THE 2016 - LONG BEACH LANDSCAPE DESIGN • BUILD • MAINTAIN • SUPPLY EXPO
OCTOBER 19TH & 20TH

Dealing with Drought & Landscape Watering Restrictions

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THE 2016 - NORTHERN CALIFORNIA LANDSCAPE EXPO
DESIGN • BUILD • MAINTAIN • SUPPLY
AT THE CAL EXPO IN SACRAMENTO

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CENTER FOR LANDSCAPE & URBAN HORTICULTURE **www.ucanr.edu/cluh**

- M.S. Horticulture, Ohio State University
- Graduate Studies Soil Science, U.C. Riverside
- 35 yrs. experience - landscape & urban horticulture
  - Education and applied research programs
  - Landscape irrigation mgt., plant water needs, plant selection, specimen palm transplanting
  - Presentations, workshops, publications, Web

Useful Reference Materials

- *Landscape Irrigation BMPs Manual*. 2014. Irr. Assoc. & ASIC. (J. Barrett, et al.)
  - www.irrigation.org/landscapebmps
- Irrigation Association's *Landscape Irrigation Auditor Man'l.* 3rd Ed. (2013).
- Center for Landscape & Urban Horticulture (UCCE Web site)
  - www.ucanr.edu/cluh (*Landscape Water Conservation* tab on left)
- UC Cooperative Extension Handbook: *Landscape Irrigation System Evaluation and Management*. (D. Shaw and D. Pittenger, 2009)
  - www.ucanr.edu/cluh (*Landscape Water Conservation* tab on left)

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Center for Landscape & Urban Horticulture

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- Publications
- **Landscape Water Conservation & Irrigation Management**
  - Easy Calculators for Estimating Landscape Water Requirements
  - Drought and Landscape Water Use - Some Perspective
  - Tree Water Requirements
  - Estimating Landscape Water Needs
  - Plant Factors and Crop Coefficients

Questions & Answers About Drought & Water Conservation

Q. How much water do landscapes use in California?

A. Landscape irrigation accounts for only about 9% of total statewide developed water use, but the percentage varies widely among communities. Water applied to landscapes is estimated to account for about 50% of residential water consumption statewide, but the amount varies from about 30% in some coastal communities to 60% or more in many inland suburban communities.

Q. What are some easy things I can do to save water in a landscape?

A. Check the irrigation system regularly for leaks as well as physical and operational problems that reduce the efficiency and function of sprinklers, drip emitters, and other water delivery devices. Correcting these problems can reduce water use by 10% or more, improve the uniformity of water application, and likely improve the health of plantings. Check that automatic valves are functioning and repair any leaks at valves, spray heads, and other connections. Walk through an area while the irrigation system is running and repair or replace sprinklers or other types of emitters that

Useful Equations

Inches = Gallons ÷ (Sq. Ft. × 0.623)

