

Waterwise Tree Care

Help trees survive drought: Tips for inland Southern California

Water, or the lack of it, should never be far from the minds of southern Californians. Whether it is due to drought or climate change, water is rapidly becoming a more limited and expensive resource.

Like water, trees are also a precious resource. Trees can suffer and decline if they are in landscapes where watering is decreased due to shortage or drought. During those periods, you may be asked to cut back on watering your yard. Trees should be given a higher priority over lawns and shrubs, because trees take many years to mature. Grass and small shrubs are relatively quick to replace. Make sure you keep your trees alive and healthy by providing adequate water.

Urban trees provide many benefits worth preserving, including shade, energy savings, improved air quality, higher property values, wildlife nesting sites and food sources, improved quality of life, plus control of storm water, erosion and climate extremes. According to research by the USDA Forest Service* an average tree in the Inland Empire provides \$3880 of benefits.

*Trees Pay Us Back by the USDA Forest Service Pacific Southwest Research Station: http://www.fs.fed.us/psw/programs/uesd/uep/products/18/804uesd_uep_tpub_InlandEmpire.pdf



PHOTO BY DIANA RUIZ



PHOTO BY NANCY SAPPINGTON

How can you tell if a tree is under stress?

- Wilting, curling, graying or yellowing of leaves and browning of leaf edges
- Dieback of twigs and branches
- Lack of new growth and shoot lengthening in spring
- Disease and/or insect infestation.

Did you know? Trees that are stressed may curl their leaves up or down to reduce the amount of solar radiation they absorb.

Several Riverside area park trees were uprooted during strong winds, August, 2013. This example shows that the roots never developed adequately to provide a strong support, perhaps due to shallow and deficit-irrigation. Irrigation systems designed to water turf do not sufficiently water deeper rooted trees. In addition, the grass was allowed to grow close to the trunk, utilizing water and nutrients that were needed for tree growth.

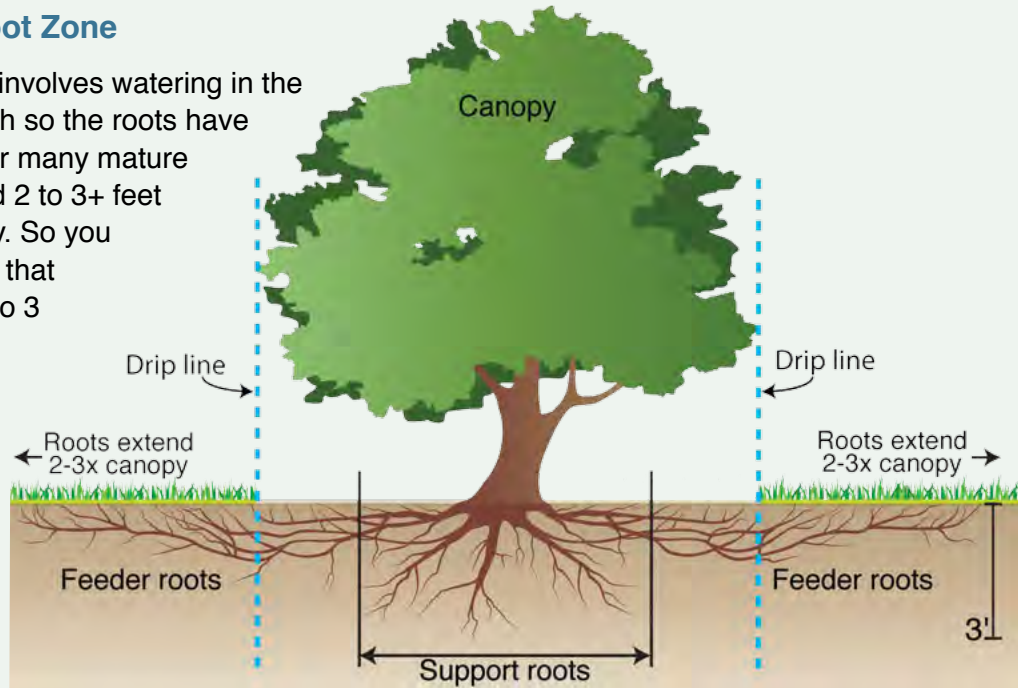
Watering Tips

How often you will need to water depends on many variables, including weather, soil type, site conditions, irrigation system, tree age/size, and kind of tree. The following few pages provide some simple approaches to help you evaluate conditions and apply water to keep trees healthy.

