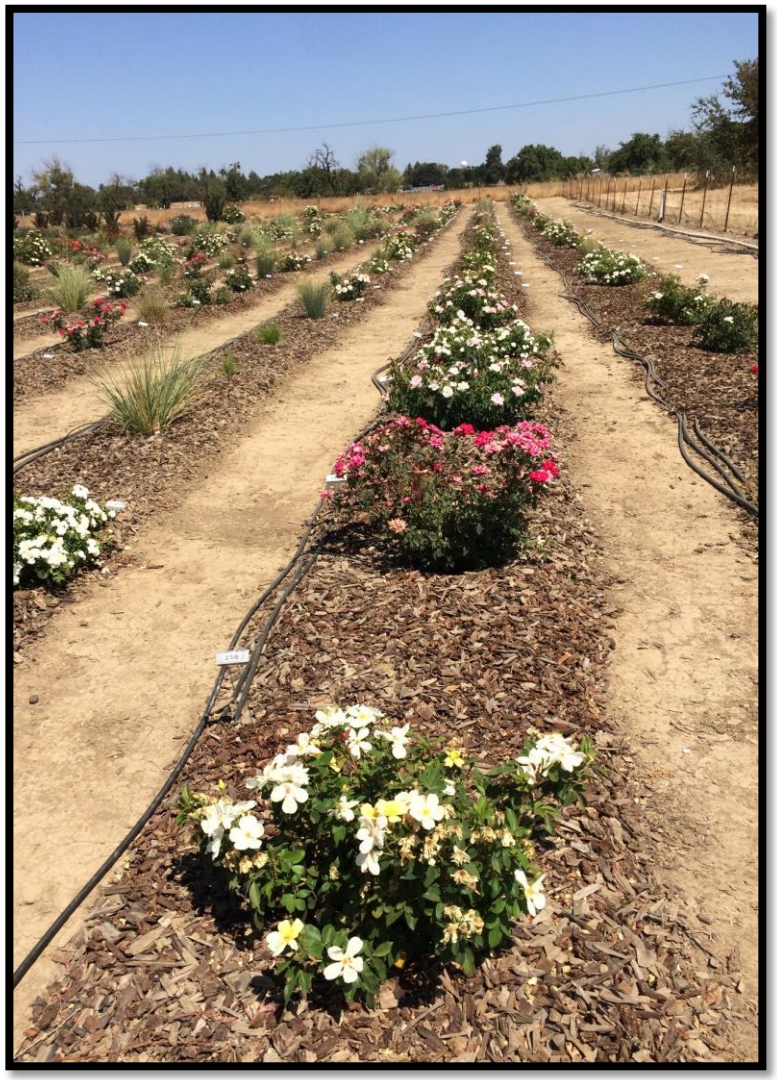
PURPOSE of UC LPIT

1. **Provide research-based water use info for**
   - **plants already thought lower water users**
   - **new introductions from growers**
2. **Demonstrate just how low you can go**
   - **Recommended rate or range of water**
     - **HIGH – MODERATE - LOW**

★ **Evaluate for other sustainability traits**

METHODS

- Rows & plants: 2 m spacing
- 2 randomized complete blocks
- 4 treatments; 6 reps – 3 treatments; 8 reps
  - Total of 24 plants of each species/cultivar
- No fertilizer, no pesticides



Herbicide between rows only

METHODS

- **Fall planting – October**
- **1 G pots** **(exception- bareroot roses)**

METHODS

- Drip irrigation rings
  - ½ inch tubing
  - @ pot/soil interface
  - 4 emitters/plant
- 3” chipped wood mulch
- 18 months of irrigation at 100% of ET_0 & 25% Available Water deficit

Plant Available Water (PAW)

- The amount of water present in the soil ***that plant roots can take up.***
- Some water is held tightly to the soil particles, some drains below the root zone.
- The remainder is ***AVAILABLE***.

