WATER MANAGEMENT IN URBAN LANDSCAPES

INTRODUCTION

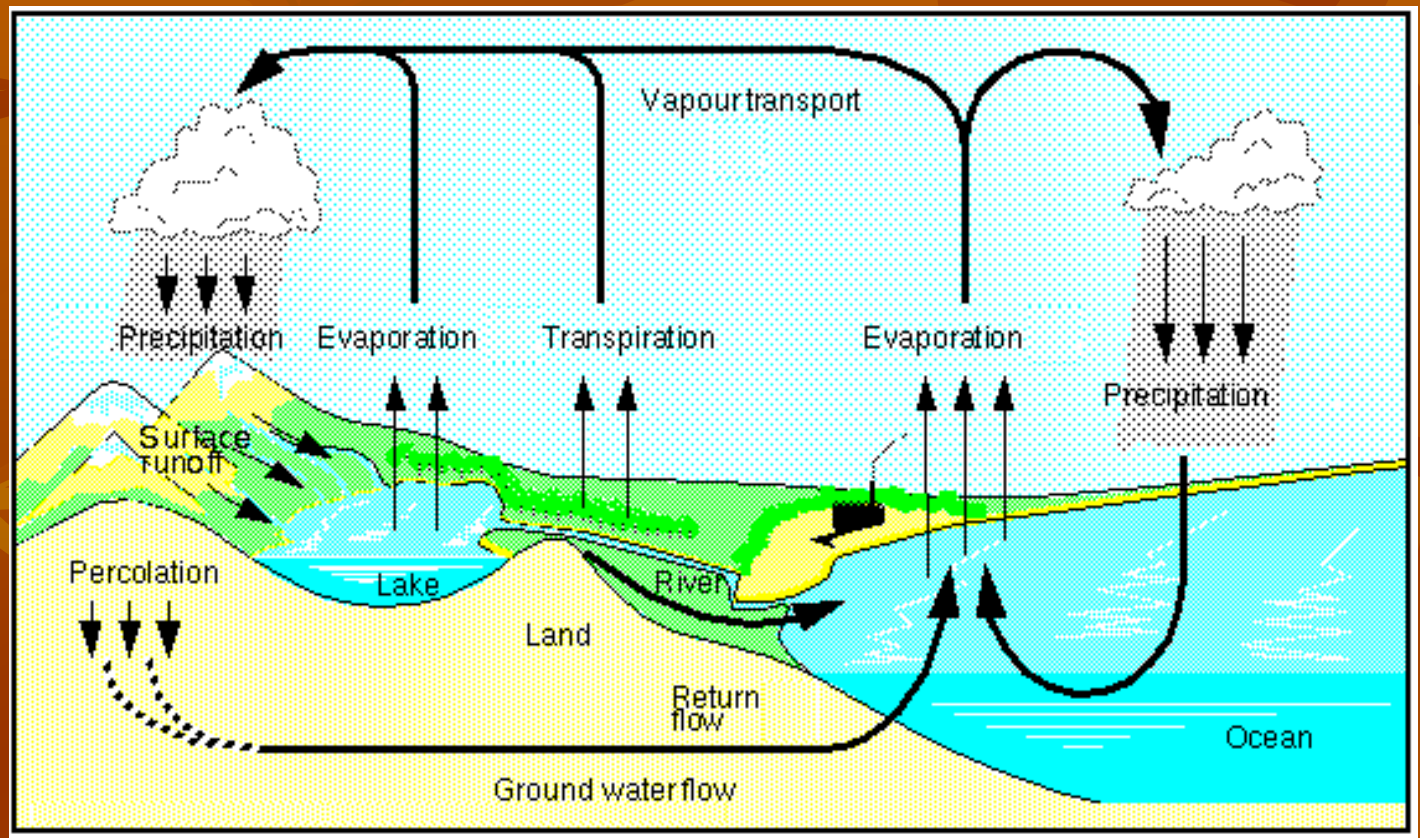
Water is a valuable yet limited resource that is essential for life and required by all land plants in large amounts. In fact, about 90 percent of most plants are comprised of water. Water is necessary for photosynthesis and other biochemical processes, cell turgidity and nutrient transport.