Water the Entire Root Zone

Keeping trees healthy involves watering in the root zone, deep enough so the roots have adequate moisture. For many mature trees, roots are located 2 to 3+ feet deep under the canopy. So you will need to make sure that water is percolating 2 to 3 feet deep.

Wet the surface of the soil beneath the area shaded by the tree's canopy and beyond. In some situations, feeder roots extend 2-3 times beyond the distance of the canopy.



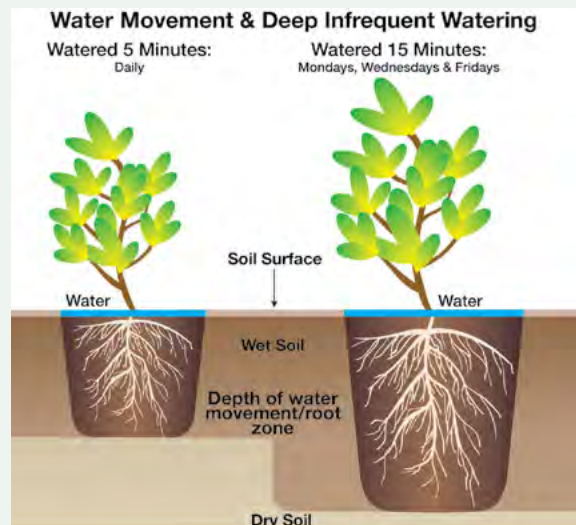
Soak Deeply

Shallow watering encourages shallow root development and limits the volume of soil a tree uses for water and nutrient uptake, making a tree more susceptible to drought, disease, and uprooting during strong winds.



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Use a soil probe, auger, or small shovel to determine if water is reaching the entire root zone.





Simple Methods

If you don't have a separate irrigation line for your trees, try other simple ways to water the root zone:

- let a hose drip and move it around to soak under the canopy and beyond the drip line
- coil soaker hose under the tree and run for a few hours
- build a circular berm and fill with water.

For newly planted trees, water the root-ball area deeply one or more times per week to encourage the growth of deep roots. It's important that the root ball be moistened frequently to encourage rapid root growth. Check for moisture 6 inches into the soil on the sides of the root ball.

When to Water

Sun and wind increase evaporation. To reduce evaporation, apply water in the early morning, not during the heat of the day, especially if using a sprinkler system. With sprinklers, avoid watering during wind.

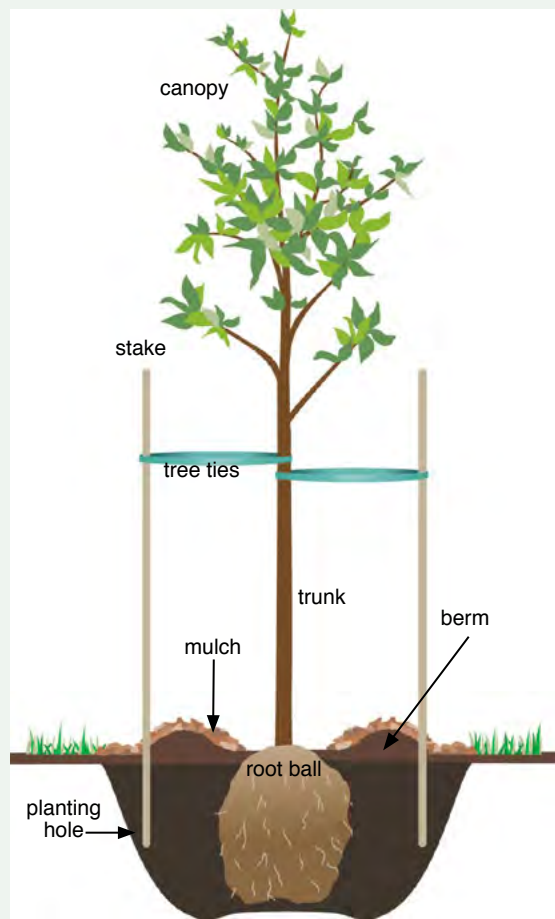
Frequency

Water mature trees every 1 to 4 weeks during the dry season, which is generally from May to November. If there is a lack of rainfall, you will need to extend watering into the winter months. Well-timed fall and winter watering may allow a tree to survive on less water than a regime of plentiful water during the growing season. Waterwise (drought tolerant) trees require less frequent irrigation.

