

Soils are Key to Supplying Plants with Water

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The soil is a reservoir that holds water for plants. It is important for recharging groundwater by allowing rainfall to infiltrate and filter through the soil into the water table. This happens because the soil is a porous media where the spaces in the soil (pores) are either filled with air or water. The capacity of soil to hold water determines your watering practices in order to provide continued sufficient water for plant growth depending on the drought resistance of your plants. However, not all soils are equal in this capacity.

Field capacity is an important characteristic of soil because it represents the maximum amount of water that a soil can hold. The main soil properties that affect the field capacity of a soil include soil texture, organic matter and compaction.

Soil texture refers to the proportions of sand (0.05-2.0 mm), silt (0.002-0.05 mm), and clay (smaller than 0.002 mm) in the soil. A higher proportion of the larger sand size particles, the more coarse a soil is. Sandy, coarse textured soils have lower field capacity. This is because the greater amount of large particles leads to larger pores from which the water can quickly drain. On the other hand, fine textured soils comprised of the smaller soil particles have a greater amount of small pores that can hold water better, leading to a greater water holding capacity of these soils. However, not all the water held by soils can be used by plants. Some water is very tightly held in the soil and not able to be taken up by plants.

Plant available water holding capacity represents the water retained in soil between field capacity and the wilting point, in another word, it represents the amount of water retained in soil that can be taken up by plants. Even though soils that have high clay contents (such as clay loam, clay) can hold more water, they hold the water tightly so less water is available for plants than silt loam or a sandy loam. The question is, how do we improve soil texture for improved plant available water holding capacity? Unfortunately, changing soil texture of a field is not a viable option unless you introduce foreign soils to the field. Fortunately, there are other options available to improve plant available water holding capacity.

Organic matter is another portion of the soil that holds water. The higher the organic matter content, the more water the soil can hold. Increasing organic matter can increase the field capacity significantly. Increased soil organic matter content improves soil structure which results in increased infiltration, therefore, increasing plant available water. The strategies to increase soil organic matter includes growing cover crops, adding manure, compost or biochar or mixing in leaf mold, peat moss or coir. Avoid disturbing the soil by refraining from overtilling, either manually or with a rototiller.

Compaction reduces the plant available water holding capacity of a soil. This is because compaction reduces porosity which in turn decreases a soil's field capacity. Compaction also crushes large pores into smaller pores which leads to a greater proportion of the water being held more tightly by soils. As a result, compaction results in less water available for plants to take up. Also, when a soil is compacted, it becomes harder for roots to penetrate. This can lead to less volume of soil for roots to access to water that is held below than the compacted layer. Stay off soils when they are wet, avoid overtilling, and make defined walking paths through garden areas or perhaps use stepping stones so as not to compact your soils.

Salt content is another soil characteristic that impacts availability of water to plants. Soils that are high in salt concentration tend to have higher wilting points that results in less water for plants to take up. This is more of a problem in the dry regions of the US where salt accumulation is mainly a result of natural soil formation processes and irrigation. In our soils, the salt level can be elevated in areas that have been overfertilized.

In addition to adopting practices that can increase the plant available water holding capacity, there are other practical options for reducing water loss from soil. Mulching is an effective practice to reduce evaporation loss of water. There are many sources of mulches available in the market such as hay, straw, wood chips, bark or cocoa shells. Gardeners can also use untreated lawn clippings.



Straw mulch. Photo by dmp, 2015.

For questions on soil water or if you have any other gardening questions, contact the UConn Home & Garden Education at (877) 486-6271 or www.ladybug.uconn.edu or your local Cooperative Extension Center.

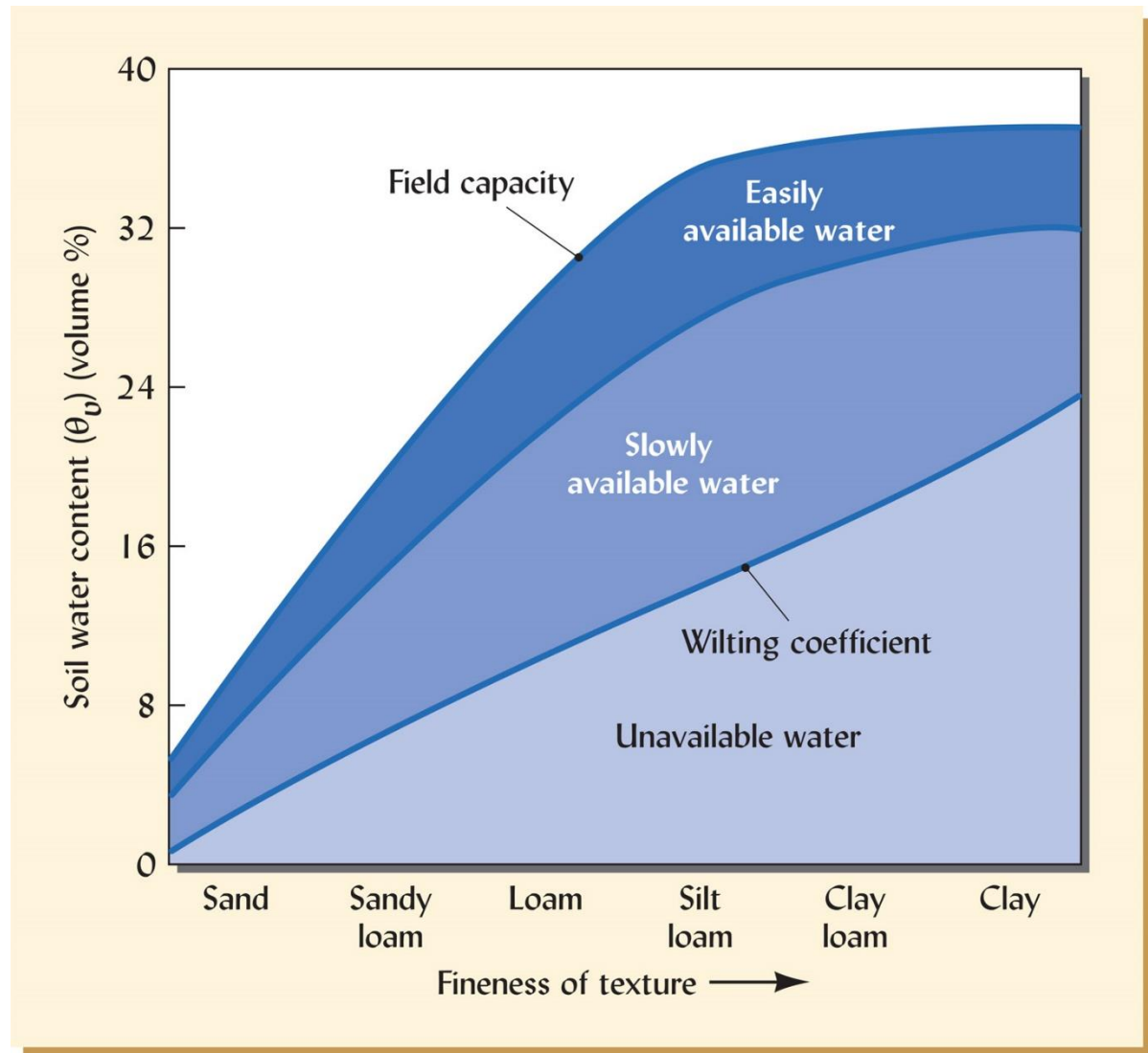


Figure shows general relationship between soil how plant available water capacity (easily available water plus slowly available water) is impacted by soil texture (source: The Nature and Properties of Soils by Ray R. Weil and Nyle C. Brady).