Due to prolonged droughts, uncertainty of future Colorado River water supplies, and state legislation limiting urban landscape water allocations, implementing sound water management practices to insure the health and vitality of California's urban plantings is critical.

The Water Cycle

Understanding the water cycle of plants is useful for developing effective watering schedules and for recognizing and correcting signs of drought stress. Water and minerals in the soil enter plants through roots and are transported to shoots in the xylem.

Eventually water is returned to the atmosphere in the form of vapor in a process called transpiration.



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

Plant Water Use

Evapotranspiration (ET) is the combined water loss from transpiration (from plants) and evaporation (from soil surfaces) and approximates the water requirement of a plant. On hot summer days, some trees lose a hundred gallons of water or more through this process. ET rates vary among plant species, and are driven by temperature, relative humidity, solar radiation,

and wind speed.

Increasing Landscape Irrigation Efficiency

Visitors to the arboretum find the perfect vantage point

Turfgrass Irrigation Scheduling

Using the Lawn Watering Guide

- Helps determine how much water to apply
- When to apply it

Scheduling irrigations based on water requirements of the turfgrass and maintaining a high distribution uniformity (DU) of the sprinkler system are keys to healthy, water efficient plantings.

Too much water can result in diseased turf and unsafe, flooded parks and playing fields, while too little water can lead to a thin stand of poorly growing grass with low vigor, poor recuperative ability and appearance, and unsafe playing conditions.

Soggy Unsafe Field

Reference Evapotranspiration (ETo)

- An estimate of the amount of water used by healthy 4 to 6 inch-tall cool season grass.

The Lawn Watering Guide is most useful when climatic conditions are near average. During an unusual persistent weather pattern it may not accurately predict ET and the grass should be monitored for signs of too much or too little water with corrections made.

Poor Distribution Uniformity

Common Problems with Sprinklers that Reduce Distribution Uniformity

- Unmatched sprinklers
- Broken sprinklers
- Sunken sprinklers
- Crooked sprinklers
- Turfgrass growing aournd sprinklers
- Sand or debris plugging sprinklers

80% Distribution Uniformity

A typical catch can.

Even Watering

How to Use the Lawn Watering Guide

1. Determine the sprinkler system precipitation rate (output) using a ‘can’ test

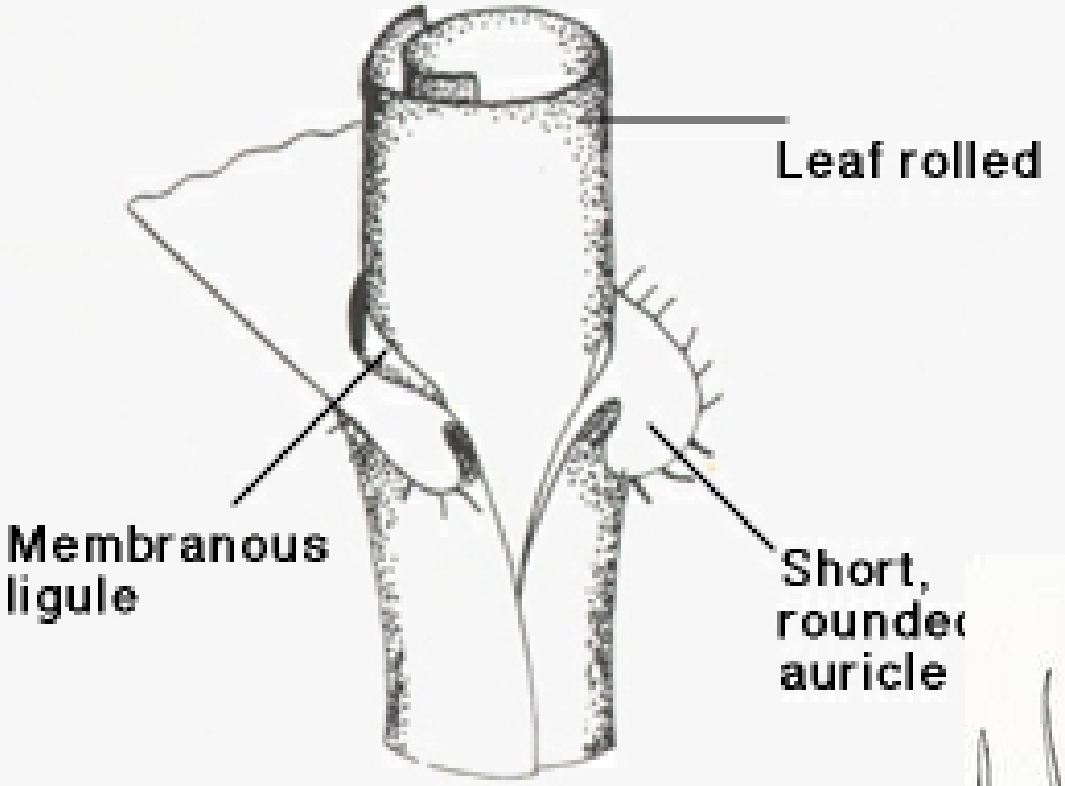
2. Run the system for 15 minutes and measure the depth of water in each can (if straight sided cans are used)

