## **Irrigating Trees**





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## Irrigation Scheduling Involves Applying the Right Amount of Water at the Right Time



What Factors are Involved in Irrigation Scheduling?

Plant Water Use
Soil Water Holding Capacity
Water Infiltration Rate
Plant Rooting Depth
Irrigation System Output

### **Plant Water Use**

Varies Among Species
Influenced by Microclimate
Varies by Density

ET (Landscape Species) = ETo (reference evapotranspiration) x Kc (crop coefficient)

## **Reference Evapotranspiration** (ETo)

ETo = The amount of water used by a large uniform planting of a cool-season grass growing 3-6 inches tall and given unlimited water.

### **Factors that Determine ETo**

Solar radiation
Temperature
Wind speed
Relative humidity

www.cimis.water.ca.gov

California Irrigation Management Information System



#### **CIMIS Station**

# Avg. Monthly Irrigation Percentages

**Monthly Irrigation Index without Rain** 



### Average (mean) ETo



### Plant Requirements Based on UC Research

Potentilla tabernaemontani 0.5 - 0.75 Sedum acre 0.25 Cerastium tomentosum 0.25 Liquidambar styraciflua 0.20 Quercus ilex 0.20 Ficus microcarpa nitida 0.20 Hedera helix Ôneddlepointo 0.20 Drosanthemum hispidum 0.20 Gazania hybrida 0.25-0.50 Vinca major 0.30 Baccharis pilularis 0.20

### Plant ET often higher than actual water required for acceptable performance (Mesquite and Ficus)



### Water Needs of the Same Species Varies Depending on Microclimate

 Landscape plants in heat islands require up to 50% more water than the same species in park settings











### **Shade Vs Full Sun**







### **Hydrozone : Plant Species with Similar Water Needs Together**





## Plant Density Affects Water Requirement



### Multi-tiered canopy uses more water than single tier canopy





## **Low Density Planting**



### **DWR WATER BUDGET**

\*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

### **Example of Maximum Applied Water Allowance (MAWA)**

Greater LA Basin (annual historical ETo = 51.1 in)
Hypothetical Landscape Area = 50,000 sq ft
MAWA = (Eto) (0.7)\* (LA) (0.62)\*\*
MAWA = (51.1) (0.7) (50,000 sq ft) (0.62)
MAWA = 1,108,870 gallons per year

#### \*ET Adjustment Factor \*\* Conversion factor from inches to gallons

**Trees and WUCOLS IV** (Water Use Classification of Landscape Species)

http://ucanr.edu/sites/WUCOLS/WU COLS\_IV\_User\_Manual/Using\_WU COLS\_Evaluations/

### WUCOLS Illustrates Differences Among Species Across Climate Zones

- Variegated Chinese lantern (*Abutilon pictum*) in in the high water use in the Central Valley, moderate in the South Inland region.

- Engelmann oak (*Quercus engelmannii*) is in the very low category in the South Coastal region and low in the North-Central Coastal region. Glendale's protected tree ordinance prohibits "cutting, removing, moving, or encroaching upon the following protected indigenous trees:"

California Live Oak
Valley Oak
Mesa Oak
Scrub Oak
California Sycamore
California Bay







## WUCOLS IV Very Low Water Use

- Red shanks/ribbonwood: (Adenostoma sparsifolium)
- Big Berry Manzanita: (Arctostaphylos glauca)

## WUCOLS IV Low Water Use

- California Fan Palm (*Washingtonia filifera*)
- Mexican Fan Palm (Washingtonia robusta)
- Engelmann Oak (Quercus engelmannii)
- Honey Mesquite (Prosopis glandulosa
- Chilean Mesquite (Prosopis chilensis)
- Red Gum: (*Eucalyptus camaldulensis*)

### WUCOLS IV Moderate Water Use

- Valley Oak: (Quercus lobata)
- California Bay (Umbellularia californica)
- California Black Oak (Quercus kelloggii)
- Sycamore (Platanus rasemosa)
- Indian Laurel Fig (*Ficus microcarpa*)
- Monterey Pine (*Pinus radiata*)

## WUCOLS IV High Water Use

Weeping Willow: (*Salix babylonica*)
Red/River Birch: (*Betula nigra*)
Coast Redwood: (*Sequoia sempervirens*)

## Determining When To Irrigate is as Important as Knowing How Much Water to Apply

#### **Determine Soil Water Holding Capacity**





## Use the 'Feel' Test







#### Medium





### **Depths to Irrigate**

<u>Turf</u> - 8 to 12 in.

<u>Shrubs</u> - Small – 1 ft. - Large – 2 ft.

 $\frac{\text{Trees}}{-\text{Large}-3 \text{ ft.}}$ 

## **Monitor Soil Moisture**



#### Soil probe

#### Soil sampling tube

### **'Whole System' Approach to Irrigation Management**

# Biotic and Abiotic Disorders Often Result From Too Much or Too Little Moisture

### **Engraver Bark Beetle Damage**



## **Engraver Beetle Holes and Sap**

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Drought damage develops in plants when the transpiration rate exceeds the rate of water available for root absorption.

Recently transplanted plants are at greatest risk of drought damage due to root loss.





### **Phytophthora** Root Rot Results from Poorly Drained Soils





### **Oxygen Deprivation/Waterlogging**

- Many tree species decline and eventually die from a lack of oxygen.

- The majority of roots are in the top few inches of the soil and poor drainage can greatly deplete oxygen levels.

### Mulch

Reduces water evaporation from soil

Buffers soil temperature

Reduces weeds

Prevents mechanical weed whip damage

## **Correct Mulch Application?**







# 16 inches of mulch!



# 16 inches of mulch!



Established landscape trees do not require annual fertilization....increases water requirement

Apply no more than ½ lb N per circumference inch of tree trunk

Not producing a crop

## pH and Nutrient Uptake



## **Nitrogen Deficiency**





## **Iron Chlorosis**



## **Thank you!**



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