Gardening in California Under Drought Limitations

Statewide Master Gardener Conference

October 9, 2014

Janet Hartin
UCCE Area Environmental Horticulture Advisor
(San Bernardino, Los Angeles, and Riverside Counties)

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 Given Unlimited Water.

Factors That Determine ETo

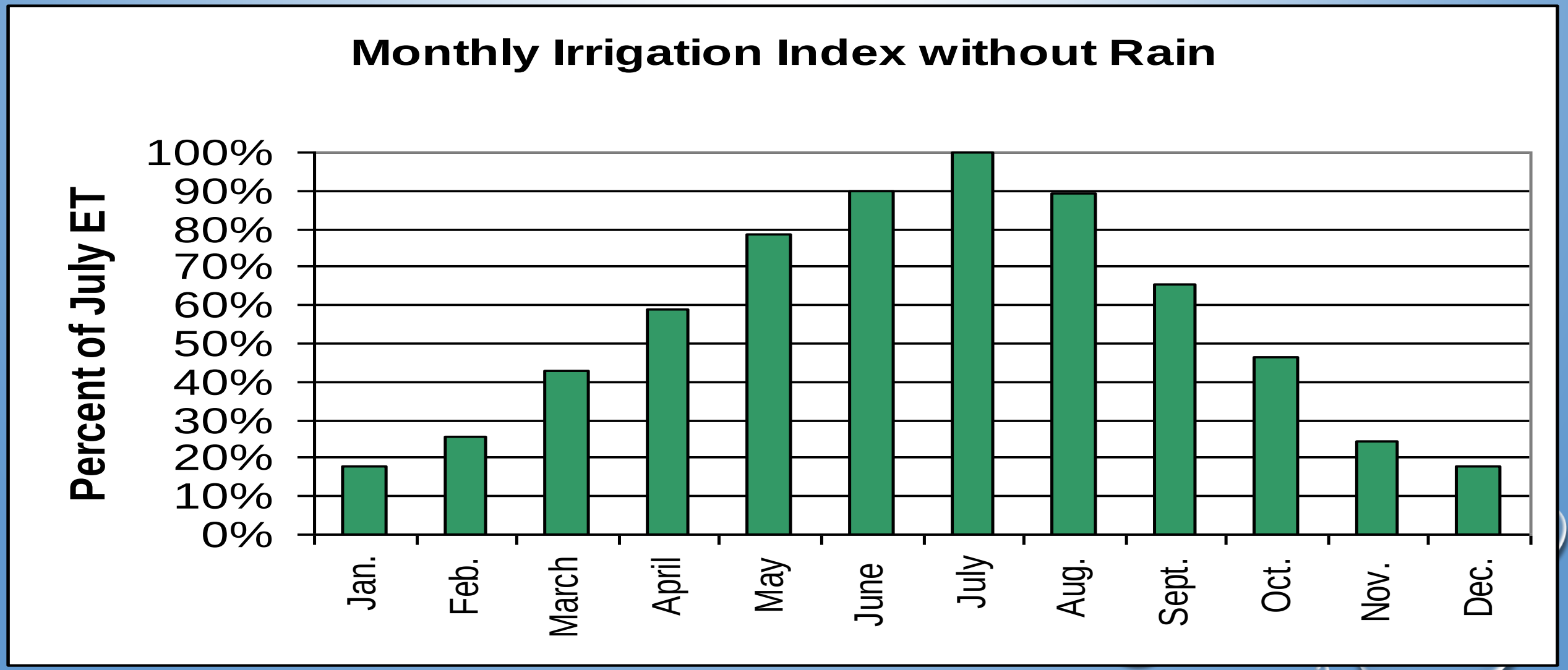
- Solar Radiation
- Temperature
- Wind Speed
- Relative Humidity