Gallons = Inches × Sq. Ft. × 0.623

1 Billing Unit = HCF = CCF = 748 gallons

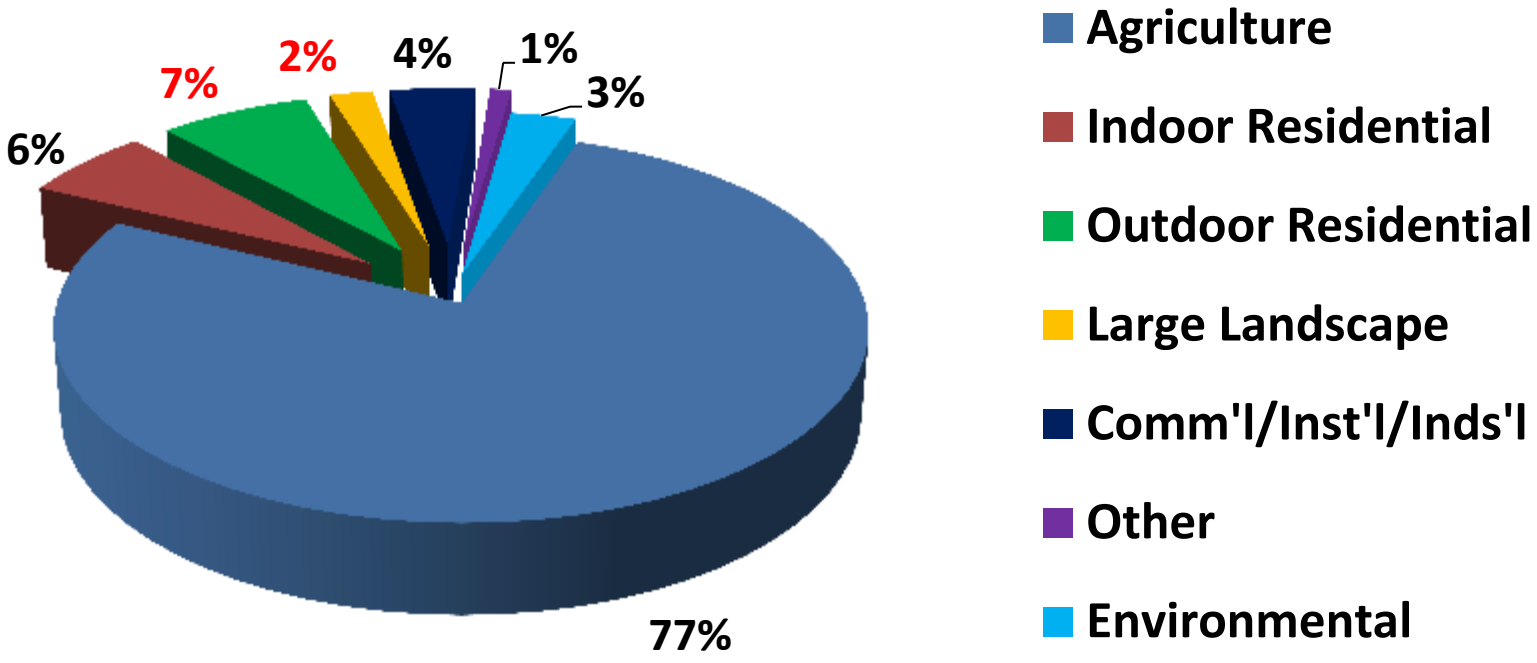
0.623 gal. covers 1 sq. ft. 1 in. deep

1 gal. covers 1 sq. ft. with 1.6 in. of water

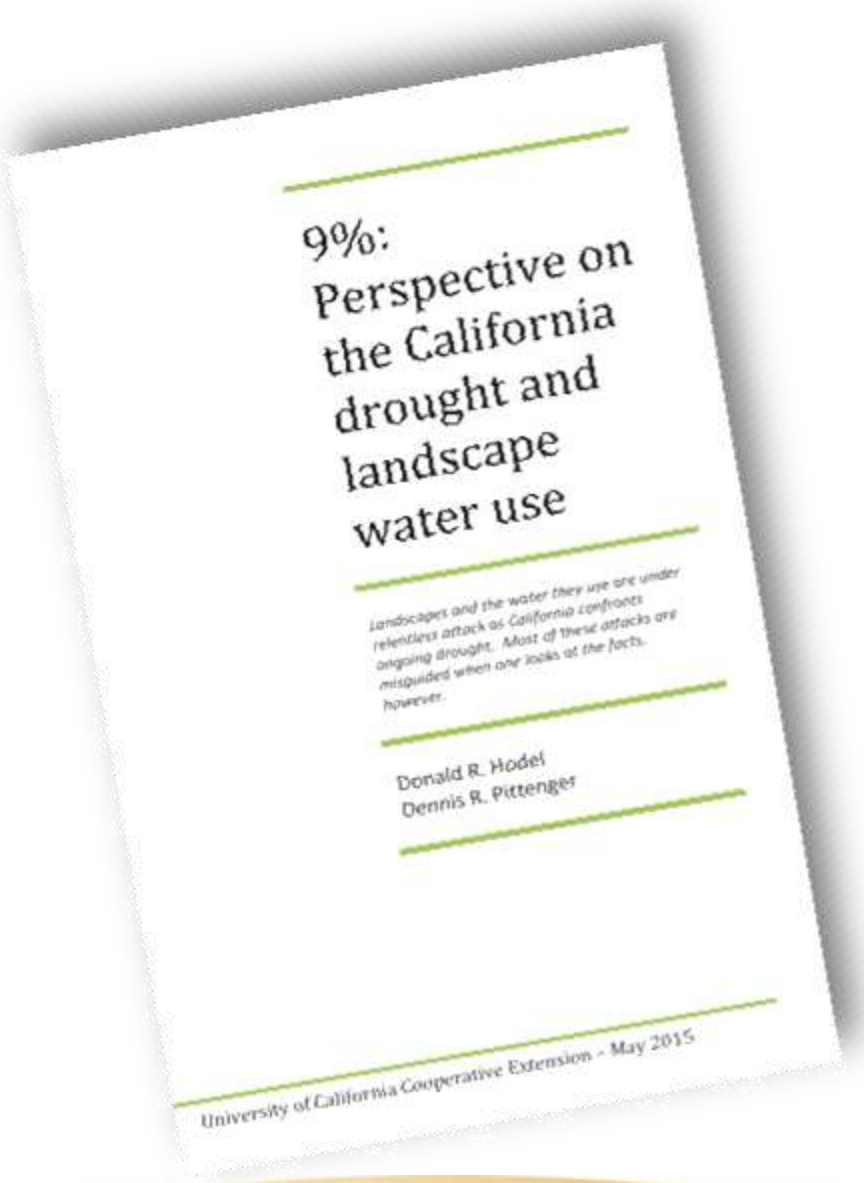
Average California Water Use

Statewide Developed Water

20% Urban & 9% Landscape



Sources: Calif. Dept. Water Resources, 2013 Calif. Water Plan Update Chp. 3.
UCLA Inst. of the Env't. and Sustainability, So. Calif. Environ'l. Report Card, Fall 2009.