Soak infrequently until the soil is moist, not mushy, allowing it to dry in between irrigations to prevent diseases that thrive in warm, wet conditions. Prevent mulch from touching the trunk of the tree, also, direct sprinkler spray onto the soil surface and not at the trunk.



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Newly planted and young trees require more frequent irrigation. Initially upon planting, build the berm so its inside edge is just above the edge of the root ball to direct water above and into the soil of the root ball. As the tree becomes established, move the berm out to under the drip line, and continue to widen as the tree matures.



Mulch!

Apply mulch 2-6 inches deep under the canopy and, if possible, throughout the feeder root zone area. Place mulch 6 inches away from the trunk. Also, avoid using weed cloth, plastic sheeting, or inorganic mulch, such as gravel or stones under trees.

Mulches of organic matter (dead plant parts: chipped bark, leaves, grass clippings, etc.) conserve water by holding moisture, preventing weed growth, and reducing evaporation from the soil surface.

Organic matter creates a favorable environment for soil life, including helpful bacteria, earthworms, and beneficial fungi, which help break up the soil to allow water to penetrate. Prevent compaction by keeping off wet soil, and avoid parking cars on the soil surface above the roots.

Mulch prevents the growth of highly competitive annual weeds, but not perennial weeds such as Bermuda grass or Kikuyu grass.

Fresh organic material is better for mulching the soil surface than compost. (Compost is used as an organic fertilizer that can be mixed into the soil at planting time.) Don't be concerned that mulch will absorb nutrients from the soil surface as it decomposes. This has been studied and found not to occur unless mulching material is incorporated into the soil rather than placed on the surface. Also, some trees are known to be able to prevent the growth of neighboring plants, but this is not true of their chips.

Bulk, fresh mulch can sometimes be obtained from tree services. Some cities, such as Riverside, provide free chipped mulch for pick up.



Mulch away! Place mulch onto the wetted area, but to prevent disease, don't let mulch touch the tree trunk.



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Soil Type

Soil is composed of tiny fragments of rock or minerals, plus the spaces between those particles (pores) which drain and hold water and air. There are many variations of soil, as every soil has a different composition of minerals and organics, and every soil has been subjected to different environmental conditions. However, the basic concept to understand is soil texture, because particle size determines the pore size which holds water and air and affects how much water is needed to replenish the root zone and how frequently water should be applied.

What is the texture of your soil?

Soil texture can be determined by using the “feel” method: rub moist soil between fingers. Soil texture varies by proportion of sand, silt, and clay. When soil is moist, make a ball of soil and press it into a ribbon shape. In general, the longer the ribbon, the more clay you have in the soil. If you can't make a ribbon, you probably have a lot of sand.

- Sand particles, the largest size, feel gritty and are generally visible to the eye. Sandy soils drain relatively quickly, but very coarse sand (sandbox size) drains too quickly to support root growth.
- Silt particles feel slippery or silky when moist.
- Clay particles, the smallest size are microscopic. Clay holds significant amounts of water. Clay feels sticky when wet and hardens into clods that are like rocks. If you've ever sculpted with clay you know how sticky and hard pure clay can be.

For an online guide to texturing soil by the feel method, see: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2_054311