www.cimis.water.ca.gov

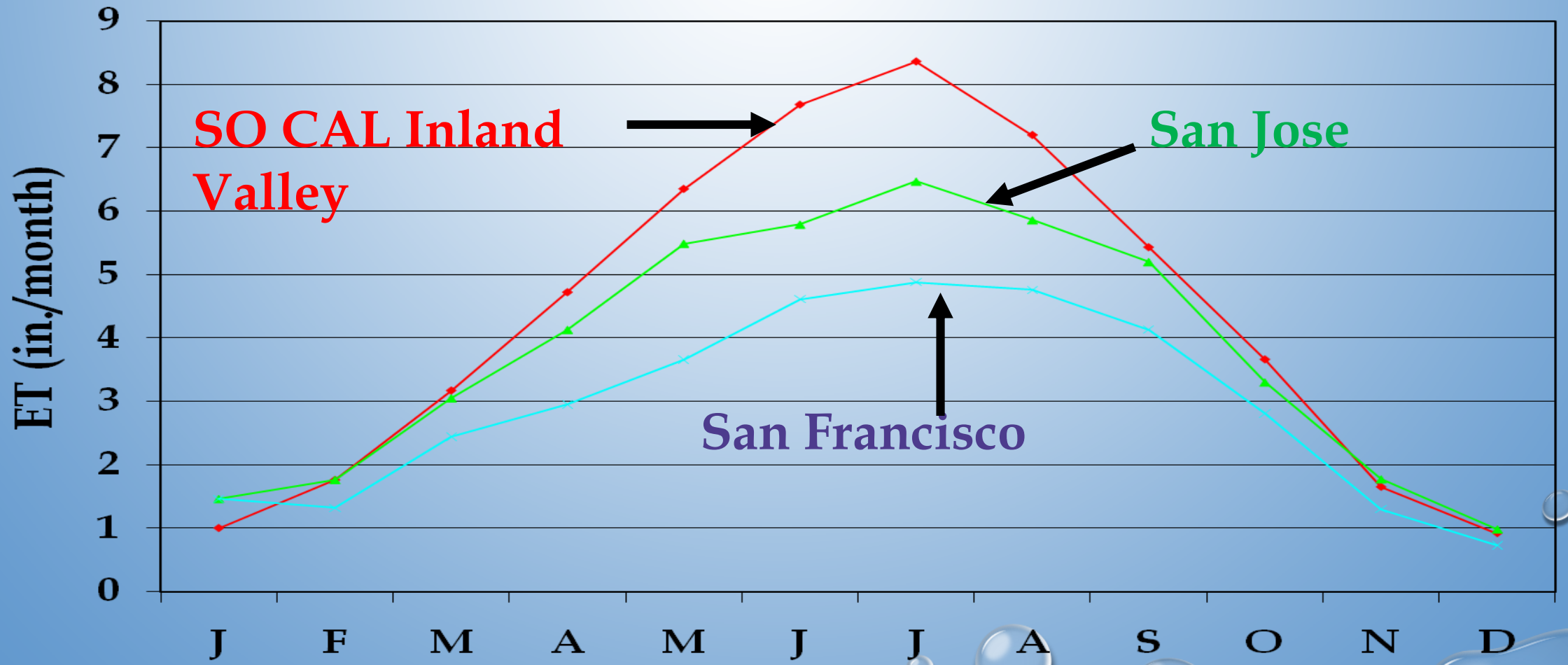
California Irrigation Management Information System

CIMIS Station

Avg. Monthly Irrigation Percentages



Average (Mean) ETo



Plant ET Often Higher Than Actual Water Required For Acceptable Performance (Mesquite And Ficus)

Water Needs of the Same Species Vary Depending on Microclimate

- Landscape Plants in Heat Islands Require up to 50% More Water Than the Same Species in a Park Setting

Shade Vs Full Sun

Hydrozone: Plant Species With Similar Water Needs Together

Planting 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

Lists of Estimated Plant Water Use

- WUCOLS IV (Water Use Classification of Landscape Species): http://ucanr.edu/sites/WUCOLS

- Plantfinder.sunset.com

- California Native Plant Society: http://www.cnps.org/cnps/grownative/lists.php

- Water districts such as:
    - contracosta.watersavingplants.com/listplants.

Differences Exist Among Species Growing Across Climate Zones (WUCOLS)

- Variegated Chinese Lantern (*Abutilon Pictum*) is in the High Water Use Category in the Central Valley but Moderate in the South Inland Region.