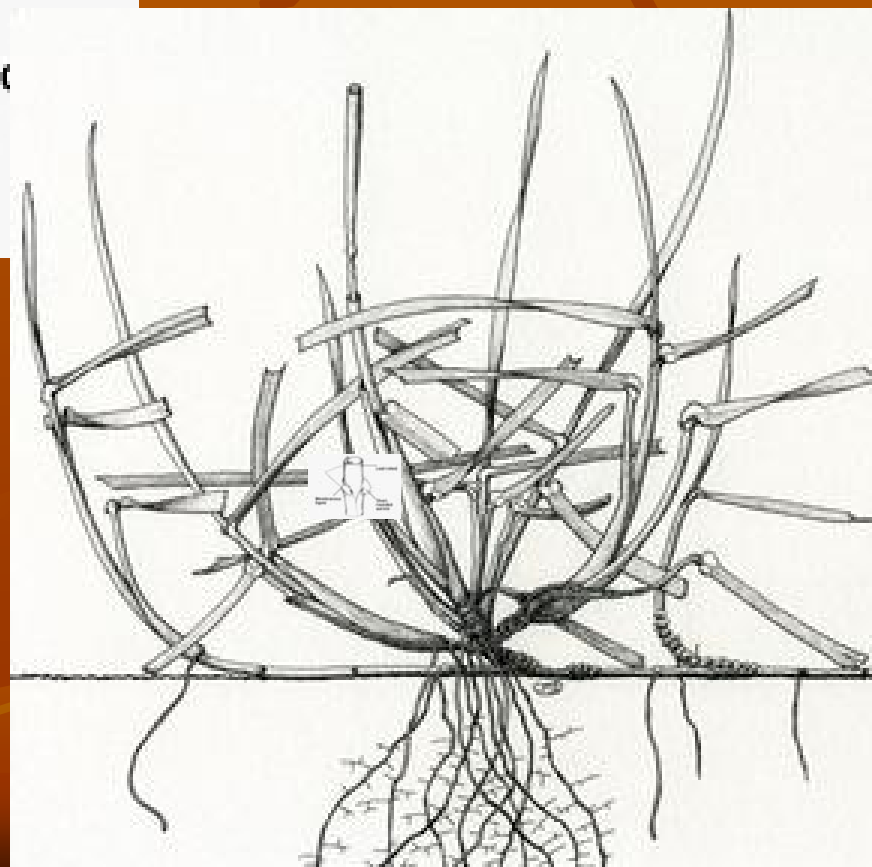
3. Determine the average (mean) amount of water per can and multiply by 4 to determine hourly output (precipitation rate)

- Find the appropriate geographical area in Table 1 in the ***Lawn Watering Guide*** tables (Southern CA coast, inland valleys, or desert) and use the correct table for either warm or cool season grass.

