



DECISION GUIDE

HOW TO IRRIGATE TREES

*Your roadmap to irrigation planning
for healthy, thriving trees.*

The Intelligent Use of Water.™

HOW TO IRRIGATE TREES

When planning an irrigation system, trees are commonly an afterthought. Healthy trees, however, require proper irrigation infrastructure and several factors should affect your tree-watering approach. This guide will help you select an efficient irrigation method for your unique trees and determine how much water they need to thrive.

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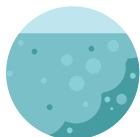
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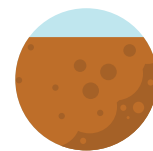


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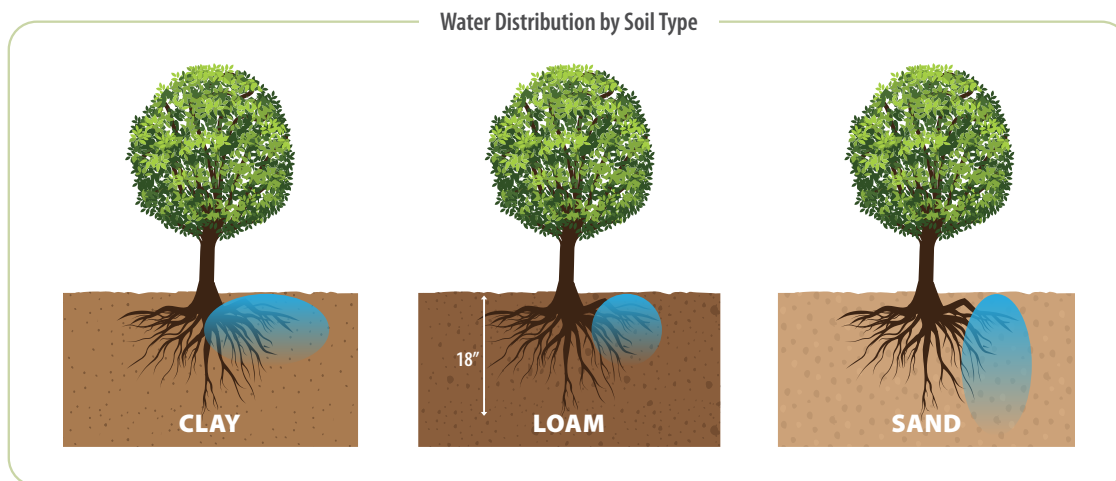
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SOIL

Know Your Soil Type

Different soils absorb water in different ways. Coarse, sandy soils tend to absorb water vertically without water spreading very far horizontally. In finer clay soils, the opposite is true. Loamy soil usually absorbs water horizontally and vertically in relatively equal proportions.

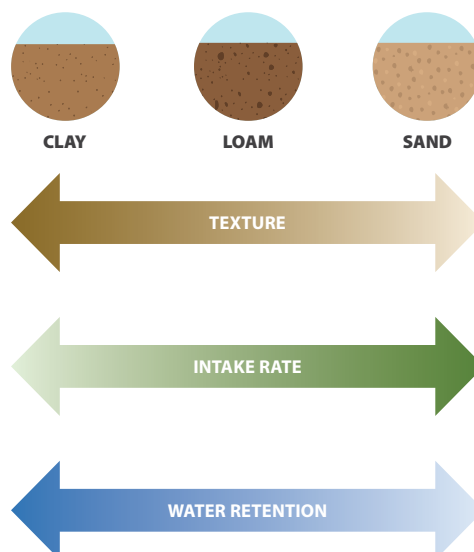


Pro Tip: In urban settings, trees are often given very little soil volume which becomes quickly compacted due to heavy foot traffic. This results in limited access to water and oxygen. Significantly extend urban tree life by increasing soil volume to the largest depth and width, and use permeable paving where possible to maximize water intake.

Understand Intake Rate

The soil's intake rate—or how fast it absorbs water—dictates how quickly water can be applied by the irrigation system and therefore, what type of irrigation will be optimal. Coarse, sandy soil absorbs water quickly, while finer silts and clays absorb slowly. Fine-textured soils retain moisture longer than coarse soils. The relationships are depicted to the right.

Pro Tip: Avoid overwatering, which means applying water faster than the soil can receive it. Too much water can kill a tree as easily as too little water, because it prevents the tree roots from getting the oxygen they need to stay healthy. Overwatering also causes runoff, erosion, or soil puddling—all of which can waste water and cause damage.





TREES

Consider Establishment and Age of Trees

Getting water to a tree's root tips is imperative, as this is where all the action happens! Each tree should be watered along the edge of its canopy, known as the "drip line." The feeder roots primarily responsible for water intake, often reach as wide or even wider than the drip line. Figuring out how far a tree's roots spread can help you determine where to water and how much water is needed for each tree. Consider whether the tree is newly planted or well established (see below).