Available at:

www.ucanr.edu/cluh

From: Irvine Ranch Water District Turf Removal Rebate Program

Zero-scape

(*Not* Xeriscape)

Prioritize Irrigation

- *Focus water on most valuable & difficult to replace plants*

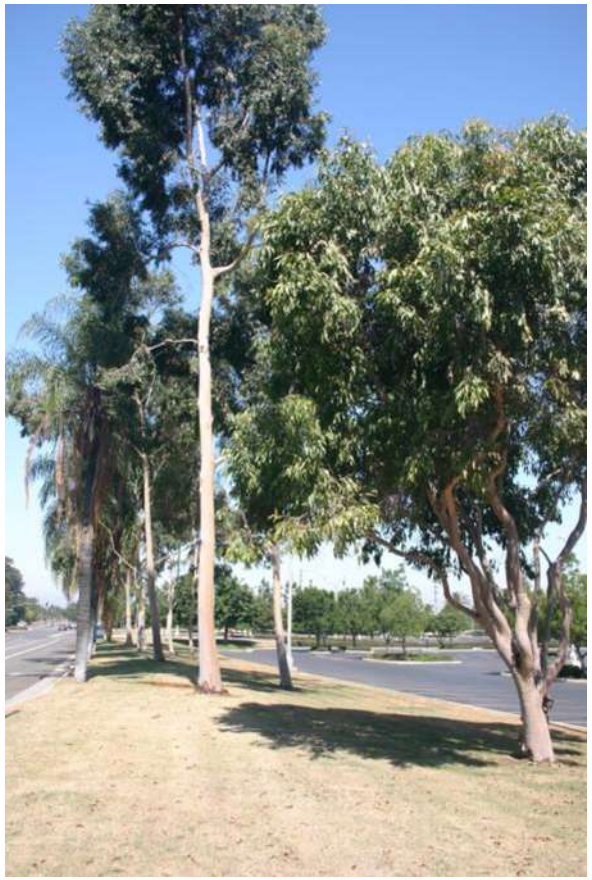
Trees/Shrubs/Vines/Grdcvrs

↓

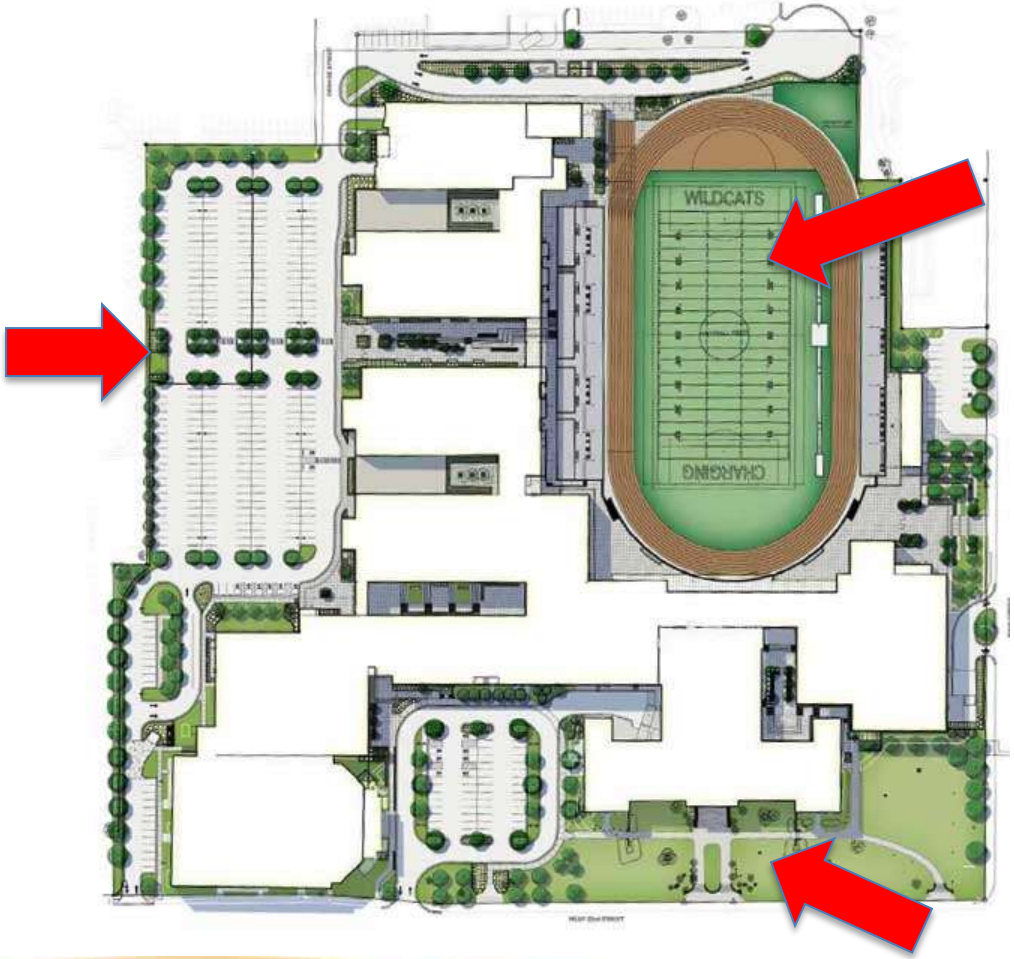
Perennials Flowers

↓

Lawn/Annuals



Prioritizing Irrigation



Evaluating Irrigation Systems & Management

- How efficient is my irrigation system?
- Can I improve my irrigation management?
- Could a Smart irrigation controller help?
- Is my Smart controller performing correctly?
- Am I managing plants to maximize their water use efficiency?
- What can I do to reduce irrigation demand?