85-90% of cool season grasses are Tall Fescues

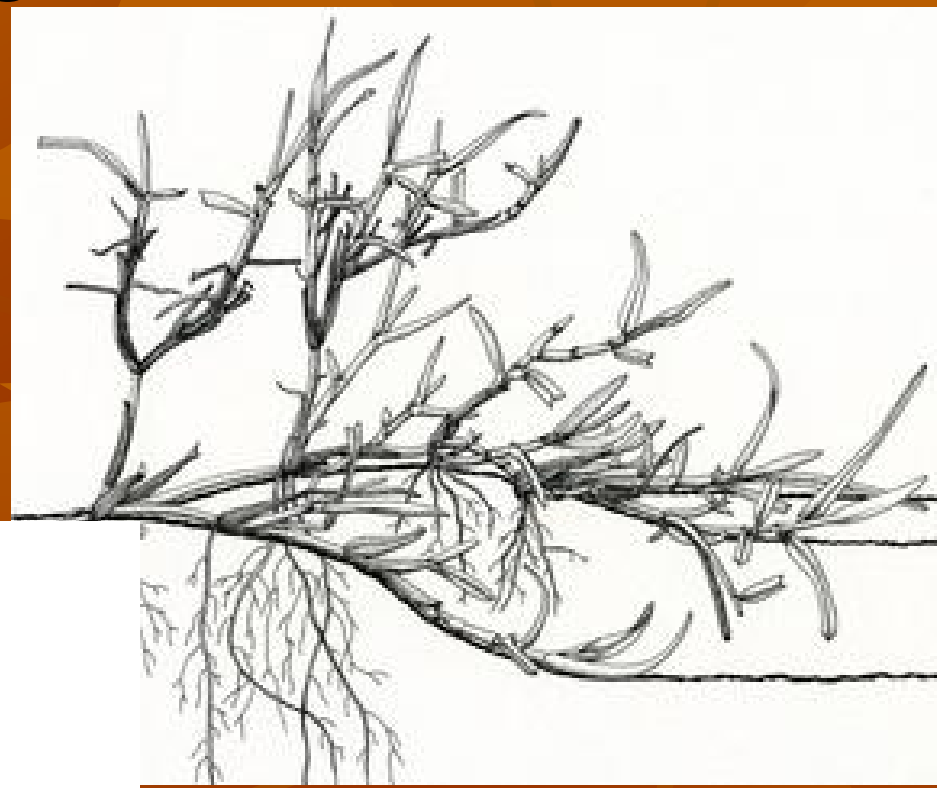
Tall Fescue Morphology

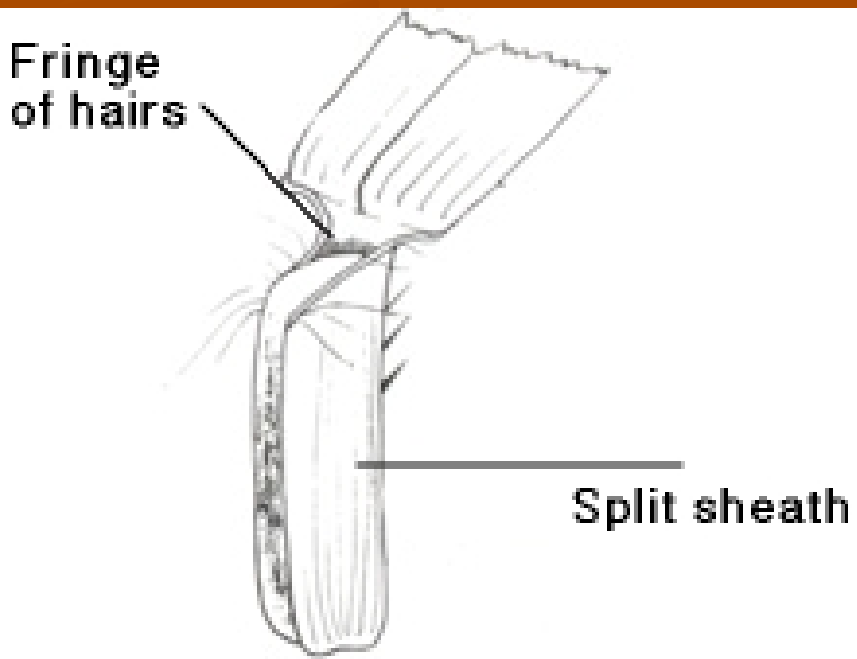




Bermudagrass (main warm season turfgrass)

Bermudagrass Morphology





- Use the precipitation rate in the table that comes closest to, but does not exceed, the determined precipitation rate. The columns in **Table 2** indicate the total number of minutes to irrigate weekly. Divide this number by 2, 3, or 4 depending on how many minutes a single irrigation can run before runoff just starts.

