Determining Tree-Available Water In Soils of Different Textures

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Figure #1 shows the amount of unavailable water held by soils of various textures. This water can not be pulled from the soil and into the tree through transpiration. In old terms, this soil concentration of water was called the permanent wilting point. **Figure #2** shows the total amount of water which could be held against gravity in a soil. This concentration of soil water is the most water a soil can hold without any water draining away, and the soil is said to be at field capacity.

Figure #3 shows the total amount of tree-available water present in soils of various textures. ***Subtracting Figure #1 from Figure #2 produces Figure #3.*** In Figure #3, the top line on the graph is the total water in a soil. The bottom line on the graph is the amount of water unavailable to a tree due to soil surfaces and pore spaces holding water too tightly, and to trees not being able to generate enough force to remove water from the soil.

Calculation Example (follow the dotted lines)

Step 1: A tree root occupancy area of a loam soil is three feet deep. Use Figure #1 to determine the total unavailable water in a loam soil. ***Answer*** = 1 inch of tree unavailable water is present per foot of soil depth, or 3 inches of water are unavailable for tree use in the whole three feet deep loam soil.

Step 2: Use Figure #2 to determine the total amount of water present per foot in a loam soil. ***Answer*** = 3.1 inches of total water is present per foot in a loam soil, or 9.3 inches of total water in a loam soil three feet deep.

Step 3: The shaded area of Figure #3 shows the inches of water available for tree use per foot of soil. Figure #3 = Figure #2(Step 2) minus Figure #1(Step 1). ***Answer*** = There are 2.1 inches of tree-available water per foot of soil, or 6.3 inches of tree-available water in a loam soil three feet deep (2.1 inches X 3 feet soil depth).

Step 4: If evapotranspiration on the site is estimated to be 1/3 inch of water per day, how many days of tree-available water is present in the loam soil? ***Answer*** = 6.3 inches of tree-available water present in soil from Step #3 divided by 1/3 inch of water loss per day from evapotranspiration = 18.9 days (~19 days of tree-available water present in a loam soil three feet deep with 1/3 inch of water loss per day from evapotranspiration.