Hierarchy for Reducing Landscape Water Demand

- Improve Irrigation System Performance
- Improve Irrigation Schedules & Management
- Adjust Cultural Practices
- Reduce Turf Area/Alter Plant Palette
- Reduce Total Planted Area

Improve Irrigation System Performance

- Spray/Overhead
  - Matched heads and emitters
  - Head-to-head coverage for sprays
- Drip
  - Water ≥50% of root zone

Improve Irrigation System Performance
Fix Leaks & Obvious Problems

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Irrigation System Evaluation

Be wary of in-field modifications!!

Improve Irrigation System Performance

Hydrozone Plantings

Separate irrigation zones for turf

System Performance Evaluation

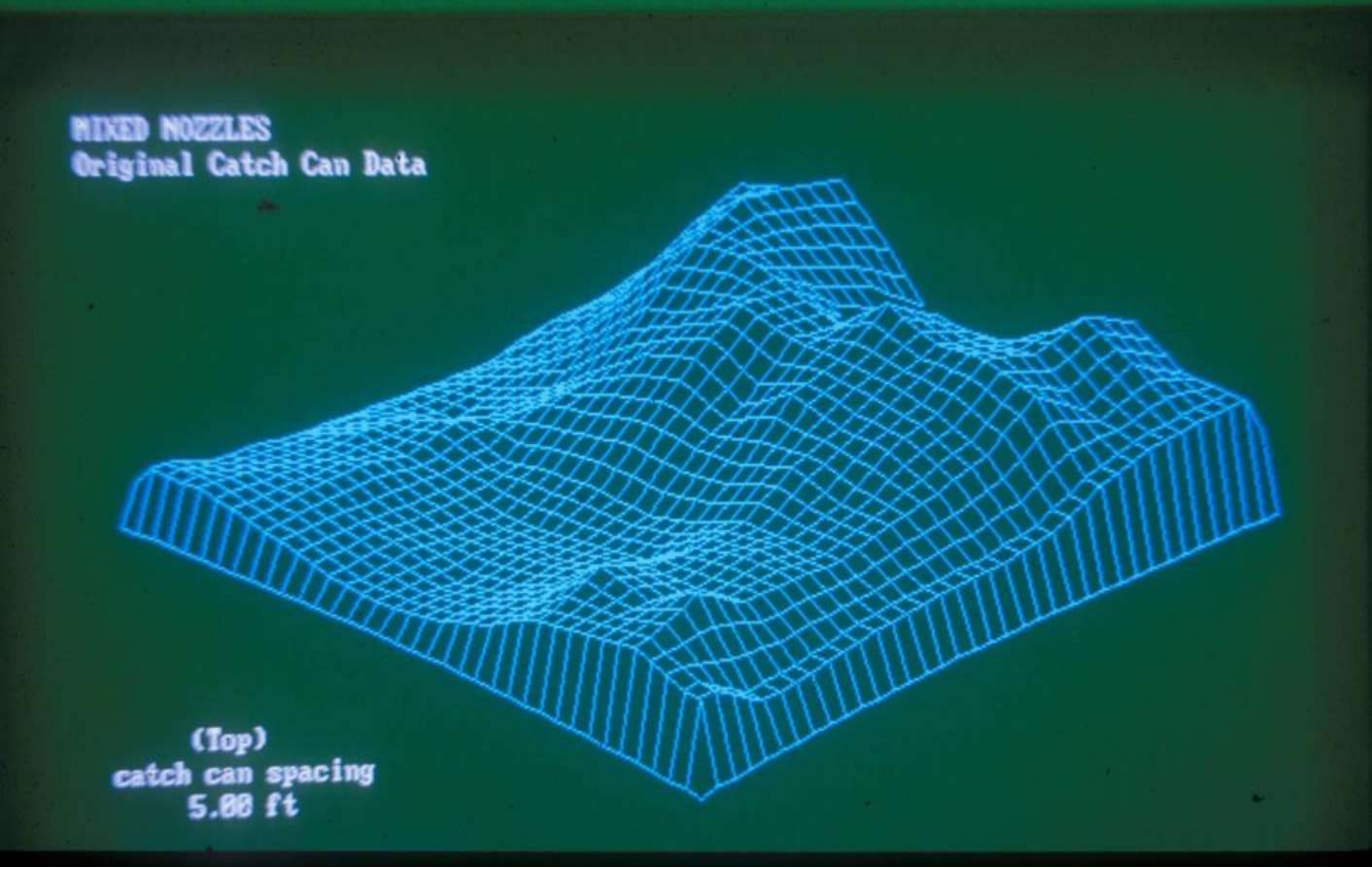
- Evaluate each station's
  - *Distribution Uniformity (DU)*
  - *Precipitation Rate (PR)*
- DU Goals:
  - Overhead (turf) = 70%
  - Drip = 90%
- Catch can test
- Time run/Read meter/Sq. ft.
  - In. = Gal. ÷ (Sq. Ft. × 0.623)