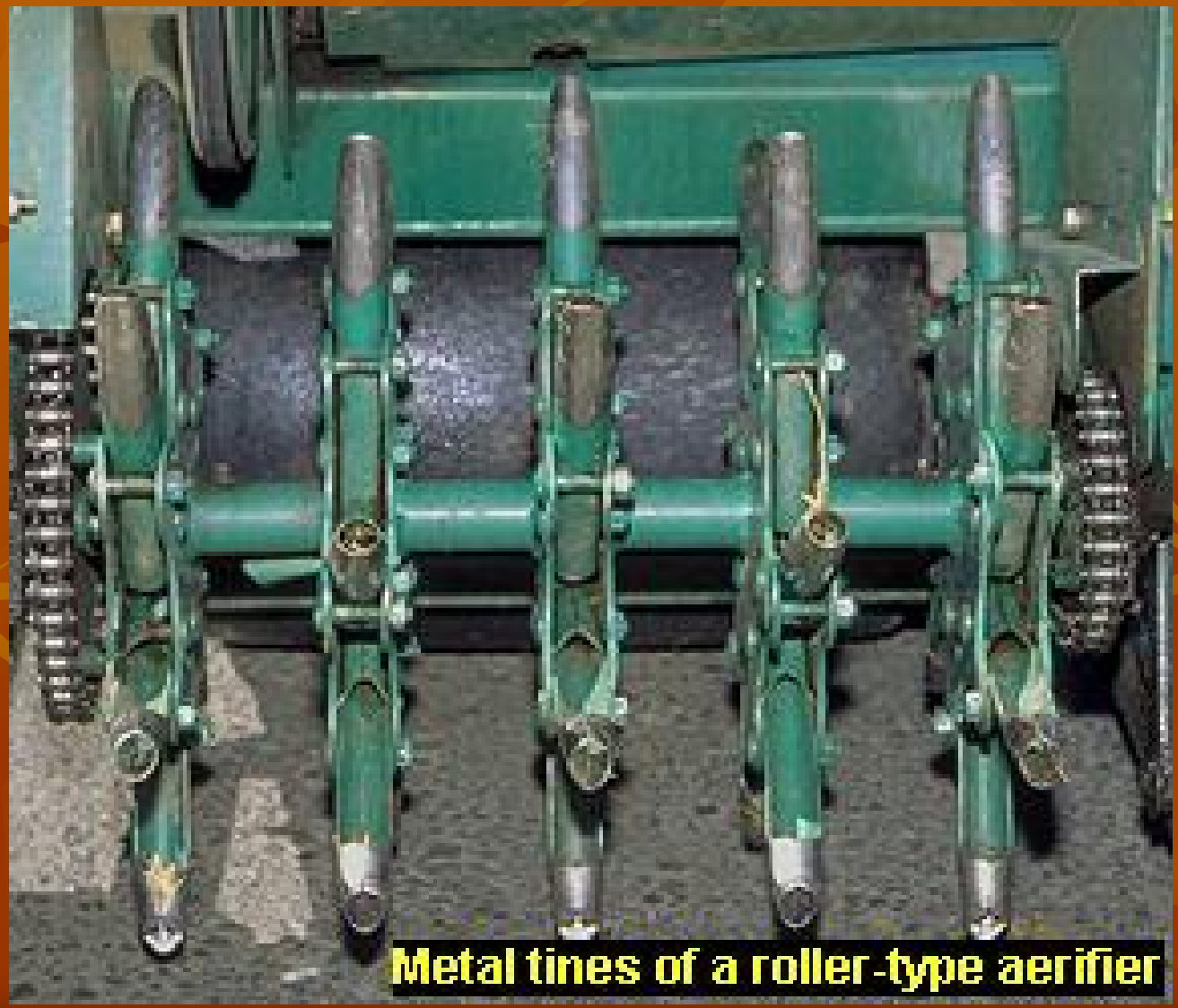
- On slopes and soils that do not absorb water quickly, irrigation cycling is recommended. Water until runoff starts, wait 10 or 15 minutes and irrigate a second time, and possibly, a third time until the required amount of water for that particular day has been applied.