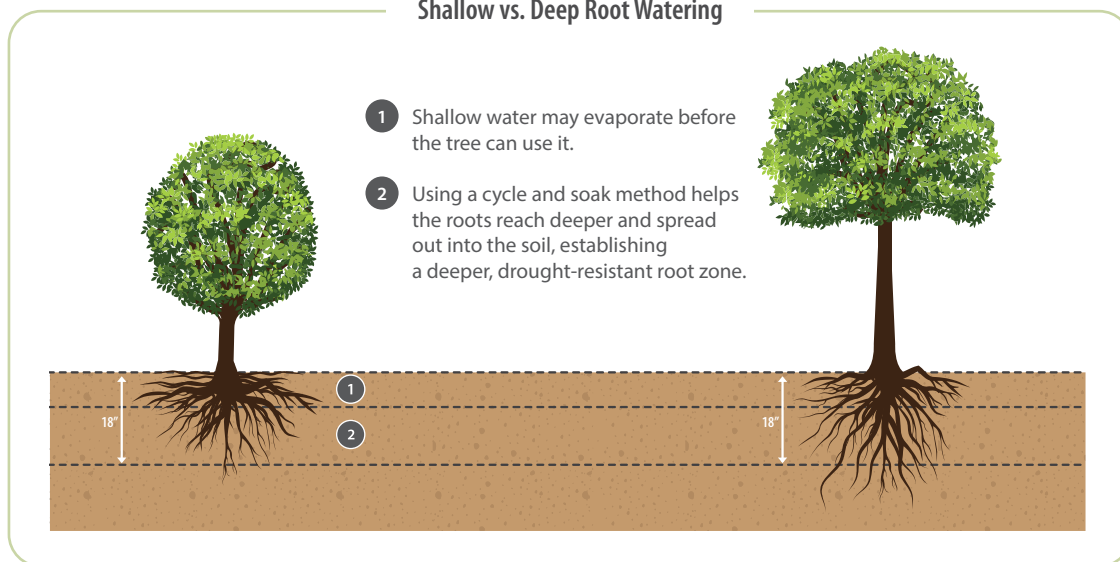
Watering New Trees

Proper watering during the first years after planting is vital to the health of trees. New trees require more water at the base than established trees, since new trees have not yet spread their roots out into the surrounding soil.

If you just planted a new tree, you should water it "deeply" for longer periods of time but less frequently, completely soaking the root ball and the area beneath the canopy when you water. Allow up to three years for the tree to establish its root system.

Pro Tip: If your newly planted tree is in an area where its root expansion may be inhibited by a nearby hardscape, you should water more deeply to encourage downward vs. outward root growth.

Shallow vs. Deep Root Watering

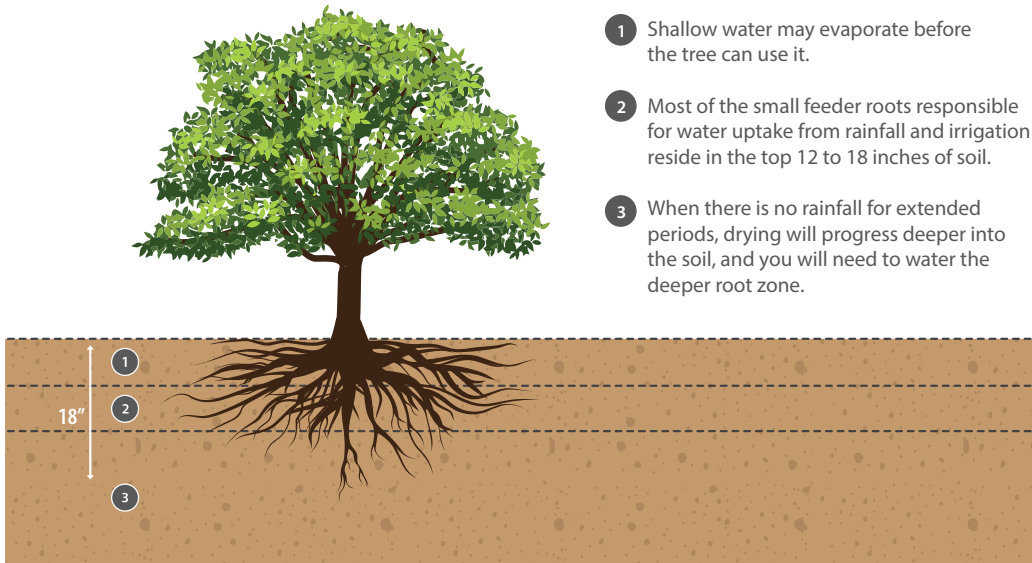


Watering Established Trees

For established and mature trees, proper irrigation continues to be important to health and growth. Established trees should be watered enough to penetrate the soil to a depth of at least 18 inches. Additionally, as the tree matures, you should stop watering the base of the tree directly and expand the watering zone out to the drip line. By expanding the irrigation in a loop around the tree, you will encourage it to develop expansive and healthy roots.