Improve Irrigation System Performance

The irrigation system should distribute water as efficiently & uniformly as possible

Improve Irrigation System Performance

When applied water closely matches the needs of plants, the uniformity of the irrigation system is critical


MIXED NOZZLES
Original Catch Can Data
(Top)
catch can spacing
5.00 ft

Distribution Uniformity (DU)

DU	Irrigation Multiplier
0.5	2.00
0.6	1.67
0.7	1.43
0.8	1.25
0.9	1.11

Effective Irrigation Controllers

Improve Irrigation System Performance

- Smart controller???
- Minimum 3 programs
- Minimum 4 start times
- Interval or day of wk. option
- Station for each zone
- Rain shutoff
- Global % adjustment

Improve Irrigation System Performance

The irrigation system should be designed, maintained, and <u>operated</u> to avoid runoff

Avoid Runoff & Overspray

- Cycle and soak
- Run irr. laterals across slope
- Reduced precipitation rate heads

Improve Irrigation Schedules & Management

- How much? How often?
- Irrigate ≈11 PM – 6 AM
- Set July runtime & cycles
- Adjust schedules monthly
  - Use global % adjust
- Extend interval Fall-Spring

Improve Irrigation Schedules & Management

The schedule should apply water at the time and in the amount needed by the plants

… plus extra water for non-uniform distribution & salt management

Factors Affecting Scheduling

- Evapotranspiration (weather)
- Plant performance expectations
- Root system depth
- Soil texture
- Plant type (turf, tree, etc.)
- Irrigation system type – drip vs. spray
- Uniformity and efficiency of irrigation system

Estimating Landscape Plant Water Requirements

Evapotranspiration (ET)

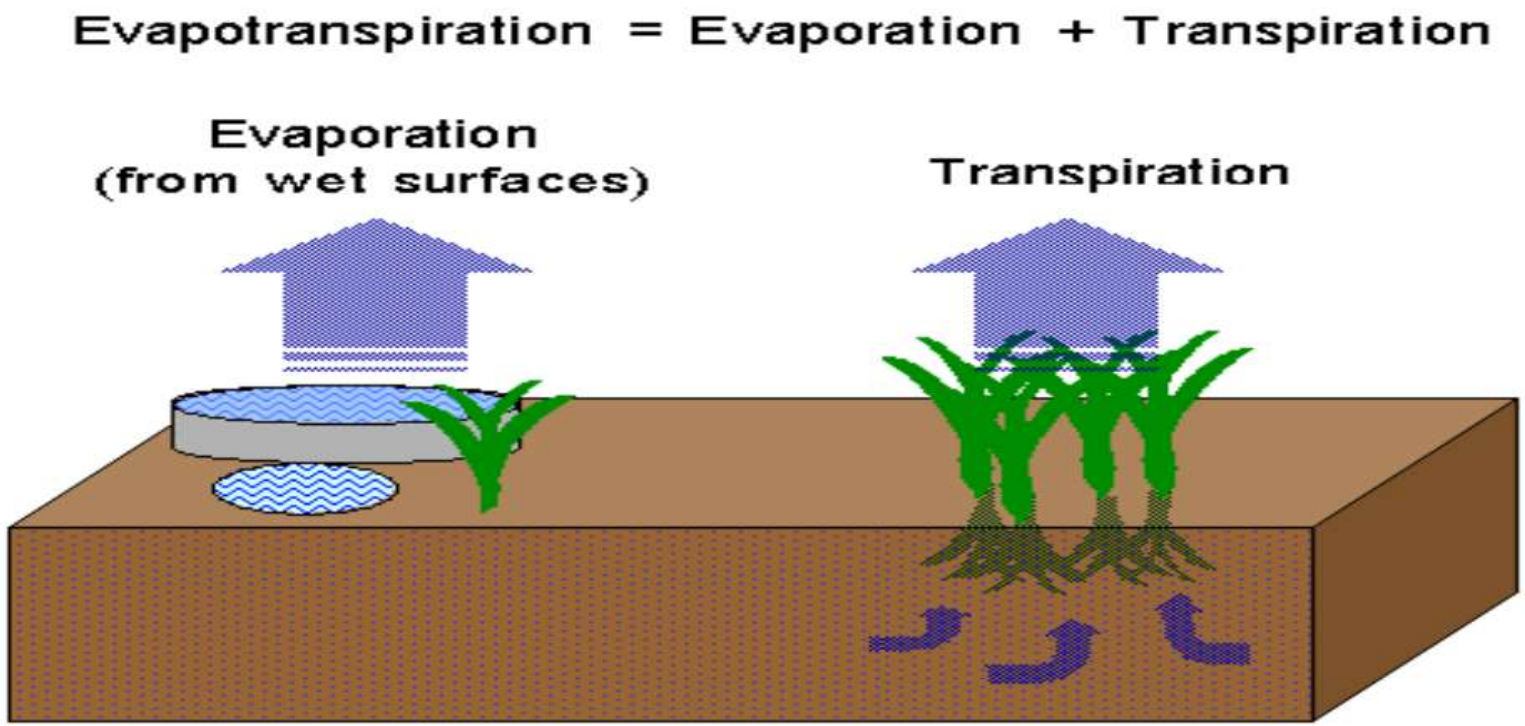


Figure 1. Evapotranspiration

ET (plant water use) is driven mostly by the energy from the _____.

