



## Watering Trees

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Trees constantly lose water to the atmosphere. Water is the single most limiting essential resource for tree survival and growth. Water shortages severely damage young and old trees alike, and set-up healthy trees for other problems. Drought conditions and heat loading can lead to tree decline, pest problems, and non-recoverable damage. Supplemental watering can greatly assist in maintaining tree health during droughts – both during the growing season or during the dormant season.

### Save Assests

Trees can be old and valuable, and are usually considered non-replaceable beyond 10 inches in diameter. Many associated landscape plants are low cost and easily replaceable. If low cost plants are damaged or lost to drought, the landscape can be corrected quickly and relatively cheaply. Large, drought-killed trees can not be replaced in a time period spanning multiple human generations. Please emphasize watering trees during droughts.

### BWPs

The best way to water a tree is by providing a burst of soil water followed by a drainage period. In fine soils like clay, the drainage period can be difficult to judge. In sandy soils with good drainage, a constant water supply could be used if no water accumulation around roots occur. Trees can be watered by irrigation which is applied when soil moisture reaches a certain level. Ideally, irrigation should automatically begin when soil moisture reaches some critical measure determined by a moisture probe or soil tensiometer. Careful tuning of irrigation systems are needed to prevent over-watering trees.

Manually, the best ways to water trees are by soaker hose or trickle (drip) irrigation which are turned on and off, as needed. Sprinklers are less efficient for applying water to trees than soaker hoses or drip irrigation, but are easy to use. Use a light organic mulch over soil under a tree to conserve moisture and then apply water just under or over the top of mulch.

Do not water at the base of the trunk as this can lead to pest problems. Always keep water application devices and saturation areas at least four feet (4 ft) away from the stem base in mature trees. Always emphasize areas of soil away from foundations and hardscapes for water applications. Ideally strive to reach at least one-half ( $\frac{1}{2}$ ) the tree rooting area under a tree crown for watering.

### Sprinkles

Sprinkler system use on hot days can waste a lot of applied water in evaporation. Water applied in the daytime does cools soil and hardscapes through evaporation. If excess heat loading is a problem,

sprinkling is the best way to dissipate heat around trees. Nighttime sprinkling is best for effective water use by a tree.

Set sprinklers near the outside edge of a tree crown beneath foliage, assuring the sprinkler area is shaded if used in daytime. Water should be applied in order to soak in well, not puddle or run-off the surface, and then drain from soil. Trees will take up a good share of water even if surrounded by grass. Isolating / zoning trees in special tree watering areas apart from other plants, especially those in full sun, would be ideal.

Trickle irrigation is another excellent method for providing trees an adequate supply of water. Multiple emitters are needed scattered around the tree rooting area. Trickle irrigation maintains easily accessible water near tree roots. Soaker hoses, or even a garden hose moved often, can provide a good soaking. Do not allow water to be wasted by surface runoff or ponding on soil surface for extended time periods.

### Don't Go Deep!

Deep watering a tree with a pipe or wand stuck down into the soil 12-24 inches is not as good for trees as surface applications, especially in finer textured soils. Most of the tree's absorbing roots are in the top foot of soil. Applying water deeper than this level misses active roots and allows water to drain away from roots, wasting efforts and water. Net water movement in most soils is downward. Soil hydraulic conductivity and gravity allow little horizontal movement of water unless water is concentrated over a restrictive layer. Apply water across a soil surface and let it soak into soil. Surface or near surface soaking allows tree roots more chances to absorb any water, cultivates soil health, and helps maintain essential element cycling in soil.

### Be Neat

Do not spray foliage, new shoots, or wounds of trees when watering at any time. The wetting action of water can initiate and sustain a number of pest problems. The only time you should spray tree foliage or wounds is when cleaning tree surfaces, such as trees in dusty environments. Cleaning sprays should be ideally completed when dew is already on tree tissues, or in daylight when there is sufficient time for tissues to dry before nightfall. Do not continually wet the trunk.

Place water hoses or applicators out to the tree crown edge (drip-line). Try to water the soil areas directly beneath foliage and shaded by a tree. Do not water much beyond the drip-line and do not water closer than four feet from the trunk base on established trees. Be sure supplemental water soaks in well. Use mulch and slow application rates on slopes, fine soils (clays), and compacted soils to assure water is soaking-in and not running-off.

### Placing Water

If a tree is surrounded with other landscape plants, or by turf, deep soaking water applications will benefit all. Young, newly planted trees need additional watering care. Water does not move sideways in a soil. Water must be applied directly over tree roots. For new trees, concentrate water over the root ball and into the planting area, to assure survival. Old, large trees can be extensively watered over the entire area under their foliage. Another method in watering large trees is to select roughly 1/3 the area within the drip-line for concentrated water applications often, while the whole area below the foliage can be watered occasionally.