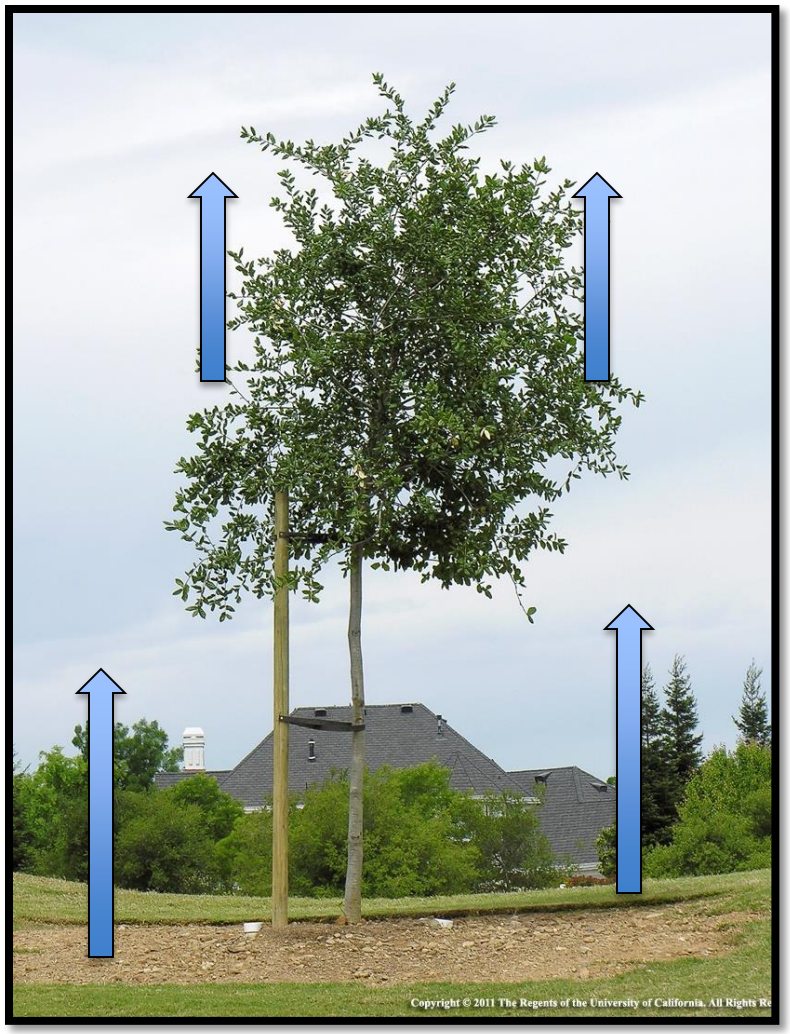
METHODS

- Treatments begin 2nd April/May
- Real-time ET_0-based irrigation
  - @ 100% AW depletion
  - 80%, 50%, or 20% of ET_0

Who remembers ET_0?

Evapotranspiration (ET)- *What is it?*

- ***Water loss to the air***
  - ***by evaporation from the ground +***
  - ***transpiration from plants* (like exhaling)**
- **Affected by wind, sun, humidity, temperature**



Reference ET or ET_0

- **Amount used by tall fescue turfgrass (4-6”)**
- **Varies by region**
- **Stations collect data**
- **CIMIS reports it-**
  California Irrigation Management Information System

http://wwwcimis.water.ca.gov/

Irrigation Methods

- 80%, 50%, or 20% of ET_0
- Corresponds to WUCOLS LEVELS
  - HIGH
  - MODERATE
  - LOW
- ***Why do HIGH?***

Average 2nd-Yr Irrigation Frequency

(full sun, clay-loam soil, 18" deep/ 1m², ≅16G)

Treatment ET_0 Percentage	# Days between irrigation events
80	12 (8-14)
60	18 (14-21)
40	30 (23-36)
20	2X during the period

University of California
Agriculture and Natural Resources

Average 2nd-Yr Irrigation Frequency

(shade, clay-loam soil, 18” deep/1m², ≅16G)

Treatment ET_0 Percentage	# Days between irrigation events
80	1x/month
60	45 days
40	2x/ season
20	1x (maybe)

University of California
Agriculture and Natural Resources

METHODS

- Monthly measurements
- Monthly quality ratings on scale of 1-5
  - Foliage quality
  - Flowering abundance & length of flowering time
  - Pest/Disease resistance
  - Vigor
  - Overall Appearance – **WOW Factor!**

Open House Field Days

Industry Pros & MGs

University of California
Agriculture and Natural Resources

Sample Results- FULL SUN

PLANT	Average Annual Quality Rating (1-5)				REC rate
Irrigation Rate	80	60	40	20	
Aster 'Purple Dome'	4.1	4.2	4.2	3.9	40-60%
Bulbine 'Tiny Tangerine'	4.5	4.2	4.5	4.6	20%
Rosa 'Korbin'	3.9	4.2	4.1	3.9	40-60%
Buddleia 'Blue Heaven'	3.9	4.0	3.8	3.6	60%
Cordyline 'Purple Sensation'			2.0	2.6	20%
Escallonia 'Pink Whisper'	2.3	2.5	2.7	2.4	40%
Lomandra 'Seascape'	3.5	2.9	3.2	2.6	40-80%
Mimulus 'Curious Georgie Boy'		3.0	3.0	3.2	20%