- Engelmann Oak (*Quercus Engelmannii*) is in the Very Low Category In The South Coastal Region but Low in the North-central Coastal Region.

Protected Tree Ordinances May Prohibit Cutting, Removing, Moving, Or Encroaching Upon Protected Indigenous Trees:

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

WUCOLS IV
MODERATE WATER USE

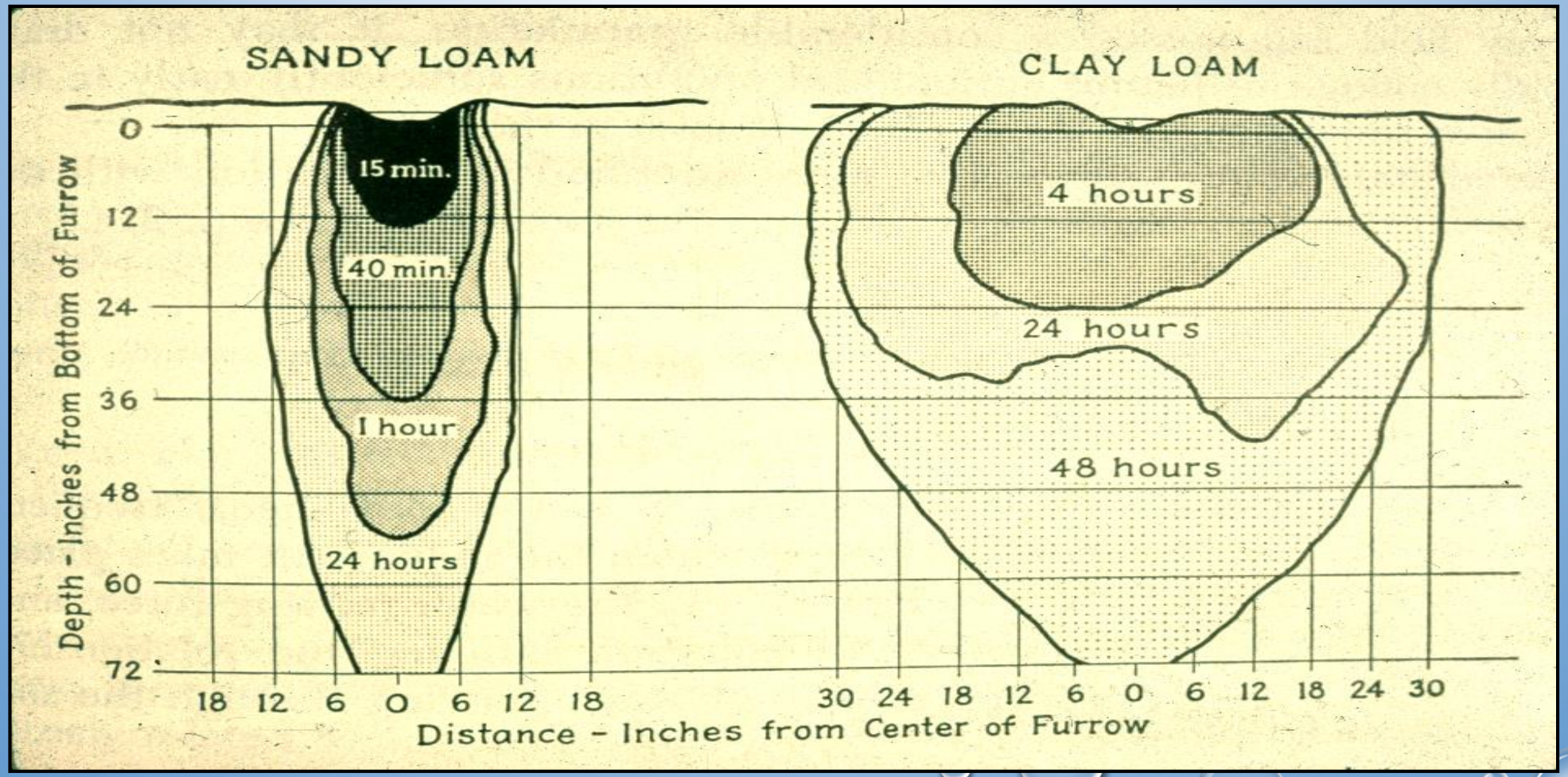
- Valley Oak: (*Quercus Lobata*)
- California Bay (*Umbellularia Californica*)
- California Black Oak *(Quercus Kelloggii*)
- Sycamore (*Platanus Rasemosa*)
- Indian Laurel Fig (*Ficus Microcarpa*)
- Monterey Pine (*Pinus Radiata*)

