MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #657

Watering Mature Shade Trees

Outline:

Why Trees Need Water

All living things need water to survive and trees are no exception. Trees use water for physiological functions and growth processes. In the landscape, water moves from soil in three ways.

1. Available water is *absorbed* through plant root systems, transported upward and lost via transpiration from leaves and bark.
2. Water *evaporates* from the soil surface.
3. Water *drains* through soil due to gravitational forces.

As soils dry, water molecules are held more and more tightly by soil particles. These water molecules become unavailable for plant use, resulting in the *permanent wilting point* of plants (the point of "no return"). As drought and desiccation increase, normal plant functions may cease. During drought stress, normal physiological functions of plants are interrupted, including:

1. Reduction in photosynthesis; water is an important component of photosynthesis and the process is negatively affected during dry periods.
2. Stomata, which regulate water and gas exchange in the leaf, may close. This prevents water vapor and oxygen from leaving the plant, as well as carbon dioxide entering the plant (which is essential for photosynthesis).
3. There is likely a reduction in carbohydrate production and storage (due to reduced photosynthesis).
4. Plant growth is reduced (leaves, shoots, roots, fruit, etc.)

Plants under drought stress also have weakened defense systems, which can lead to problems with certain insects and diseases. Fortunately, trees can tolerate *some* drought and dry conditions. It is very difficult to detect short-term drought stress in trees. Prolonged drought stress, however, may result in wilting, early leaf drop, smaller-than-normal leaf size, early fall leaf color, scorch on leaf margins, purpling or browning of leaf tissue and increase in disease or insect pressure.

Tree Establishment

Established trees in the landscape don't require water as frequently as those that are recently planted. (Trees generally take a season to establish for each inch of trunk caliper; a 2" tree will take two years to establish). In Colorado's dry climate, trees will need supplemental irrigation during dry periods in the summer and during fall and winter. Keeping your trees well-watered will contribute to their overall health and survivability in the landscape. A general rule of thumb is that the bigger the tree, the more water it will need.

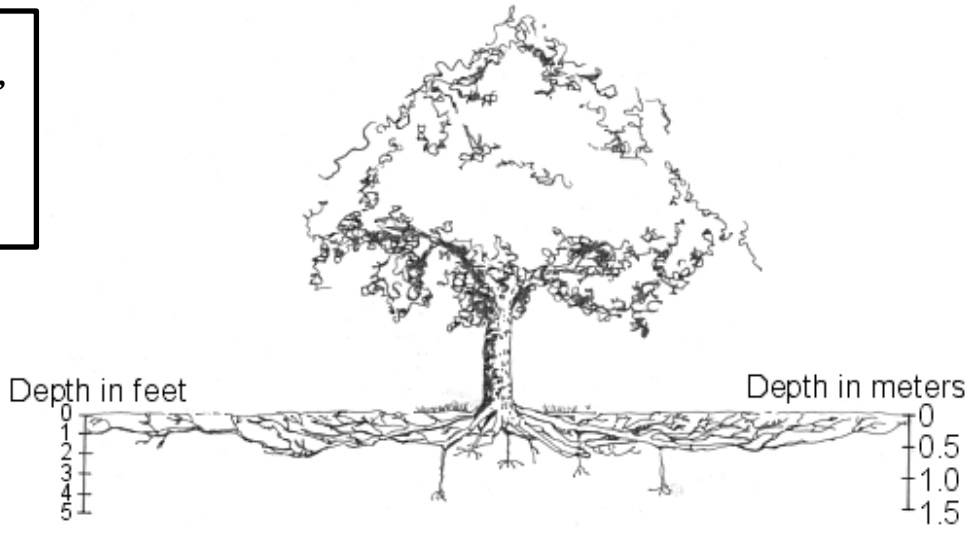
Tree Roots and Their Location

Tree roots tend to be shallow and most are located within the top 36" of soil. In compacted clay soils, up to 50% of roots may be located in the top six inches of the soil with nearly all roots located in the top 12 inches.

Tree roots can extend several times the width of the canopy. Trees planted near or in a lawn will share water with turf roots. Whichever was planted first has the advantage. New trees in an established lawn will have fewer roots to compete; mature trees with an extensive root system will outcompete turf grass.

In compacted or clay soils:

- **90-95% of roots in top 12"**
- **50% of roots in top 4-6 "**
- **Spread up to 5x canopy width**



Determining When to Water

It is difficult to look at a tree and determine if it needs water. Instead, take a slender screwdriver and poke it into the soil in several places around the tree, both inside and outside the dripline (where the canopy extends). If the screwdriver can easily penetrate the soil to a depth of six to eight inches, there is no need to apply water.

Amount of Water

The amount of water to apply will vary depending on the size and age of the tree, the time of year, soil type, watering method and other factors. Aim to apply one to two inches of water every two weeks during the growing season. If you prefer to measure in gallons, apply 10 gallons of water for each inch of trunk caliper - diameter- (e.g. a 4" caliper tree needs 40 gallons of water). These amounts are *recommendations only*. Adjust as necessary for your local situation and precipitation.

