RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS
SCIENTIFIC TREE CARE SINCE 1907

Tensiometers

In Landscape Plantings

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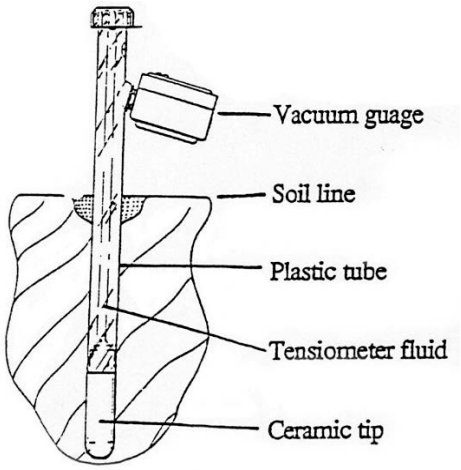
The amount of water in the soil, in large part, determines how well trees and shrubs will establish and grow. Lack of water is one of the leading causes of failure of new plantings. Mature trees with root damage from construction injury, root rot or other factors also may die during drought periods due to their inability to take up adequate amounts of water. At the other end of the water spectrum, trees and shrubs that receive excess amounts of water experience root loss due to lack of air in the water-saturated soil. When water levels are high, 'water mold' type root pathogens can infect and eventually kill.

Figure 1: Components of a typical tensiometer



Judging soil moisture level is difficult and often inaccurate without the aid of a soil moisture-measuring instrument. While there are different devices available, the most practical is the tensiometer (Figure 1). When properly installed in the soil, water moves in or out of the tensiometer tube through the ceramic tip to reach equilibrium with the soil. As the fluid moves out, a vacuum is created inside the tube and it is measured on the gauge. The higher the vacuum reading, the dryer the soil. When the soil is saturated, there is no suction because water moves back into the tube, so the gauge will register zero.

Installing a Tensiometer

Tensiometers should be installed in problem areas on landscapes which can be irrigated. Problem areas include those which may be too wet or dry, new plantings, trees in construction areas and trees with root problems.

For more routine measurements, tensiometers may be installed near the trunks of important trees, within hedgerows or near the base of any important plant. These locations will provide information on existing irrigation programs and, if used to regulate the irrigation timing, can provide great water savings.

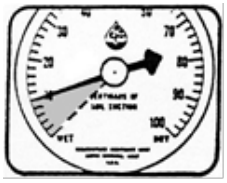
Care should be taken in tensiometer placement so that mowers, people or vehicles do not hit it. Once installed, the tensiometer should remain in place for as long as the moisture needs to be monitored in that area. It must, however, be removed before subfreezing temperatures.

During dry periods or when the irrigation system is set to run routinely, the tensiometer should be checked every day or two. In periods of normal rainfall without supplemental irrigation, a weekly reading is usually sufficient. The tensiometer is also checked during regular Monitor inspections.

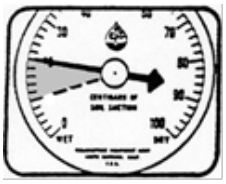
Interpreting Tensiometer Readings

After the tensiometer is in the soil for a day or two, the reading on the gauge should be representative of the soil conditions in that immediate area. The gauge on the tensiometer is calibrated in centibars of soil suction. One bar (100 centibars) is equal to 14.5-lb./sq. inch.

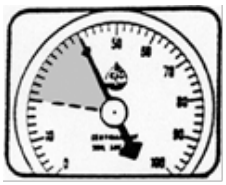
The amount of water available to the plant depends on the soil suction and soil texture, so different soil textures will require irrigation at different soil suction readings. The following are approximate interpretations of the gauge readings. Interpretations should be modified for each landscape as experience is gained with the tensiometer.



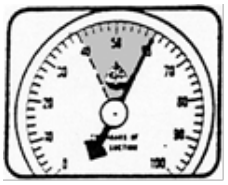
0 - 10 Centibars: The soil is saturated with water. No irrigation should be applied. If this condition persists for more than a few weeks during the growing season, some plants will be damaged. Drainage may need to be modified to correct this problem or plants that tolerate wet sites should be installed. During rainy periods in the dormant season, readings in this range are common and not a problem for most plant species.



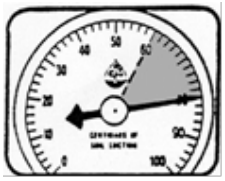
10 - 20 Centibars: This range is referred to as 'Field Capacity'. No irrigation is necessary. There is adequate moisture and air at this level to provide plant growth.



20 - 40 Centibars: For clayey and loamy soils, no irrigation is needed. There is adequate soil moisture and aeration. For sandy soils, irrigation should be started.



40 - 60 Centibars: For clayey soil there is still adequate soil moisture. For loamy and sandy, irrigation should be started.



60 - 80 Centibars: Irrigation should be started for all soil types.

Above 85 Centibars: Soil suction will remove all fluid from tensiometer and damage to nonxerophytic plants may occur. The tensiometer will need to be refilled and irrigation started.

When irrigation is needed, approximately 650-750 gallons should be applied per 1000 square feet of soil surface beneath the dripline. The irrigation system should be calibrated so that this water volume is translated into irrigation time.

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