### Timing

The best time to water trees is at night from 10pm to 6am. Trees relieve water deficits (refill) over night time hours. Watering at night allows effective use of applied water and less evaporative loss, assuring more water moves into soil and tree. Night time application hours, when dew is already present, does not expand foliage wetting period for understory plants. This water timing cycle minimizes pests.

The next best time to water is when foliage is dry and evaporation potential is not at its mid-day peak. This watering period is either in late morning as daytime temperatures have not reached their peak, or in late afternoon or early evening. Be sure to allow any dew to dry off foliage surfaces before applying, or assure a “dry gap” between atmospheric condensation and watering to help minimize pests which require longer wetting periods. This is especially critical where turf surrounds a tree.

### Watering Seasons

Because trees lose water day to day, month to month, and season to season – dormant season watering during winter drought is important, especially for evergreen trees and juvenile hardwood trees which have not lost their leaves. Because of temperature and relative humidity interactions, much less water is required in the dormant season, but water is still needed. Do not water in the dormant season when air temperature is less than 55°F.

### Heat Interactions

For every 18°F increase in temperature above 40°F, the amount of water lost by a tree and site almost doubles. This feature of water loss must be factored into applying supplemental water to a tree. Trees surrounded by pavement and other hot, hard surfaces can be 20-30°F warmer than a tree in a protected, landscaped backyard. Water use rapidly climbs with increasing temperatures, and so should water application volumes if soil drainage can be assured.

A tree can use a large amount of water on a summer’s day if water is available in soil. Twenty to eighty gallons of water being pulled through a tree is common. A large maple in moist soil was once logged using 500 gallons on one hot, sunny day. These amounts of water were under ideal water availability conditions. The drier the soil, the less water is available and the less water used.

### How Much?

Depending upon soil texture, daily temperatures, and rainfall amounts, 1 to 2 inch-equivalents of water per week should keep a tree alive. Five gallons per square yard is about 1 inch of water. Trees in limited rooting areas, in containers or pots, or on major slopes, need additional care to assure water is reaching the root system in adequate amounts and not suffocating roots from lack of drainage. Fine soils require careful attention to prevent over-watering, anaerobic conditions, and root death.

Sandy soils can be severely droughty because water runs out of the rooting zone quickly. There are some water holding compounds commercially available for keeping water near roots. In addition, composted organic material additions and organic mulch covers on soil surfaces can help hold and prevent rapid loss of applied water. In all cases water use formula should be used to determine tree water requirements.

### How Often?

In the growing season, trees should be watered once or twice a week if there has been no rainfall. A few heavy (high volume) waterings are much better than many light, shallow waterings. A greater

proportion of applied water is utilized by a tree with heavy watering. Once watering begins you should continue to water until rains come. Tree root systems will survive close to the soil surface to utilize supplemental water. If supplement watering is suddenly withdrawn, large sections of root system may be damaged. Trees use water all year round. Dormant season watering during winter droughts can help trees. In the winter or dormant season, trees should be watered once every two weeks it does not rain and the air temperature is above 55°F.

### Competition

Many plants in a small area will all be competing within soil to pull out enough water for themselves. This water competition can be severe, especially for plants in full sun. Water competition will inhibit or slow tree growth. Remove excess plant competition from around any tree to decrease water stress. Use mulch to conserve water and prevent weed competition. Careful applications of herbicides can also reduce weed competition for water, but severe drought conditions can lead to unexpected negative results. Plants under trees which are not in full sun for any part of the day are not as competitive for water as vines and grass which receive partial full sun.

### Hard Water

Water from nature can be loaded with dissolved materials, many essential to trees. When water is modified for human consumption, changes can occur which could lead to long-term tree problems. For example, one traditional nemesis of natural water use by humans has been dissolved calcium and magnesium salts, called “hard water.” Soaps react with calcium and magnesium, generating an insoluble film while detergents do not. Trees are not bothered by calcium and magnesium in water except high mineral concentrations at high pH.

Calcium and magnesium can be removed from household water (“softening water”) by adding lime and sodium carbonate producing two insoluble products which can then be filtered. Ion-exchange systems soften water by trading sodium or hydrogen ions for calcium and magnesium. Sodium build-up in soils and acidification of irrigation water can cause tree problems. In addition, grey water use and chlorination systems produce unique problems for water use by trees.

### Conservation Ideas

Xeriscaping, developing water-efficient landscapes, water harvesting, cistern use, gray-water use or drought proofing concepts are becoming more important. There are a number of ideas involved in developing a water-efficient and sustainable landscape, when integrated wisely, can help conserve water while providing a functional and aesthetically pleasing tree-filled landscape. Trees remain a critical part of any water-efficient landscape.

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