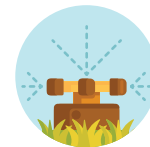
Considerations for Watering Mature Trees



Prepare Trees for Droughts

During periods of consistent rainfall, a well-sited and well-established tree or shrub will need little additional water. But during long periods without rainfall, established trees and shrubs will decline or die without timely irrigation. Proper irrigation practices can also help trees become more drought-tolerant by encouraging root systems to occupy a greater soil volume.

Pro Tip: Don't forget the mulch! Mulching helps keep the irrigated soil moist. Mulch or compost can improve soil properties, moderate soil temperature, reduce compaction, minimize evaporation, and meet local water requirements.



IRRIGATION

Know Your Irrigation Options

Proper irrigation can be accomplished in several ways, including hand watering, micro-irrigation, and sprinklers. It's important to familiarize yourself with available options so you can select the best fit for your trees.

Water by Hand

Hand watering might be a good choice for establishing young, drought-tolerant trees that will not require supplemental water in the climate where they are planted. To hand water your tree, create a soil basin within the drip line of the canopy, fill it with water from a hose or bucket, and allow it to soak in. Avoid overwatering! Check the soil 6 to 9 inches deep for moisture to determine when it's time to water.

Water with Micro-irrigation

Micro-irrigation, also known as "drip" irrigation, involves applying water at a slow rate directly where it's needed near the tree roots. A low-volume drip irrigation system is the most efficient. When possible, give trees their own dedicated valve or zone. Consider using different types of emission devices based on the soil type and how established your trees are. See the chart below for details.

HOW TO CHOOSE MICRO-IRRIGATION EMISSION DEVICES	APPROACH	BEST SOLUTION FOR:
	Low-Flow Nozzles	<ul style="list-style-type: none"> Supplemental water on established trees Spray conversion Coarse soils
	Dripline Circles	<ul style="list-style-type: none"> Adapting as trees grow (most flexible) Watering on a slope
	Root Watering Systems	<ul style="list-style-type: none"> Establishing structural roots in newly planted trees Hardscapes Fine soils
	Bubblers	<ul style="list-style-type: none"> Containers and small beds

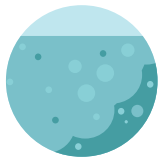
Use Sprinklers and Spray Irrigation

Sprinklers and sprays are not the most efficient ways to irrigate trees. They generally apply water at a fast rate, resulting in water loss due to runoff and evaporation. Additionally, spraying a tree trunk is not advised for its long-term health.

If you have an existing sprinkler system, there are ways to make it more suitable:

- Use water-efficient nozzles, which apply water slowly. These nozzles give water more time to soak into the ground and reduce runoff. (See Low-Flow Nozzles in the chart above.)
- Adjust the watering schedule. Break water run cycles into smaller periods in the same day to allow the water to soak into the soil. This may be more difficult if trees share a zone with turf or other plants.

Pro Tip: Trees that are established with water from nearby turf sprays do not have the deep roots needed to find water on their own. If turf and its irrigation are removed, the tree will likely die without supplemental irrigation.



WATER QUANTITY

Water Calculation Tool

Don't worry! You don't need an advanced understanding of math, meteorology, geology, or botany to determine the quantity of water your trees need. Below, the simplified "Calculation for Total Water to Apply" uses ranges and estimates in five key areas.

1. Evapotranspiration

Soil loses water in two ways: evaporation and transpiration from the plants growing. Combined, these are known as evapotranspiration. You can find the evapotranspiration rate, (written as ET_0), for your local area by consulting the Environmental Protection Agency's [Water Budget Data Finder](#).

2. Tree Species

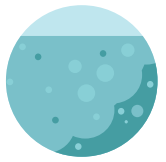
Different tree species have different water requirements when planted in your regional climate. Three broad categories include low, moderate, and high water needs. From there, you can further refine your watering based on [plant hardiness zones](#) and other species-specific requirements. Consult region-specific resources as well. For example, the [WUCOLS database](#) has detailed information on plants that grow in California.

WATER NEED	VALUE	DESCRIPTION
Low	0.25	Trees with high drought tolerance
Moderate	0.5	Most trees
High	0.75	Trees with low drought tolerance, thirsty trees

3. Density Factor

Density refers to the percentage of land the tree's leaf canopy covers. Using the chart below, select a density based on the age or size of your tree.