CIMIS Station


Brown Patch

Grasscycling

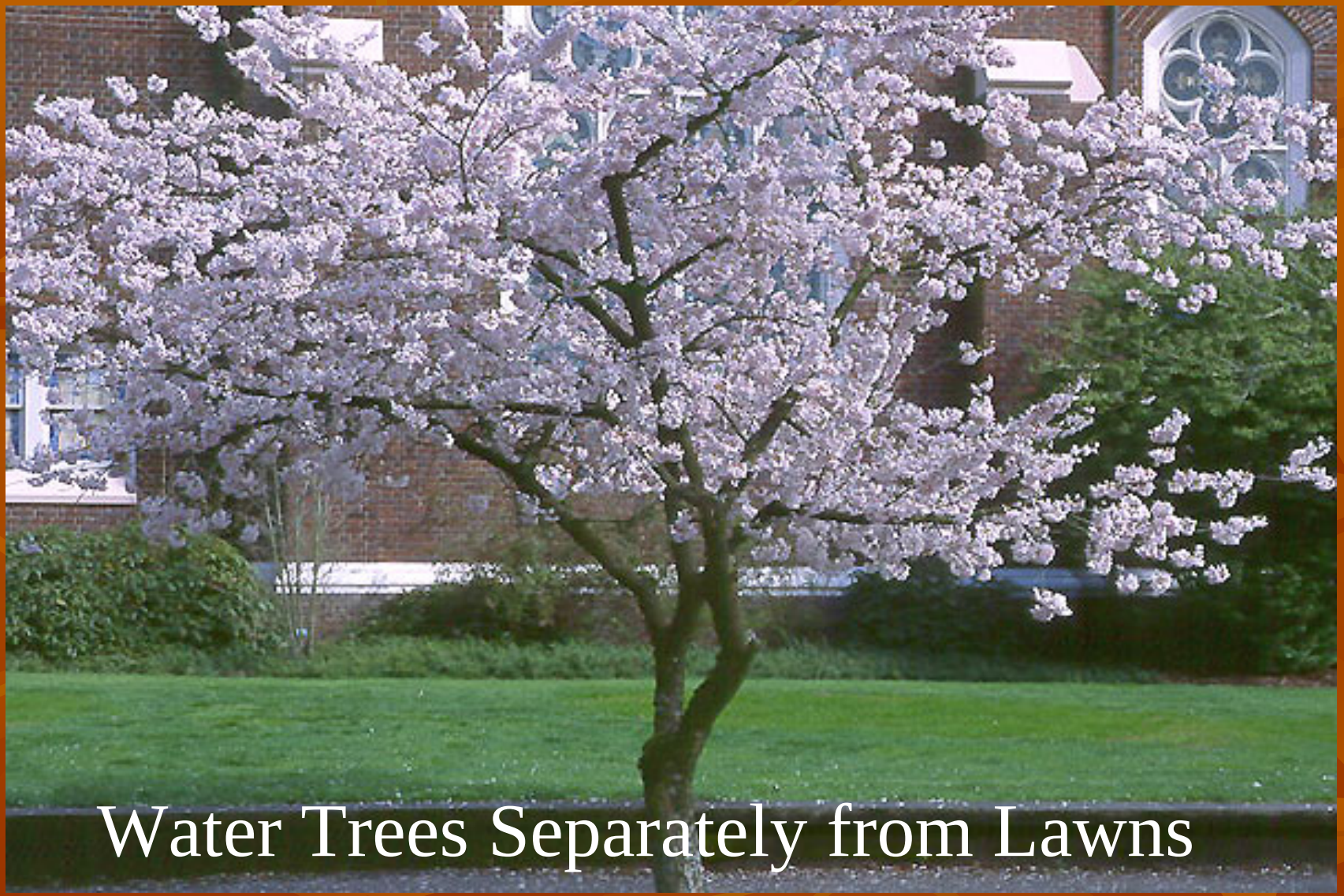
Aerating



Managing Soil Compaction

Irrigating Landscape Trees

Water Deeply and Infrequently Once Established


Water Trees Separately from Lawns

Mixed Landscapes

Hydroscape

Landscape Tree Irrigation

- Most landscape trees require at least some water throughout their establishment period