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

Dry

Medium

Wet

Depths to Irrigate

Turf - 8 To 12 In.

Shrubs - Small: 1 Ft.

- Large: 2 Ft.

Trees - Small: 2 Ft.

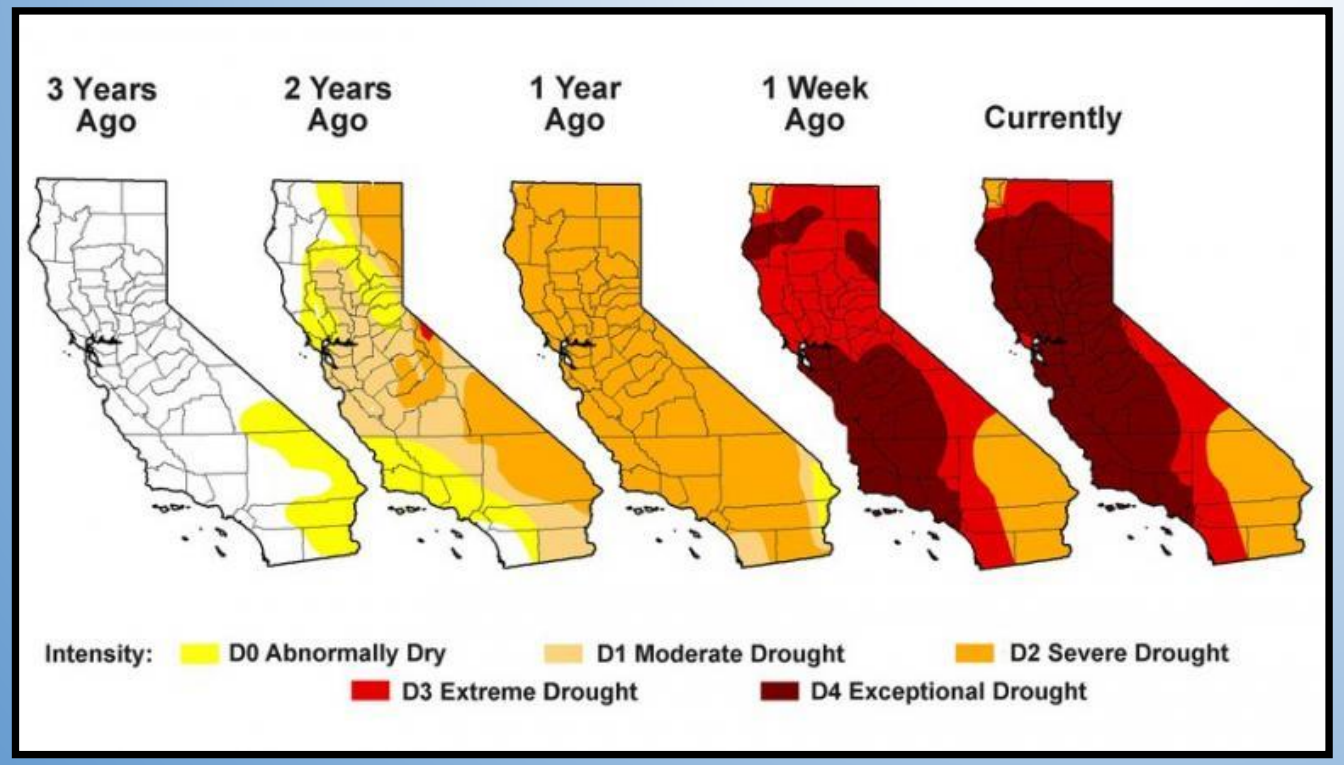
- Large: 3 Ft.