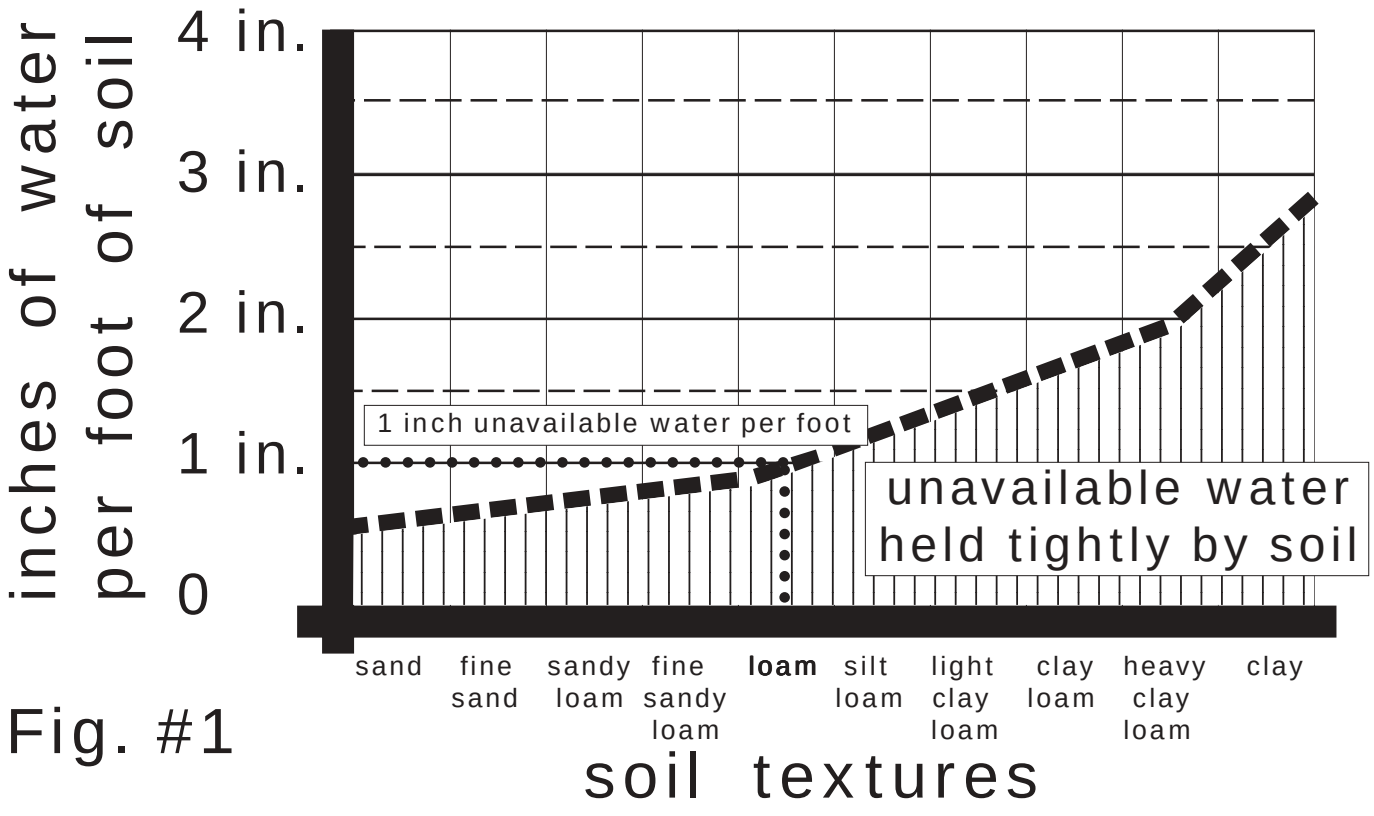

Fig. #1

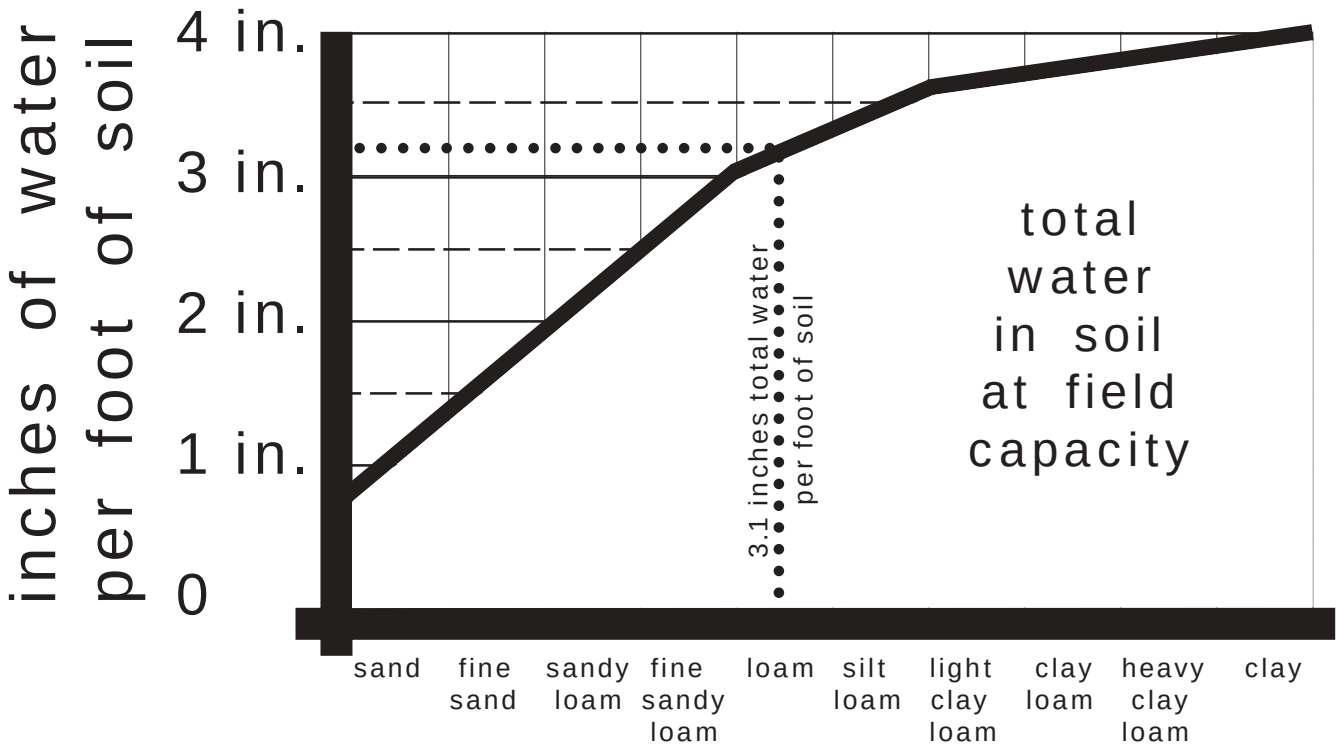

Fig. #2

difference between total water at field capacity and unavailable water held by soil