Methods of Watering

In general, it is easier to apply the entire amount slowly over one period of time instead of over a period of days. However, if your soil is very dry and cannot absorb the water - resulting in runoff - consider watering over several days to allow for absorption.

Trees growing in sandy soils will need to be watered more frequently than trees in clay soils, since sand drains more quickly and doesn't hold water well.

It is much easier to keep soil continually moist throughout the season than to rehydrate dry soils. Dry soil often become hydrophobic and rewetting it takes a long time with multiple applications of small amounts of water.

There are many ways to water mature trees in the landscape: lawn irrigation, hose and sprinkler, drip irrigation, soaker hoses and self-watering devices.

Lawn Irrigation

When mature trees are planted in/near the lawn, using a lawn sprinkler system is an easy and effective way to water them. (Figure 1) Remember that the turf and tree roots are located in the shared rooting area and both are using the applied water. A good goal is to apply enough water to the lawn to compensate for evapotranspiration (ET); this is the amount of water used by the plants and lost from evaporation. The amount will

Figure 1

vary throughout the season. A typical bluegrass lawn may need one inch of water early in the summer (May-June), up to two inches during July and August and one inch in September and October. You can consider running additional cycles (perhaps a couple times per month) to supply additional water to tree roots. To measure how much water you are actually applying in an irrigation cycle, place several cups in the area and measure the amount of water in them. Multiply this by the number of days the system runs per week:

0.5 inches applied/cycle x 3 days per week = 1.5 inches of water applied per week
1.5 inches of water applied per week x 4 weeks/month = 6" of water per month

Hose and Sprinkler

Figure 2

A hose and sprinkler is an effective way to water trees. (Figure 2) A hose and sprinkler should always be used when the lawn irrigation system is turned off. Place several cups in the pattern of the sprinkler to collect output, or attach a water meter to the hose to determine how much water was applied. The most effective place to water mature trees is just outside the dripline (NOT at the trunk). Depending on the type of sprinkler, it may take 30-60 minutes of run time to apply one inch of water.

Drip Irrigation

Drip irrigation is often used to water newly planted trees. One mistake many homeowners make is leaving the drip irrigation in the original location for years. Emitters must be moved out and additional ones added as the tree grows or drought stress may occur. Depending on the location and tree species, drip irrigation may be eliminated after the tree matures. When using drip, understand the systems' emitter size and output to calculate the amount of gallons applied during each irrigation cycle. For example:

2 gallons/hour emitters x 4 emitters x 30 minutes per irrigation cycle = 4 gallons per cycle

Soaker Hoses ("leaky pipe hose")

Soaker hoses are probably most effective on smaller trees, but can be used on larger trees if there is enough hose available to apply in the tree's

dripline. Soaker hoses apply water very slowly and need to run for long periods of time. It may take several hours to apply one inch of water, depending on pressure and hose size. A small container could be placed beneath the hose (or dug in a shallow hole) to collect water and determine total irrigation output. Do not coil soaker hose around trunks of mature trees.

Self-watering Devices

These systems, sometimes known as "Gator Bags", are best used *only* on newly planted trees. They are not an effective or practical way to water mature trees. Even with newly planted trees there are some potential problems. First, the bag must be monitored to ensure that it is filled with water. Second, bags are often dark in color and when left around the trunk of the tree, can trap excess heat. Third, bags may keep the trunk and surrounding soil overly moist, leading to disease and insect problems. Self-watering devices may be used for the short term, but are not a reliable way to irrigate.

Deep Root Watering Devices

Since the majority of tree roots are not located deep within the soil profile, deep root waterers are not an effective method of irrigating. In addition, the device must frequently be moved around the tree, which is time consuming. A hose and sprinkler is a better option.

Following your method of irrigation, stick a slender screwdriver into the soil. If you cannot penetrate to a depth of six to eight inches, water again. Repeat this process until you have adequate soil moisture.

Fall and Winter Watering

Watering trees in Colorado's dry fall and winter months is extremely important. Moist soils hold more heat than dry soils, leading to additional growth in the fall and increased time for establishment. Adequate soil moisture also leads to better plant hardiness and ability to survive cold, dry winters. Aim to water trees and other woody landscape plants monthly when natural precipitation between October and April is less than an inch per month.

Precipitation can be in the form of snowmelt or rain, but snow moisture can vary. Water on days when the temperature is above 40 degrees. Apply an inch of water early in the morning to allow it to soak into the soil before freezing at night. For additional information, refer to CSU Extension Fact Sheet #7.211 at www.extension.colostate.edu

Figure 3 Snow holds varying amounts of water

Obey All Ordinances

Be smart when watering and avoid irrigation during the hottest part of the day (10am to 6pm), when evaporation can occur more readily. Follow all HOA guidelines and town/city restrictions.

Authors: Dr. Alison O'Connor and Eric Hammond, Colorado State University Extension. Figure 1 source: By M.O. Stevens (Own work) [GFDL (http://www.gnu.org/copyleft/fdl.html) or CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons; Figure 3 courtesy of Mary Small, Colorado State University Extension

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