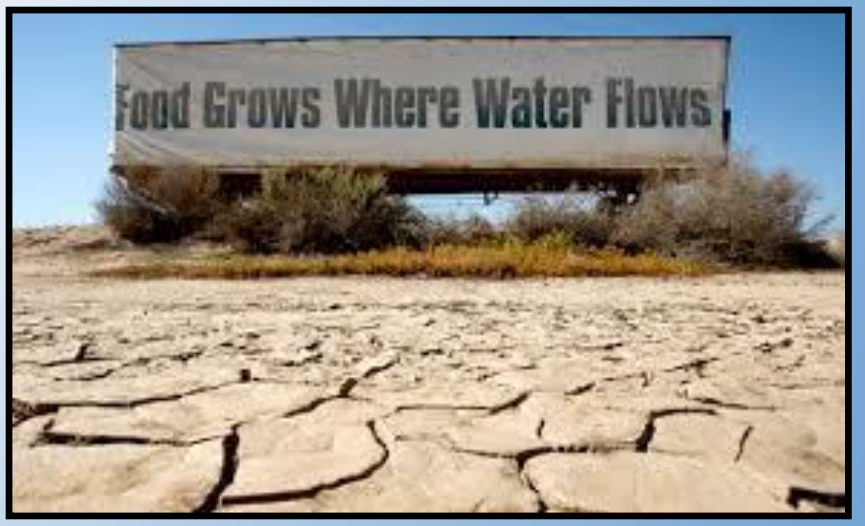
Monitor Soil Moisture

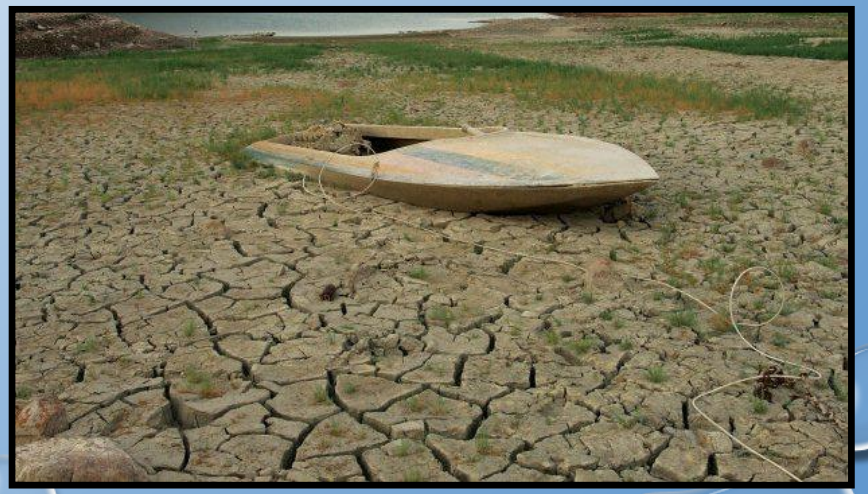
Soil probe

Soil sampling tube

Drought


3 Years Ago
2 Years Ago
1 Year Ago
1 Week Ago
Currently
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought


Food Grows Where Water Flows



- Recently Transplanted Plants are at Greatest Risk of Drought Damage Due To Root Loss.

- Established Plants (trees) are Less at Risk.

Recognizing Early Signs of Drought Stress is Important Because:

- Irreversible damage can occur that no amount of watering will correct
- Mature fruit trees and landscape trees are worth saving!

Common Symptoms of Drought Include:

- Wilting or drooping leaves that do not return to normal by evening
- Curled or chlorotic (yellow) leaves that may fold or drop
- Foliage that becomes grayish and loses its green luster
- New leaves that are smaller than normal
- Lawns that retain a footprint for several minutes


Hosta Drought Damage


Drought
Stress


Turf Drought Damage

Maintaining Various Types of Plants During Water Restrictions and Severe Drought

Ornamental Trees

- Most homeowners wisely choose to use whatever water is available to save their mature landscape ornamentals and fruit trees.
- One or two deep irrigations with a garden hose several weeks apart in spring and summer will often keep these valued plants alive, especially if roots are relatively deep.