SUN

Factors Affecting Plant Water Use & ET

- **Sunlight**
- Temperature
- Humidity
- Wind
- Plant species
- Plant size
- Site characteristics

Reference ET (ETo) values are derived from the water use of cool-season turf under the local climate when water is unlimited.

TRUE or FALSE?

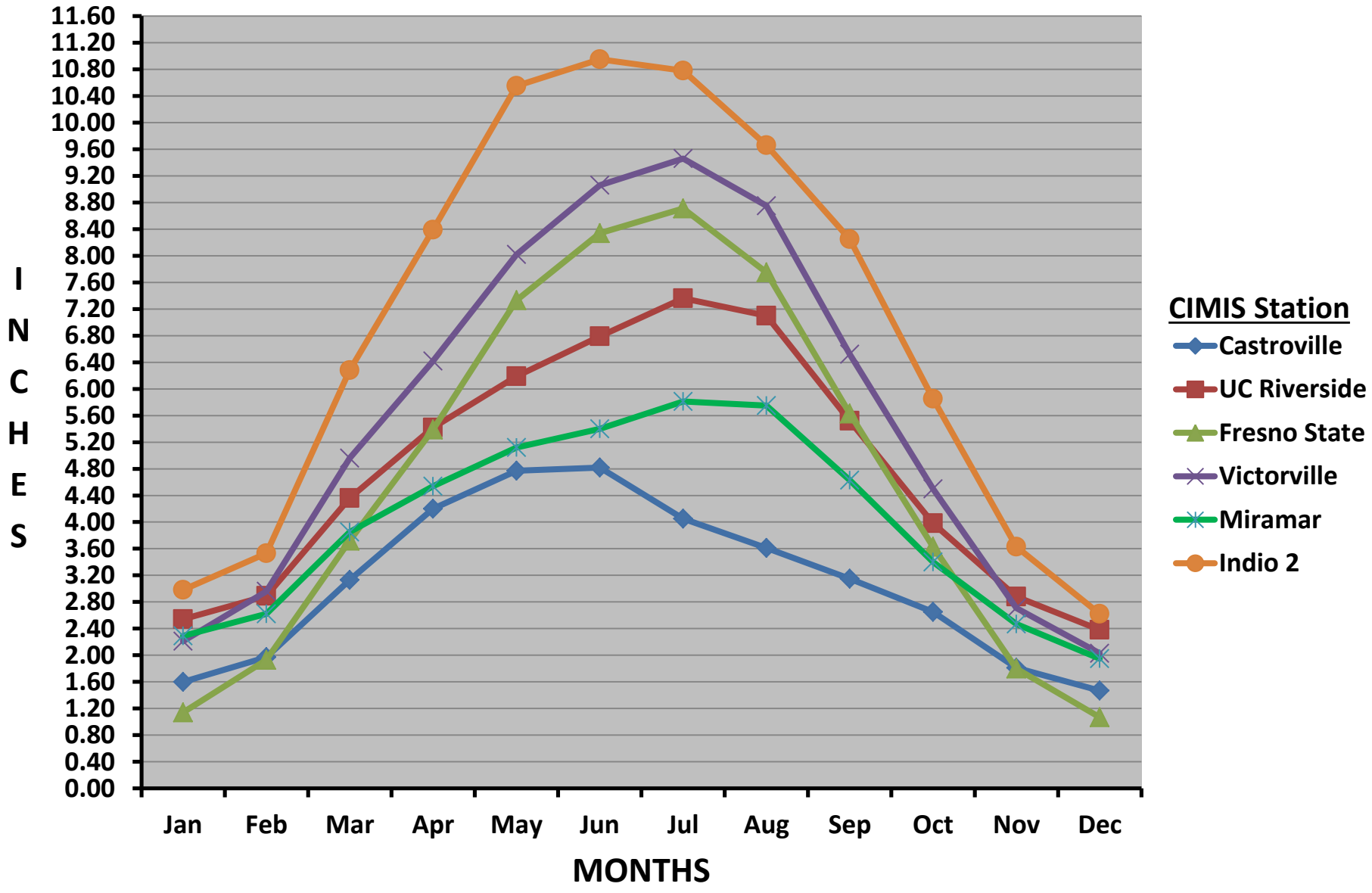
TRUE

ETo = Reference Evapotranspiration

An estimate of environmental water demand over a planted area

- Climate-based reference
- Inches/day
- ETo = estimated water use of well-watered cool-season turf
- Calculated from weather data
  - Sunlight, temperature, RH, wind
  - ASCE Penman-Monteith equation
- Based on field research with agricultural crops

MONTHLY AVERAGE ETo



www.cimis.water.ca.gov

Evapotranspiration

Pomona, CA Average ETo (in.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mo.	1.95	2.35	3.67	4.62	5.27	5.93	6.52	6.38	4.87	3.39	2.26	1.64	**48.9**
Wk.	0.4	0.6	0.8	1.1	1.2	1.4	1.5	1.5	1.1	0.8	0.6	0.4	
Day	0.06	0.08	0.12	0.15	0.17	0.20	0.21	0.21	0.16	0.11	0.08	0.05	