Soil Texture and Water

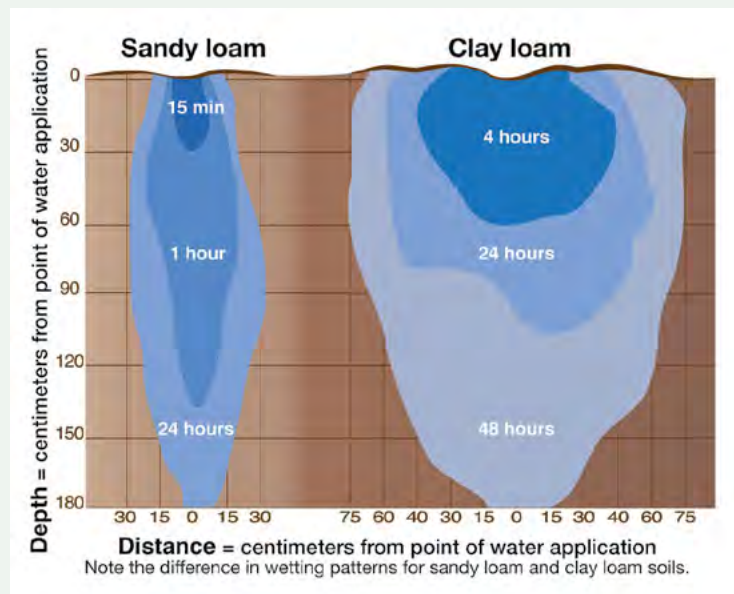
Sandy soils drain quickly, retain less water, and require more frequent irrigations. For soils high in clay, one foot of soil depth holds more than 2 inches of water. A soil that is a mixture of sand, silt and clay (a loam) is ideal because it both holds water (available for roots) and drains excess water, providing for air. Soggy or waterlogged soil can “suffocate” roots.

Most of our local soils are loam, a mixture of sand, silt and clay. For loamy soils, one foot of soil depth holds 1 to 2 inches of water. So for a small tree, a simple way to get water deep into the root zone is to build a circular earth berm below or beyond the canopy drip line and fill the basin with water a few times with 2 inches per foot of estimated rooting depth.

Example: If you think your tree has deep roots to 3+ feet:

2 inches of water X 3 feet of depth = 6 inches of water needed.

Each time you irrigate, fill water inside the berm a total of 6 inches, such as 6 times at 1-inch depth.



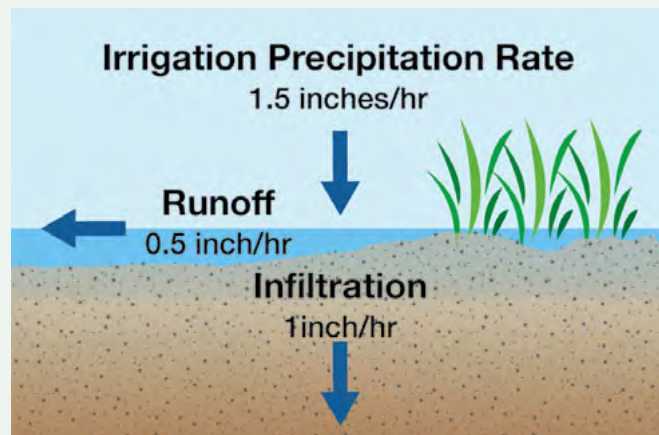
Water spreads out in soil that is high in clay. Water moves downward and drains more quickly through sandy soil, because the spaces between sand particles are larger.

Irrigation Systems and Different Soils

Just as different textured soils move water through them at different rates, they absorb water at different rates. When using an irrigation system, apply water at a rate according to the infiltration rate of the soil to prevent runoff.

A soil that is predominately clay absorbs water slowly as compared to sandy soil that has the most rapid infiltration rate. Apply water using components that don't exceed the soil's infiltration rate. Check your emitters, sprinklers, and/or sprayers for their application rates (irrigation precipitation rates). The speed at which an irrigation system applies water over a given area is referred to as the precipitation rate, measured in inches per hour.

You may have to adjust your watering run/s for site conditions including slope and amount of vegetative cover. For example, bare soils on a steep slope will shed water (and erode soil) quicker than those with a cover of mulch or vegetation.



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Water was ponding, in spite of a low-flow emitter. By watering slowly, you will prevent runoff and allow time for moisture to move downward through the soil. In areas with ponding, runoff, or compaction, schedule 2-3 short run times rather than one longer run.

Maximize Efficiency = Minimize Water Use

An efficient irrigation system is one that applies the right amount of water for the plants and uniformly over the yard or grove. If you are only watering a tree or two, uniform distribution of water may not be an issue. However, if there are dry spots in your landscape that you have to water more frequently or for longer periods of time, then you have an inefficient irrigation system. It may mean that each head on the system does not have the same precipitation rate (doesn't put out the same amount of water). Look for mismatched irrigation heads.