(Con’d)

- Two seasons without enough water can result in severe drought stress and even death.
- Drought-stressed trees are more prone to damage from diseases and insects than non-stressed trees.

Engraver Beetles


UC Statewide IPM Project
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(Con’d)

- Watering with a garden hose slowly and deeply will help water reach the root zone. Soaker hoses work well, too.
- Water mature trees several feet out from the trunk and make sure water is moving through the soil several inches deep into the root zone.

Fruit and Nut Trees

- Keeping fruit and nut trees alive during severe water shortages is also possible, although crop production will be reduced or stop.
- To produce a good crop, deciduous fruit and nut trees need adequate water in their root zones continuously from bloom until harvest.

Peaches, Plums, and Nectarines

- Adequate irrigation during the final 4 – 6 weeks before harvest is important to produce fruit. If necessary, reducing water just prior to this period and after harvest are viable strategies.
- If little or no irrigation water is available throughout the season, trees may be kept alive by severely cutting scaffolds back to the trunk (dehorning).

Citrus

- Citrus trees need adequate soil moisture during spring to set fruit and steady water in summer and fall to produce acceptable size, numbers, and quality of fruit.

Vegetables

- Vegetables are difficult to maintain during a drought.
- As a rule of thumb, water is most critical during the first few weeks of development, immediately after transplanting, and during flowering and fruit production.

(Con’d)

- Tomatoes, beans, and root crops such as carrots require regular watering and are not tolerant to long, dry periods. Vine crops such as squash and zucchini often fare better and can be kept alive with a few waterings once or twice a week through the season.

Shrubs

- Most established shrubs can survive long periods of dry soil. Thorough spring watering and one or two thorough waterings in the summer keeps most well-established shrubs alive for at least one season.

Groundcovers

- Groundcovers often survive on about half the amount of water received under optimal conditions, although some dieback may occur.
- To avoid serious drought stress groundcovers require waterings every 3-6 weeks from spring through fall depending on species and soil type and microclimate.

Lawns

- Warm-season lawns such as bermudagrass and buffalograss are more drought-resistant than cool season grasses such as tall fescue and ryegrass and may come back after several weeks of dryness. Cool season grasses may die within a month or two of receiving no water.
- Cutting the length of irrigation down to ½ of that recommended in the UC lawn watering guide (http://anrcatalog.ucdavis.edu/pdf8044.pdf) and watering only once or twice a week may help lawns survive drought.