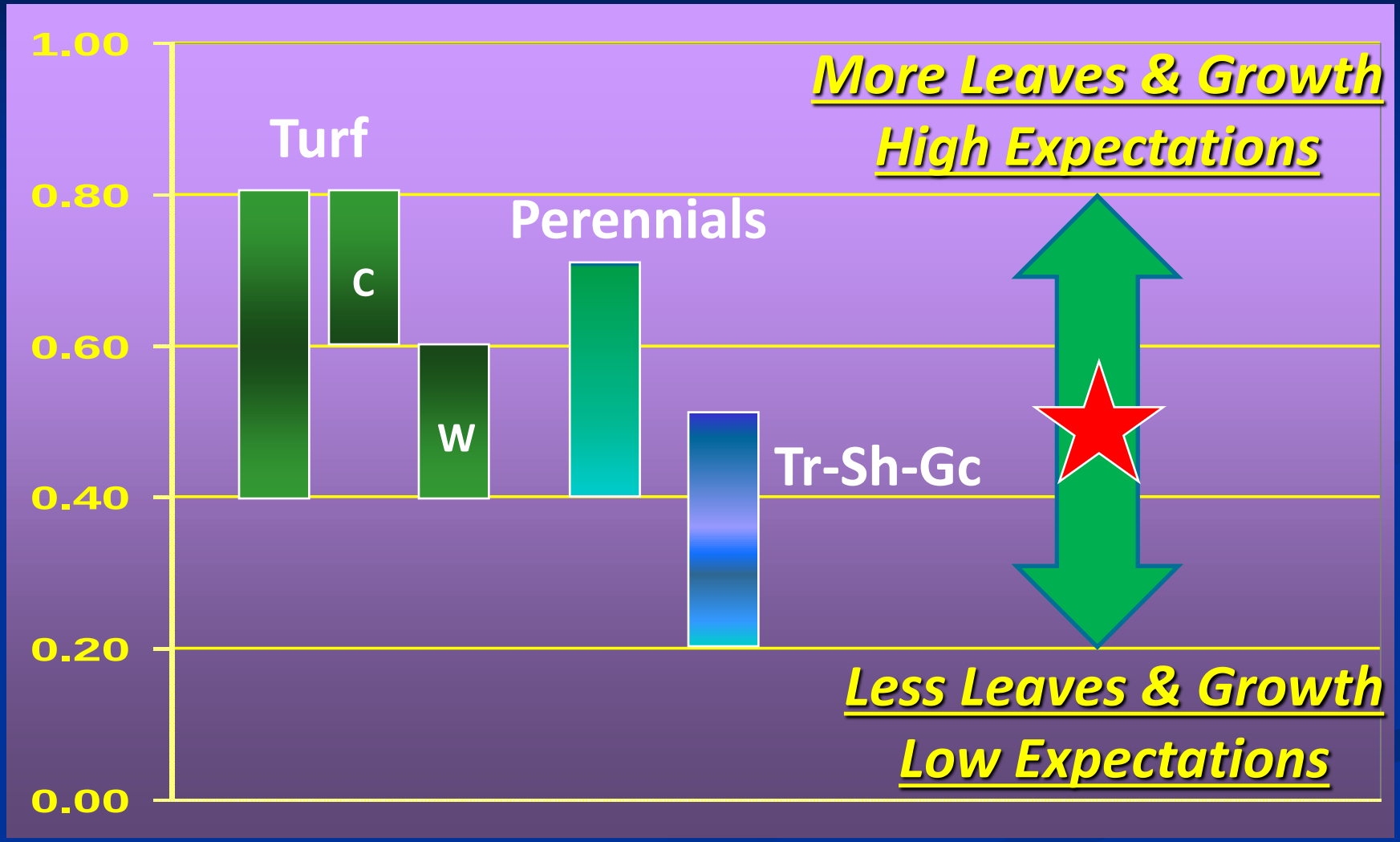
www.cimis.water.ca.gov

Limitations of Reference ET (ETo)

- *ETo tells you nothing about what plants are actually doing!!!*
- *ETo marginally estimates non-turf water use characteristics*

Estimating Plant Water Needs Through Science

Percent of ET Required



Estimating Landscape Water Requirement

Accurate and Simple Equation

Gallons = ETo × PF × LA × 0.623

gallons = inches × % × sq. ft. × conversion

- ETo = reference evapotranspiration; climate impact
- PF = plant material adjustment factor
- LA = sq. ft. landscape area
- 0.62 = converts depth to volume [gal. ÷ (in. x sq. ft.)]