To get the right amount of water to each plant, efficient systems have specific zones or stations for plants with like water requirements (*hydrozones*). That is to say, low water-usage plants would not be on the same station as higher water-loving plants. For example, if you have shade plants in a shaded area, they would be on their own station and would be watered less than sun-loving plants in a sunny area.

For Smart Irrigation, Use Smart Controllers

“Smart” irrigation controllers tailor watering schedules and run times automatically to replenish only the amount of moisture that the landscape needs. Generally, there are two types of smart controllers, those that are based on soil moisture (SMS), which utilize soil sensors or tensiometers, and those that are based on weather information. Weather-based smart controllers draw upon a variety of climatic conditions, including temperature, incoming solar radiation, wind, and precipitation to calculate evapotranspiration (ET). ET is moisture lost from the plant to the atmosphere (through transpiration), as well as evaporation from the soil surface. In addition to onsite weather stations, some controllers use historic weather data, while others use a subscription service to download daily ET values.

Smart controllers, soil moisture sensors, and rain sensors are available at hardware stores and irrigation supply stores. Technologies change quickly, so compare controllers by Toro, Rainbird, Hunter and more. Many inland cities offer rebates for the professional installation of approved smart controllers.

If you’re not using a climate based controller, manually manage run times and days to water according to soil conditions and seasonal weather conditions. Most controllers have built in functions called “seasonal adjust” or “water budget” to easily adjust for seasons. Adjust at least four times per year.



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Even if you are using a smart controller, to be smart, you will need to monitor its use.



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The California Irrigation Management Information System (CIMIS) collects data from over 140 automated weather stations throughout the state. CIMIS provides reference evapotranspiration (ET_o) and weather data to the public for irrigation scheduling and other purposes such as pest management, energy generation, fire-fighting, weather forecasting, and scientific research.

Maintain!

Irrigation Maintenance

For efficient operation and uniform distribution of water, watering systems need continual maintenance. At a minimum, conduct monthly inspections and correct deficiencies, or hire a licensed maintenance contractor with water conservation expertise. Look for broken and worn components, clogged and missing emitters, leaks, overspray, and sprinkler misting, which may indicate that water pressure is too high. A doughnut shaped water pattern may mean the pressure is too low. Every few years, have an irrigation professional conduct a water audit. Some Resource Conservation Districts (RCDs), cities, and water districts provide irrigation evaluations free of charge. Irrigation system plans should be saved to verify that system components match the original design criteria.

Herbicides and Fertilizers

Trees already stressed by drought can be harmed by heavy applications of herbicide. Some tree species are harmed by herbicides used in the lawn.

If your trees have an insect or disease problems, treat them to reduce their overall stress. Additionally it's not helpful to fertilize a tree that is stressed by drought.

Pruning

The International Society of Arboriculture (ISA) recommends pruning trees only when necessary, such as to remove dead, diseased or damaged branches. Never top or over-thin a tree. Well-meaning tree owners often do irreparable damage, so check with a professional arborist before pruning, especially during times of drought. It's normally OK to properly prune trees during times of drought to improve structure and to remove dead and weakened branches. Leaving broken, insect-infested, or diseased branches can further weaken a tree.

Berm Maintenance

If you have a water basin with an earth berm around the base of your tree, it will be important to move the circular berm out, as the tree grows and canopy expands, at least to below the canopy drip line. As roots mature and increase in girth close to the trunk, they become buttress roots and serve more in a capacity to support the tree than for water absorption. It's not uncommon to see a person watering a mature tree right at the trunk, rather than away from the trunk, where water is needed most.



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Water is not getting to plant roots. Sprinklers can be adjusted to prevent overspray onto the sidewalk.



On slopes, build berms on the downhill side of the trunk to help capture runoff and allow the water to infiltrate.



Drought Sensitive Trees and Shrubs

Some species are so susceptible to drought that one summer in southern California without irrigation can be lethal, even to established plants. At the top of the list are coast redwood, camellia, and azalea. If exposed to more than one dry summer, any of the tropical species associated with wet conditions can be included in the “drought sensitive” list. Water-loving trees usually need more watering, so please only plant waterwise trees in the future.