DENSITY	VALUE	DESCRIPTION
Low	0.5	For new trees. Canopy cover is often substantially less in a new planting.
Average	1.0	For small trees (<15 feet tall). Canopy cover of 70% to 100% constitutes an average condition.
High	1.2	For larger trees. An upward adjustment accounts for the increase in leaf area found in the canopy.



4. Microclimate Adjustments

Adjust watering needs based on your tree's specific microclimate, such as shade, nearby heat-absorbing surfaces, wind, or other factors. Using the chart below, select a microclimate value based on your unique conditions.

MICROCLIMATE	VALUE	DESCRIPTION
Low	0.5	Trees are shaded for a substantial part of the day or are protected from winds typical to the area.
Average	1.0	Trees are not substantially exposed to atypical conditions.
High	1.5	Trees are surrounded by heat-absorbing surfaces, planted near reflective surfaces, or exposed to particularly windy conditions.

5. Irrigation Efficiency

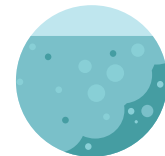
Efficiency in landscape irrigation means the right amount of water is applied to the plant at the right time. The number represents the % of the water applied that is actually used by the tree. When there is high efficiency, the water you'll need to apply will be very near what the plant needs. By contrast, a system with less efficiency will require you to use more water to meet the needs of the tree.

IRRIGATION EFFICIENCY	VALUE	DESCRIPTION
Low	0.5 - 0.7	Irrigation system produces more water than needed resulting in overspray or runoff.
Average	0.7 - 0.8	Irrigation using overhead sprays or sprinklers.
High	0.8 - 0.9	Irrigation system with drip irrigation.

Calculation for Total Water to Apply

For each piece of information described in 1 through 5 above, enter the amount in the corresponding box below.

Evapotranspiration (ET _o) per Month	x	Water Need	x	Density Factor	x	Microclimate Adjustment	/	Irrigation Efficiency	=	Total Water to Apply (in)
	x		x		x		/		=	



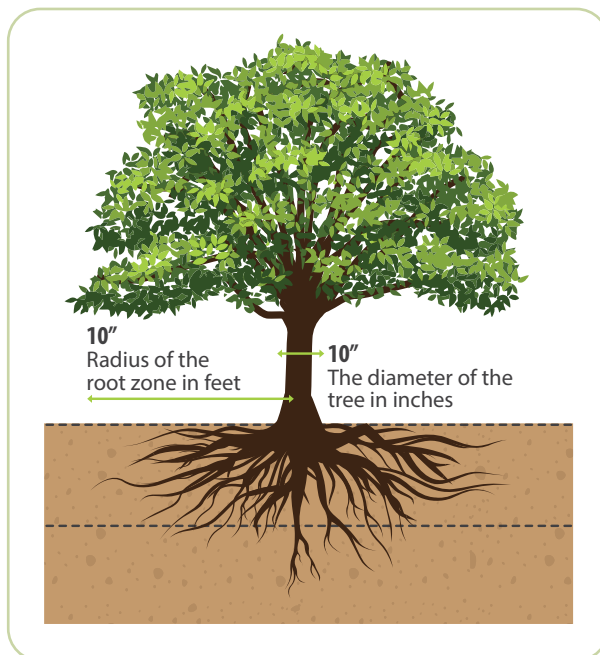
Convert Inches to Gallons

The above tool calculates the amount of water in inches that your system will need to apply. To convert your water quantity to gallons, you will need to know the surface area you are watering.

To easily calculate the ground surface area:

Tree diameter² x 3.14 = Ground area (sq ft)

Pro Tip: An easy rule of thumb is that the diameter of the tree in inches is a good estimate for the radius of the root zone in feet.



To convert inches to gallons of water:

Total Water to Apply (in)	x	Ground Area (sq ft)	x	Conversion	=	Gallons per Period*
	x		x	0.623	=	

*Note: Period = The timeframe of the evapotranspiration number you used in Step 1.

Grow Healthy, Hearty Trees

Proper irrigation can help you expand the variety of trees in your landscaping and dramatically improve their growth and health. It can also reduce the stress of drought or other adverse conditions while making efficient use of your water supply. To achieve all this, choose the irrigation system and water quantity that are best suited for your soil, trees, and region.

For more help choosing the ideal irrigation system for your trees and landscaping, visit rainbird.com.

The simplified calculation above is an adaptation of more detailed scientific approaches from the sources below. For more precision you may reference these or others:

- A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California, the Landscape Coefficient Method and WUCOLS III; "wucols00.Pdf." University of California Cooperative Extension California Department of Water Resources, Aug. 2000.
- MWELO Guidebook, "H1/ Landscape, Irrigation, Water Budget Overview.pdf"
- Landscape Irrigation Design Manual, Rain Bird, 2001.



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