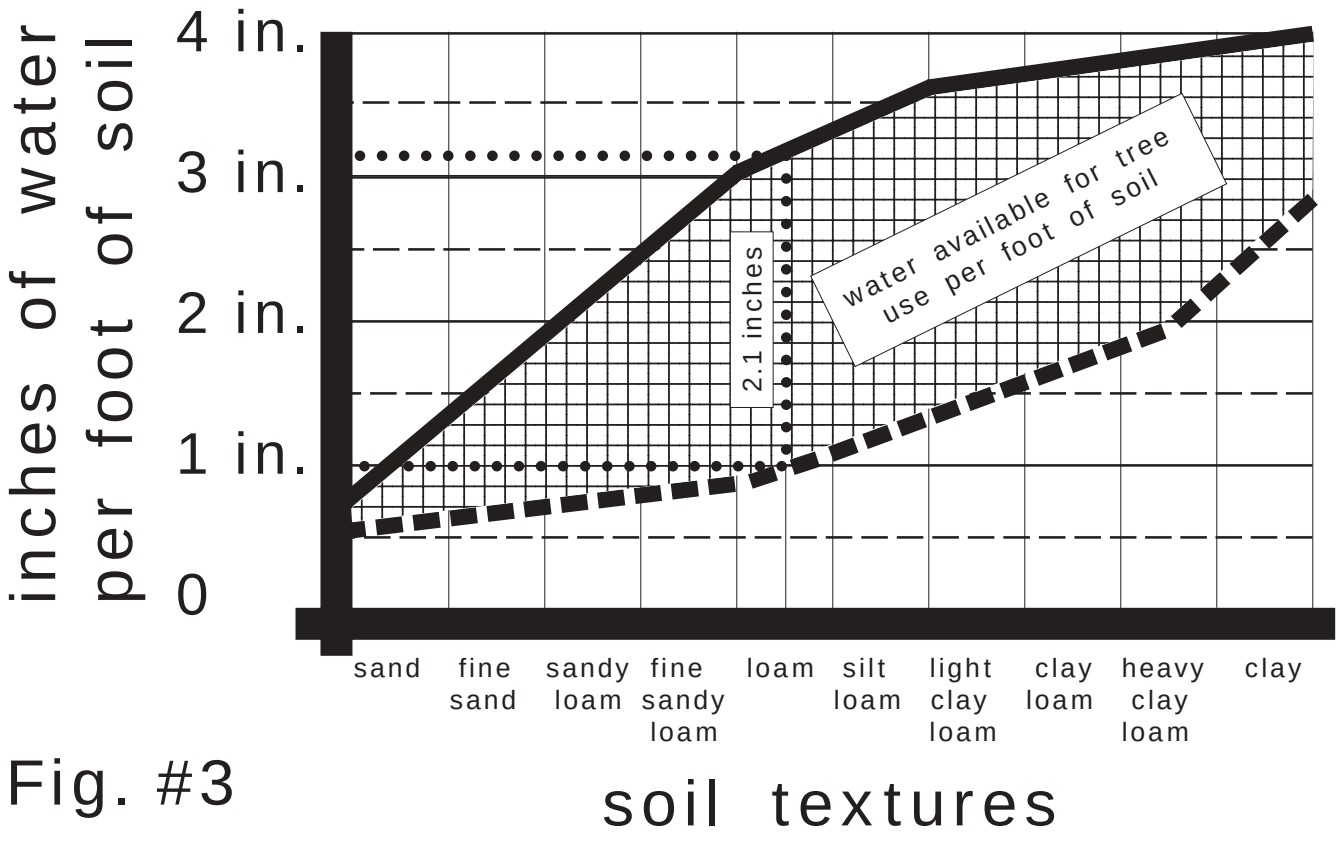

Fig. #3