A number of diseases and insect pests have been shown to be more severe when plants are exposed to summer drought, even if the susceptible plant is considered resistant to drought injury. Types of diseases that are drought related include cankers, Armillaria root rot, and surprisingly, even root rots caused by water molds such as Phytophthora. Several kinds of borers, especially pine bark beetles are commonly associated with drought. Plants that are susceptible should be irrigated deeply at least twice during the summer and into the winter if the drought continues. Common species meeting this description include:

- | | |
|--------------------|---------------|
| Aleppo pine | Incense cedar |
| Blue gum | Madrone |
| Canary Island pine | Monterey pine |
| Coast redwood | Sugar gum |
| Most fruit trees | Willow |
| Giant sequoia | |

Even native trees, including oaks may need a few deep soakings during the summer of a hot, dry year. Many factors affect tree watering needs including lowering water tables, removal of mulch or leaf litter and site disturbances such as paving and hard surfaces. Normally, native oaks do well with no summer water when they receive adequate winter rainfall.



Armillaria is a fungus that causes root and root crown rot. It has white/cream colored spores and usually has an annulus (ring-like remains) found around the stipe (stalk or stem). A frequent sign of Armillaria is a clump of mushrooms attached to the root crown/root.

PHOTO COURTESY OF SIMS TREE HEALTH SPECIALISTS, INC.



Gold spotted oak borer adult.

PHOTO BY MIKE LEWIS; CENTER FOR INVASIVE SPECIES RESEARCH; BUGWOOD.ORG



Coast live oak, *Quercus agrifolia*

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Planning for the Future

1. **Select the right tree for the right place.** (See suggested websites pg. 11). In southern California, that means selecting a low-water using, drought-tolerant species (*waterwise*).
2. **Xeriscaping** is the practice of landscaping in ways that minimize the use of irrigation water and utilize *waterwise* (less thirsty) plants. Group plantings and design irrigation systems by *hydrozones*, or sections that have plants with the same watering needs, and the same slope, sun exposure and soil conditions.
3. Use **Smart Irrigation**. Design irrigation systems that apply water with uniform precipitation rates. Plan separate irrigation lines for watering trees and large shrubs, preferably with drippers or low-volume sprinklers/sprayers to provide deep water for tree roots. Select water-conserving irrigation components, such as pressure regulated spray heads, rain switches, high efficiency nozzles, flow sensors to detect leaks, and smart controllers (timers).
4. Incorporate **Low Impact Development (LID)** methods, such as rain gardens (infiltration basins), rain barrels, and swales to capture water or allow it to percolate into underground water basins. Use non-potable (not drinking water quality) water for irrigation, when available, such as runoff water collected in rain barrels
5. **Preserve existing native trees** and non-invasive vegetation. Natural habitat that is not disturbed will not require irrigation. Irrigation will be needed to establish newly planted natives. If the ground has been disturbed with disking or weed clearance, the trees may need a good soak in a dry year.



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Often trees in city parks are only watered to 12 inches of soil depth, enough water to support a lawn with shallow roots, but not deep rooted trees.

Find excellent resources online about proper tree care, selection and irrigation.

Gardens to Visit

LandUse Learning Center

4500 Glenwood Dr, Bldg A, Riverside, CA 92501
(951) 683-7691, www.RCRCd.org

Sims Tree Learning Center

6111 Appaloosa Ave., Riverside, CA 92509
(951) 685-6662, www.simstlc.com

Landscapes Southern California Style

450 Alessandro Blvd., Riverside CA 92508
www.wmwd.com

Chino Basin Water Conservation Garden

594 San Bernardino St, Montclair, www.cbwcd.org

University of California, Riverside Botanic Garden

www.gardens.ucr.edu

Rancho Santa Ana Botanic Gardens

1500 North College Avenue, Claremont, CA 91711
www.rsabg.org

Organizations and Agencies

The Irrigation Association

www.irrigation.org

The International Society of Arboriculture

www.isa-arbor.com
www.TreesAreGood.com

California Urban Forest Council

www.caufc.org
www.InvestFromTheGroundUp.org

California ReLeaf

www.CaliforniaReleaf.org

Alliance for Community Trees

<http://ACTrees.org>

Cal Fire

www.fire.ca.gov/

National Arbor Day Foundation

www.arborday.org

UC Agriculture and Natural Resources

<http://ucanr.edu/>

USDA Forest Service

<http://www.fs.fed.us>



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www.FreeSprinklerNozzles.com