Sample Results- 50% SHADE

PLANT	Average Annual Quality Rating (1-5)				REC rate
Irrigation rate	80	60	40	20	
Helleborus 'Red Lady'	3.4	3.4	3.3	3.3	20-60%
Heuchera maxima	4.0	4.1	3.7	4.0	20-60%
Ribes viburnifolium	4.9	4.9	4.9	4.9	20-60%
Woodwardia fimbriata	3.9	3.3	3.1	3.0	80%+
Abelia 'Sunshine Daydream'	4.5	4.4	4.5	4.4	20-80%
Hypericum 'Red Ignite'	4.1	4.0	4.0	4.2	20%
Ligustrum sinense 'Sunshine'	4.9	4.9	4.8	4.8	20-80%
Trachelospermum 'Sebra'	3.7	3.6	3.6	3.5	40-80%

RESULTS- Roses

Cultivar	Treatment % of ET_0				Recommended Rate
	80	60	40	20	
'Aushouse'	2.9	3.1	2.9	3.0	60
'Gruss an Aachen'	3.8	3.1	4.0	3.4	40
'KORbin'	4.1	4.3	4.3	4.1	40-60
'KORelamba'	3.8	3.5	3.9	3.7	40
'KORfloci01'	3.3	3.1	3.7	3.4	40
'KORsixkono'	4.2	4.3	3.9	4.1	60
'KORsteimm'	3.5	3.6	3.7	3.4	40
'Meidrifora'	3.9	4.0	4.0	3.7	40-80
'Meijocos'	4.0	3.9	3.9	3.9	20-80
'Meigalpio'	4.0	3.8	3.9	3.5	40-80

Auxiliary Trial- CA Native Establishment

- **DRIVERS**
  - Losses in the first year
  - Economic loss for nursery
  - Frustration for landscapers and gardeners
  - Discourages CA Native use

CA Native Establishment

- Paired trials in clay loam and sandy loam
- Spring planting
- Irrigation based on allowed moisture depletion
  - 25%, 50%, 75%, 100%

CA Native Establishment Results

PLANT NAME	Recommended Rate(MAD %)	
	Clay loam	Sandy loam
Arctostaphylos 'Emerald Carpet	50-100	50-75
Arctostaphylos uva-ursi 'Point Reyes'	25-50	50
Arctostaphylos uva-ursi 'Wood's Compact'	50-75	50
Baccharis pilularis 'Pigeon Point'	100	100
Ceanothus 'Concha'	50	75-100
Ceanothus griseus var. *horizontalis* 'Yankee Point'	75	75
Eriogonum giganteum		25
Mimulus 'Trish'	75	75
Rhamnus californica 'Mound San Bruno'	25-50	25
Salvia clevelandii 'Allen Chickering'	75	25

New Fields

- Matched Trials Field in Irvine @SCREC
- Expanded field in both Davis and SCREC
  - Larger spacing for larger plants (3m spacing)
- FUTURE?
  - Larger field/ longer trial period – larger plants?
- BIGGEST OBSTACLE?
  - $$$$$

American Rose Trials for Sustainability

http://www.americanrosetrialsforsustainability.org/

- Beginning 2018
- New and standard cultivars
- National trial in 9 regions
- We are Mediterranean trial
- 2-year trial followed by UC LPIT protocol
- Winners awarded and marketed as
  - *Local Artists* OR *Master Roses*

All Trials Results to date:

http://ccuh.ucdavis.edu/Resources/plant-trials

Key messages for your clientele

1. Attractive low-water use plants are available!
2. Establishing on regular water is KEY to success.
   - Begin at pot/soil interface- water BOTH!
   - Gradually increase width of irrigation zone.
3. Irrigation needs to be DEEP to drive roots deep.

Key messages for your clientele

4. **Once established, infrequent, deep irrigation keeps low-water users happy and healthy.**
   - **PAY ATTENTION TO SOIL TYPE!**
   - **Resist the temptation to over-generalize frequency recommendations!**

Messages for your clientele

5. Drip below mulch is the most efficient delivery.
6. At least 3” of mulch is KEY to conserving water.
7. Hydrozoning is KEY to optimizing irrigation.
8. Weather-based irrigation saves water.


Questions?