- Properly scheduling irrigations based on reference evapotranspiration (ETo) and applying the water into the root zone are important practices

Most root growth occurs during the summer. Adequate irrigation during this time is crucial, especially during establishment. Newly planted trees grow quickest with light infrequent irrigations in the root zone. During each irrigation, apply two gallons of water per inch trunk diameter. In dry, desert climates, filling a soil berm works well, extending below the planting area.

- **Studies indicate that mature landscape trees prefer more infrequent deep irrigations than do non-woody plants such as turf. Knowing when to irrigate is as important as knowing how much water to apply. Soil texture and species preference largely determine when to irrigate.**

- **Mature landscape trees receiving 40–60% ETo often perform as well as trees receiving more water with added benefit of reduced incidence of water-borne diseases. This is approximately as much water as warm season grasses.**

Estimating Drainage and Depth of Water Penetration

Adequate soil drainage is an essential part of successful landscaping, particularly for avocado and landscape tree plantings. To test drainage where a tree will potentially be planted, dig a 30” deep hole and fill it with water. Wait 24 hours and fill the hole with water once again. If the water level drops 2 inches or more in 2 hours, drainage is adequate.

Pushing a long handled screwdriver, soil probe, or stiff piece of wire into the soil as far as possible is a good indicator of how deeply the water has penetrated. When the implement reaches dry soil, it will be very difficult to force it down further; most roots will be above that depth.

Recommended Methods of Conserving Water Around Trees

- Irrigate early in the morning to reduce soil evaporation
- Irrigate trees separately from surrounding vegetation whenever possible (hydrozone)
- Keep turf and other plants at least 1 ft from tree trunks

- Control weeds around trees
- Avoid soil compaction
- Do not routinely fertilize trees
- Prune trees according to professional guidelines

Mulch

- Reduces water evaporation from soil
- Buffers soil temperature
- Reduces weeds
- Prevents mechanical weed whip damage

Before

After


7 18 '00

Mulch is beneficial for tree growth and development

Weed and turf suppression in the root zone during establishment is essential. This can be accomplished by mulching or maintaining the soil around the root ball weed free with herbicides. Organic mulches have the advantage of adding much needed organic matter to the system.

Apply a 3-inch thick (after settling) layer of mulch at least 8’ in diameter around the tree to discourage weeds and turf. Maintain this area during tree establishment at least 2’ in diameter for each inch of tree trunk diameter. To encourage rapid establishment, minimum diameter should be 8 feet for trees with a trunk diameter less than 3”.

Mulch placed against the trunk and/or applying too thick a layer can kill a tree by holding water, depleting oxygen , causing stem and root diseases, increasing the potential for rodent damage, and keeping the root ball too wet.

16 inches of mulch!

Trees planted on a mound

- Fresh wood chips, in some cases, enhance pathogens such as Fusarium and should be avoided around susceptible species of landscape trees. Or, they may be applied on top of composted mulches. Other choices in windy areas are inorganic based synthetic mulches such as rubber or lava rock.

Avoid root bound trees!

Result of Circled Roots

High Quality Root System

Plant twice as wide and at same level tree was in container

Ash Tree with Circled Roots Planted in Too Small of a Planting Hole

Tree Planted Too Deep

Fun = Compaction

The most important way to encourage rapid recovery from transplanting in compacted soil is to loosen soil around the planting hole in as large an area as possible. A 10 to 15 foot-wide loosened soil area is not be too large. Locate about 25% of the root ball above the surrounding landscape soil by planting on a mound of soil.

Soil Amendments

Soil amendments are excellent additions to flower and vegetable gardens and in soils where small woody ornamentals are desired, but should be avoided in tree planting holes. Mature trees grown in amended soil are prone to poor structural integrity due to a tendency for roots growing in amended soils to grow less deeply as they would in unamended, yet adequately aerated soils.

Thank You!

- (951)313-2023
- jshartin@ucdavis.edu