Tree Database Websites

Be Water Wise

www.BeWaterWise.com

Cal Flora

www.Calflora.org

USDA Plant data base

www.plants.usda.gov

Tree Selection Guide for California

www.selecttree.calpoly.edu

Water Use Classification of Landscape Species (WUCOLS) <http://ucanr.edu/sites/wucols/>

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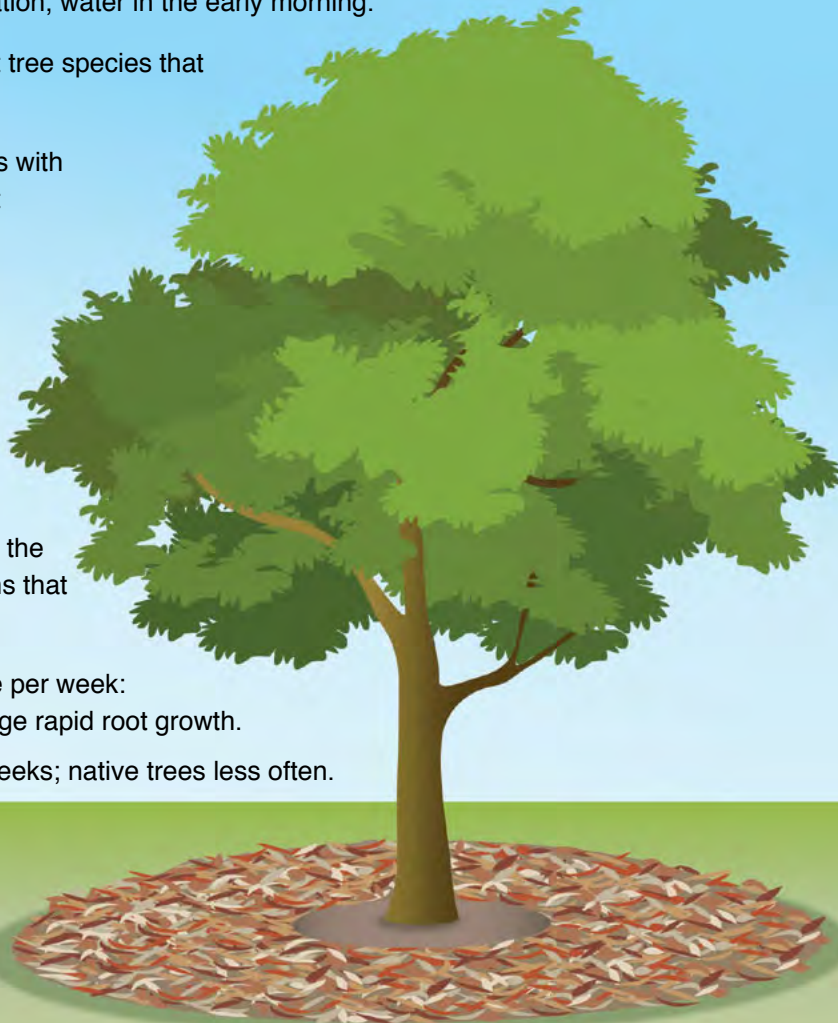
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Trees and Water Are Precious Resources.

Prioritize watering trees during a water shortage.

- To reduce water loss to evaporation, water in the early morning.
- Plant native or drought resistant tree species that require less water.
- Install efficient irrigation systems with uniform components and “smart controllers”.
- In areas with ponding, runoff, or compaction, schedule 2-3 short run times, rather than one longer run.
- Wet the surface of the soil beneath the tree’s canopy and beyond. Direct water away from the trunk, to prevent moist conditions that foster disease.
- Water young trees at least twice per week: moisten the root ball to encourage rapid root growth.
- Water mature trees every 1-4 weeks; native trees less often.
- Spread mulch under and beyond the canopy, but not touching the trunk.
- Repair broken and worn components, clogged and missing emitters, and leaks. Look for overspray, sprinkler misting, and ponding.
 - Deep, infrequent watering encourages deep root growth for drought resistance.
 - Evaluate your soil type and rooting depth.



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