ANSI/ASABE Standard S623

Plant Factors (Fraction of ET_o) for estimating water required to maintain acceptable appearance of established landscape plants	
Plant Type	**Plant Factor**
Turf-Cool Season	**0.8**
Turf-Warm Season	**0.6**
Woody/Herb. Peren'ls.- Humid	**0.7**
Woody /Herb. Peren'ls.- Arid	**0.5**
Desert plants	**0.3**

- Los Angeles County/UC Riverside

WUCOLS

Water Use Classification of Landscape Species

Landscape Coefficient (K_L)

$$K_L = K_{PLANTS} \times K_{VEG.\ DENSITY} \times K_{MICROCLIMATE}$$

Easy Calculators for *Amount*

http://ucanr.edu/cluh →

Landscape Water Conservation → *Easy Calculators*

Gallons per day or week or inches per week

Increase amounts to account for system inefficiency

“Ballpark” Irrigation Intervals

June-July-August

- Overhead Irrigation
  - Turfgrass: 2-3/wk. or ev. 2 d. @1.2 in./wk ÷ DU
  - Tree-Shr-Grdcvr: 1 ev. 10-14 days @1.0 in.
  - Perennials: 1 ev. 3-5 days @0.5-1.0 in.
- Drip Irrigation – *non-grid*
  - Wet ≥50% of root zone
  - Irrigate every 2-5 days
- Drip Irrigation – *grid*
  - Same as overhead

Improve Irrigation Schedules & Management

Deficit Irrigate

- Extend time between irrigations by 10-30%
- Wet entire root zone
- Woody plants tolerate well
- Cool-season grass least tolerant

Approximate Minimum Water Required to Keep Plants Alive

- Lawns
  - c-s (60% ETo): 0.5 inches every 3-5 days
  - w-s (40% ETo): 0.75 in. every 7-10 days
- Trees/Shrubs/Vines/Groundcovers (20-30% ETo)
  - 1.0-2.0 in. every 14-21 days
- Perennials (30-40% ETo)
  - 1.0 in. every 7 days

But how long can they go at this regime??

Adjust Cultural Practices
Turfgrass

- Raise mowing height
  - Tall fescue = 3+ inches
  - Common bermuda , w.s. = 1.5+ inches
- Aerate, reduce compaction

Adjust Cultural Practices
Turfgrass

- Limit N fertilizer to 3-4 lb. N per 1,000 s.f. per yr.
  - 0.5-1.0 lb./1,000 sf./app.
  - Tall fescue = spring & fall
  - Bermuda, w.s. = spring <u>thru</u> fall
- Slow-release N

Adjust Cultural Practices

Trees, Shrubs, Groundcovers, Perennials

- Trees, Shrubs, Grndcvers:

  No fertilizer

- Perennials:
  - 1-2 lb./1,000 sq. ft./yr.
  - Apply with early growth flush

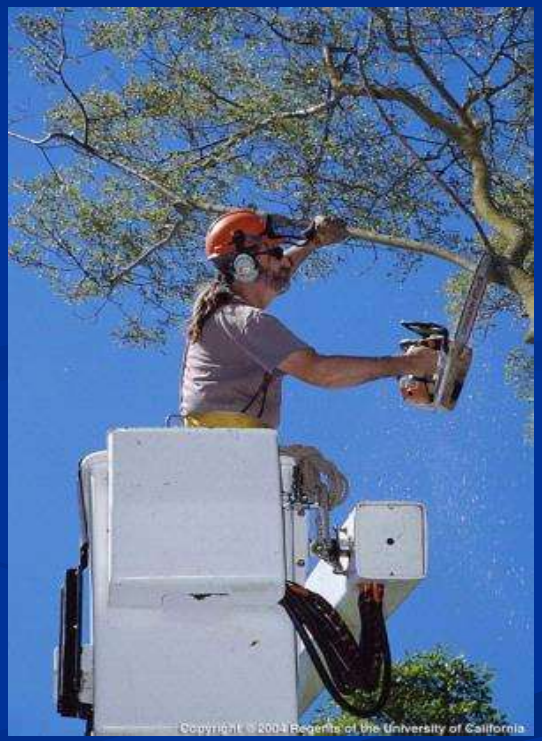
- Mulch bare soil:

  coarse, 2-4 in. deep

Adjust Cultural Practices

Trees, Shrubs, Groundcovers, Perennials

- Renovate/mow groundcovers
  - After flower flush
  - Prior to spring growth flush for non-flowering
  - Mid-season for rapid growers
- Minimize tree & shrub pruning
  - Diseased, broken, damaged branches
  - Poorly structured or spaced branches



Reduce Turf/Alter Plant Palette

- Functional turf only
  - Play & walk-on surfaces
  - Erosion, mud, dust control
  - Cooling
- Convert to warm-season grass
- Separate irrigation zones for turf

Landscape Retrofits/Turf Replacement

- Difficult to irrigate areas
- No planting during drought!!

Not Hydrozoned

- Trees irrigated with turf
- All 80% ETo

Hydrozoned

- Turf irrigated separately
- Part 50%, part 80% ETo
- Lower water demand

Reduce Planted Area

Photo Credit: Larsen Landscape

Possible Consequences when Reducing Planted Area

- Potential Pros
  - Less water demand
  - Less maintenance
  - Similar cooling
- Potential Cons
  - Similar maintenance
  - Increased heat
  - Increased erosion
  - Altered habitat
  - Expensive to install

Dealing with Drought & Landscape Watering Restrictions

- Improve Irrigation System Performance
- Improve/Adjust Irrigation Schedules
- Adjust Cultural Practices
- Reduce Turf Area
- Reduce Total Landscaped Area

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