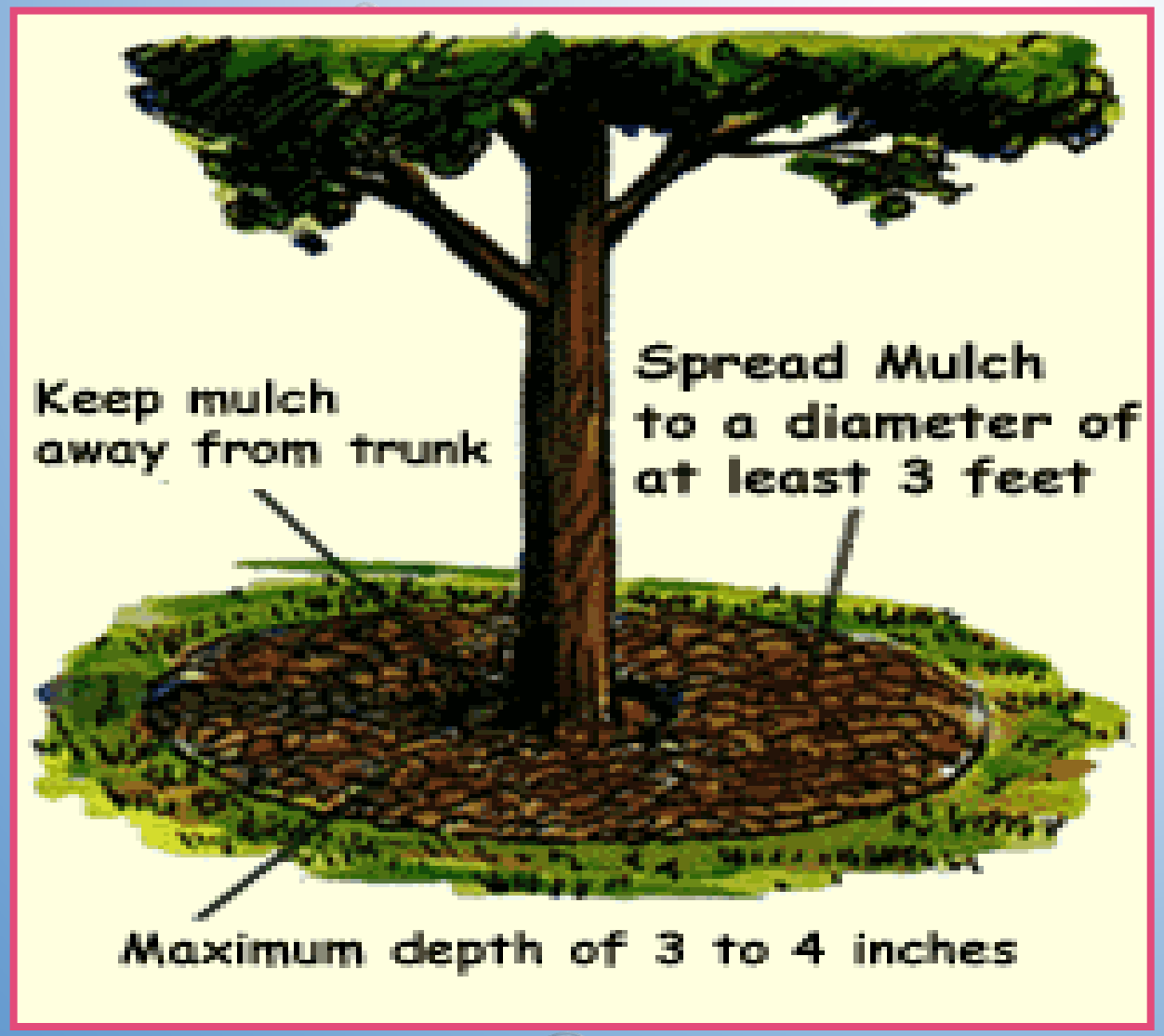
(Con’d)

- Once a lawn stops receiving adequate moisture, it will gradually turn brown and go dormant over time. A lawn that recently turned brown from drought can often be revived with regular, thorough watering.

What Else Can You Do Right Now Without Starting Over?

Mulch

- Apply 2-3” of mulch around garden plants and trees to hold water in and reduce soil evaporation.
- Keep it several inches away from tree trunks!
- Make sure to water beneath the mulch.



What Mistake Do You See?

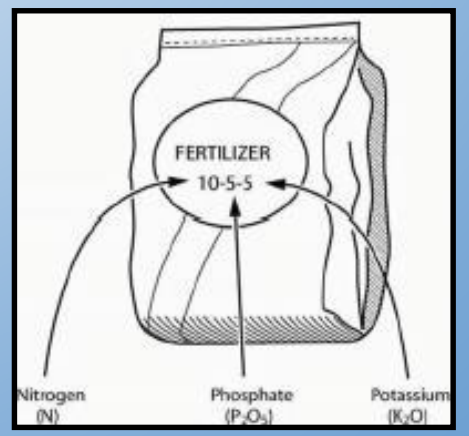
Mulch Volcano!

Avoid Planting New Plants

- Young plants require frequent irrigation until established and should not be planted during a drought or under water restrictions.
- Even native plants require continually moist root zones during establishment.

Avoid Overfertilizing

- Too much nitrogen results in lush, weak new growth, and increases the need for even more water.
- Too much fertilizer can lead to pollution of waterways.



Iron Chlorosis

Keep Weeds Out!

