



Watering Trees

Water is essential to tree survival. Trees are composed mainly of water, and it is a key ingredient in photosynthesis, the tree's food-making process. Minerals and nutrients from the soil are transported to the leaves by water. *Too little* water reduces photosynthesis, mineral uptake, and transport of nutrients in the tree, and can result in death of the tree. *Too much* water can also lead to tree death because the roots must have oxygen to function. *Not too little, not too much—just right.*

Healthy trees require a regular and planned irrigation routine. Sporadic, random, shallow watering leads to shallow rooting and water stress and increases susceptibility to insect and disease damage. *How* water is applied, *how much* is applied, and *how often* it is applied are the key factors in tree irrigation.

Consider the soil

To determine what is right for the tree, first examine the site. What type of soil is the tree growing in? Soil is the storehouse for the tree's water and may range from coarse, loose sand or cinder to fine, compact, heavy clay.

Clay soil makes a ball that holds together when squeezed in the hand. Clay soils can be hard to dig, especially when dry, but they hold water very well. Heavy soils and clay soils often hold too much water and too little air for many trees. Clay soils can become very hard when they dry, and may crack.

Sandy soil, when squeezed, makes a ball that falls apart easily. Sand can be dug easily, but does not hold water well. Water penetrates deeply but not very widely in sand. The "ideal" soil is a mixture of sand, clay, and silt, known as *loam*.

Many areas of Hawaii have irrigation problems because the soil is very compacted or is shallow over a hard layer or rock. Water, air, and roots cannot penetrate compacted soil very well. These soils should be tilled deeply to encourage root growth. Tilling 2–3 inches of



organic material into a compacted soil improves it more than tilling alone. Shallow soils less than a foot deep cannot hold much water and easily become waterlogged. Shallow soils must be watered more frequently, with less water applied in each watering to avoid run-off.

How to apply water

Water should be distributed evenly *on the ground*, not sprayed onto the trunk or canopy of the tree. Keep the application within the tree's drip line, which is the outer edge of the tree's leaf canopy. Avoid wetting leaves by using hand-held hose, soaker hose, or drip irrigation methods. If a sprinkler system is used, select heads that minimize the amount of water that reaches the leaves to reduce the chances of fungal or bacterial diseases. Apply the water only as fast as the soil can absorb it. *Make sure not to over-water.*

How much water to apply

Ideally, water from rain or irrigation should penetrate the soil beyond the root zone to "re-charge" the reserve of soil water. One inch of rain per week provides adequate water and recharge for "normal" soils and trees. If rain is lacking, irrigation should be planned to match this amount. Soil type and drainage determine how deeply a given amount of water moves in the soil. Various devices that measure soil moisture penetration may be purchased from garden supply stores.

Trees should be irrigated *infrequently*, with slow, deep soaking of the root zone. Frequent and shallow irrigation, such as that used for many turf areas, is not necessarily suitable for trees, which will receive inadequate amounts of water and will be "trained" to develop surface roots. Deep, infrequent watering encourages the growth of deep roots, making the tree more drought tolerant. It also lessens the likelihood of salt buildup.

Production of this publication was partially supported through the Renewable Resources Extension Act.

Published by the College of Tropical Agriculture and Human Resources (CTAHR) and issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Charles W. Laughlin, Director and Dean, Cooperative Extension Service, CTAHR, University of Hawaii at Manoa, Honolulu, Hawaii 96822. An Equal Opportunity / Affirmative Action Institution providing programs and services to the people of Hawaii without regard to race, sex, age, religion, color, national origin, ancestry, disability, marital status, arrest and court record, sexual orientation, or veteran status.

When to apply water

The best time of day to irrigate with sprinklers is early morning, so that tree leaves, turf, and other landscape plants can dry during daylight hours. This reduces chances of disease (rot) problems. Watering very late in the day or at night is not normally recommended. However, in areas where water conservation is critical, pre-dawn or late-night application is used to reduce water loss through evaporation. Automated drip irrigation can also be used at night because the foliage is not wetted. Avoid watering at midday. In strong sunlight, drops of water on leaves can focus the light like a lens, which can cause burn spots on susceptible plants. Evaporation loss is also highest at midday.



How often to apply water

Trees require the most attention to irrigation after planting and during establishment. After the newly planted tree has become established and its roots are able to find water in the soil, watering frequency can decrease.

Newly planted trees. Newly planted trees have small root systems and can take up water from only a very limited area. For the first 6 months after planting, apply water at least once a week (more often during dry periods and the first month after planting). From month 7 through 12, water deeply at least once a month. Again, this should increase during dry periods. During the second and third year of growth, apply water every week during which less than one inch of water is received from rainfall or irrigation (e.g., applied to turf). Supplementary watering is especially important during the dry season of July through October and in leeward areas.

Established trees. Watering frequency for trees planted more than four years in the landscape is determined by the amount of weekly rainfall and the soil type.

- If rainfall or irrigation for turf for the week is less than 1 inch, consider applying water to bring the total for the week to 1 inch. If rainfall is an inch or more, don't water that week.
- If the soil type is sandy with rapid drainage, water *more frequently*. If the soil is poorly drained or heavy clay, water *less frequently*.
- If the surrounding lawn or landscape are irrigated regularly, the trees will not need additional water.

Established trees have extensive root systems that harvest water from a large area. Most established trees have deep roots that can obtain enough moisture without additional irrigation. They are able to tolerate less frequent applications of water and some drought with no visual or growth effects. Monkeypod, paperbark, and many other trees can survive extended drought conditions without supplemental irrigation. Trees with high water requirements that are planted in arid zones will not survive without additional irrigation. Thoughtful plant selection can

avoid these irrigation problems—*right tree... right place*.

Watering frequency can be reduced by mulching around tree bases and by planting just before or during the rainy season. Be aware of other factors that will increase the time between waterings, such as

- cloudy days (evaporation and water loss is greater on bright, sunny days)
- calm days (wind dries soil and increases water loss from plants)
- flat sites versus slopes (water penetrates the soil better on flat ground—irrigate slopes more frequently with less water to reduce run-off)
- cooler areas (winter, higher elevations) versus warmer areas (summer, leeward areas)

Plants and nature are always growing and changing. Weather conditions and the water needs of plants also change constantly. Watch trees closely after starting an irrigation program. As time goes on, make adjustments as necessary. If the soil is cracked and dry, leaves are wilting or dropping, or leaf margins are brown, the tree needs more water—and fast. If the soil has a sour odor, if water can be squeezed from a handful of it, if there is puddling or standing water, or if algae appears on the soil surface, too much water is being applied. Reduce the amount and frequency of the irrigation. Adjust the irrigation program to the plants' needs to ensure continuous tree health.

Careful observation, good planning, proper watering methods, and continual attention will keep trees healthy, productive, and attractive.

*Ginny Meade and David L. Hensley
CTAHR Department of Horticulture*