- Weeds often outcompete garden plants and trees for water.
- Avoid using chemical herbicides; hand-weed instead. Overuse of pesticides can lead to waterways pollution.

Use a Broom Instead of a Hose to Clean up After Gardening/Pruning

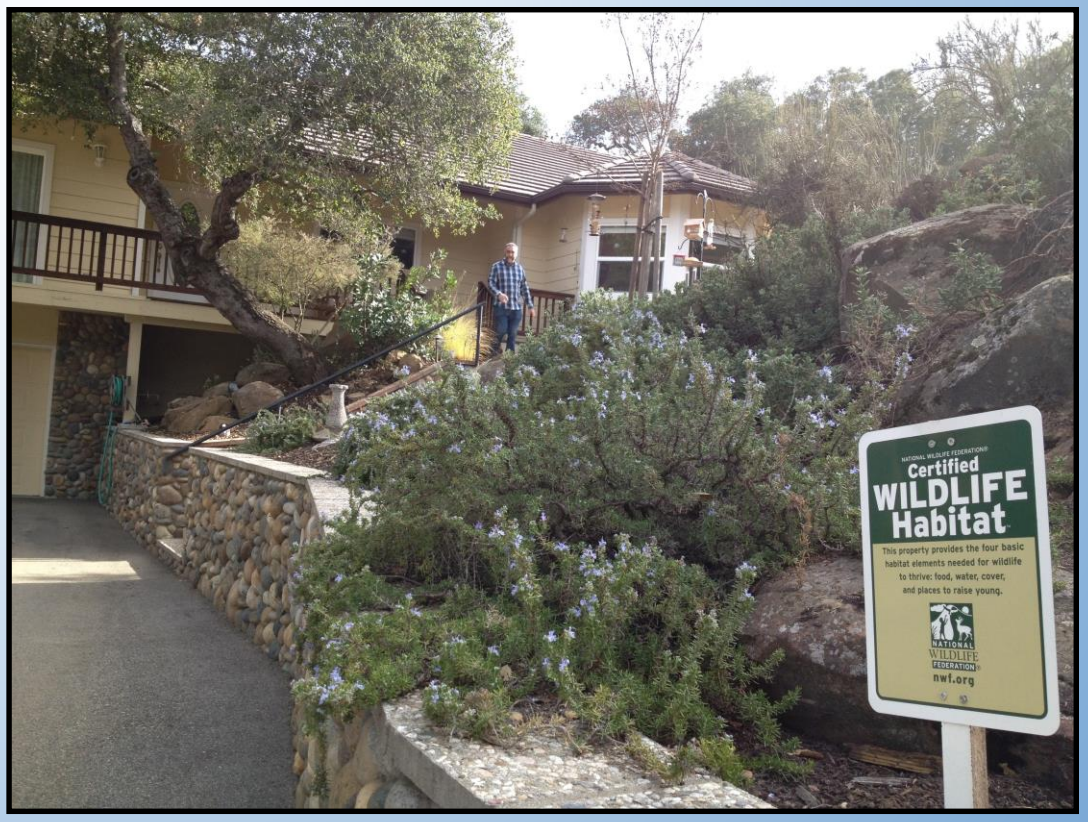
- Save water and avoid polluting waterways.
- Get some exercise!

What about Long-Term Solutions?

- Once water restrictions are lifted think about replacing all or a portion of your lawn with drip-irrigated water-efficient ornamentals.
- Hydrozone: place plants with similar water needs together.
- Before planting, mix compost evenly several inches into garden soil to hold water in longer and decrease the chance of waterway pollution from runoff (clay soils) or draining below the root zone into groundwater (sandy soils).

(CON'D)

- Add 2-3 inches of mulch on top of garden soil and around trees and shrubs, keeping it several inches away from tree trunks.
- Consider adding a graywater system if legal in your jurisdiction. (Graywater systems reuse water from washing machines and showers.) Never apply graywater to edibles or edible plant parts!



Beautify Your Landscape, Protect the Environment, and Save Water, Money, and Time!

Thank You
for Your Service as a UCCE Master Gardener

Questions?

Janet Hartin
jshartin@ucanr.edu
951.313.2023