WATERING GUIDELINES

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People frequently ask: I have a (insert plant name here). How much should I water it? While the species of plant is definitely a factor in how much water it will require, there are a number of other considerations, including:

1) The texture and organic matter content of the soil
2) The slope of the soil
3) If a shallow clay or plow pan is present
4) The depth to the water table
5) The season and the weather
6) The size of the plant

Untangling all of these factors can be challenging. Since several of the factors involve the soil in which the plant grows, a good place to start in figuring out what the plant needs is to take a look at the soil. This could be done any of a number of different ways. My preferred way is to use a soil sampler, as seen here:

The advantage of this tool is that it can answer several of the questions at once. One can get an idea of the moisture content, the organic matter content, and the soil texture in one simple sample. A trenching or "sharpshooter" shovel should also work well, as would a gardening trowel (with some dedication, anyway). All of these tools should allow the gardener a chance to look at and feel the soil.

Soil texture refers to the relative amounts of sand, silt, and clay in a given soil. The texture influences many things, including the nutrient capacity of the soil, the rate at which water can flow through the soil, and how much water the soil can hold.

Clay soils are sticky when moist or wet, while silty soils are smooth and slick. Sandy soils have a gritty feel, often when wet or dry. Most soils have some combination of sand, silt, and clay in them.

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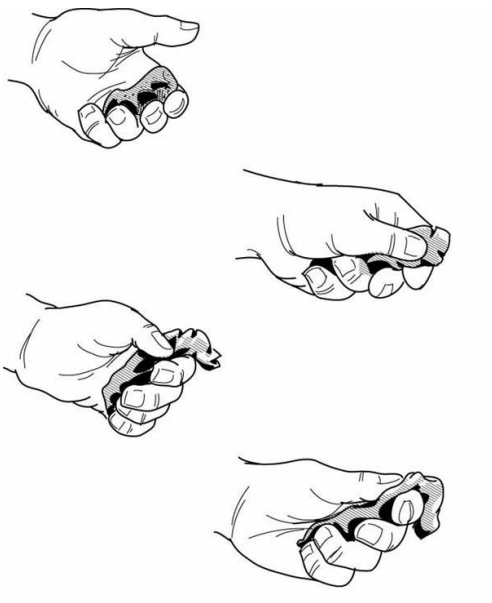
A soil with decent mix of all three (mostly silt and clay with a little sand) is said to be "loamy". In addition to the texture of the soil, fine organic matter (humus) is typically present in the upper layers. High levels of organic matter can give the soil a blackish appearance. Finally, coarser organic material such as bits of twigs and dead leaves can typically be found in the top few inches.

When you dig a hole or use a probe to sample soil, pay attention to the above factors to help determine whether the water supply is adequate. Look at the sides of the hole, and/or the sample you brought up. Is there more moisture in the top two inches, and is it dry 8 inches down, or the other way around? Many more deep-rooted plants like trees and shrubs can handle allowing the soil to dry 6 to 10 inches down, surviving on soil moisture at 12 inches or below. Many annual grasses and shallow-rooted forbs, on the other hand, have root systems that rarely extend deeper than about six inches down. These smaller plants may struggle if you allow the topmost soil to dry out.

Sandy soils typically absorb water quickly, and then drain and dry just as quickly, and don't hold a lot of the water that flowed through them. If you have a sandy soil, it will typically feel either wet or dry (usually dry), and that is your answer, plain and simple. Frequent irrigation and/or drought tolerant plants are typically required on these soils.

Clay soils can be trickier to assess. They hold onto water quite well, and can therefore absorb large amounts of it. However, they absorb and release water slowly. Clay can hold onto water so tightly that even a soil that feels damp and slightly sticky to the touch may be so dry that a plant cannot get any more water out of it. Thus, to assess the amount of water in a clay soil you will need to try and form a ribbon out of it between your thumb and forefinger. If you can form a ribbon of moist soil that is several inches long, the soil moisture is about right. If the ribbon falls apart because the clay is either too wet or too dry to form a ribbon, then the answer is self-evident.



Loamy soils have enough clay in them to absorb water, but enough sand and silt that they do it quickly, and they also drain well. In general, the moisture content of these soils is fairly self-evident. If you can squeeze water out of it, it's too wet. If it clumps together when squeezed, it's about right. If it crumbles to a powder or dry crumbs, it's too dry.

Organic matter is a term that refers to the amount of humus in a soil. Up to a point, humus adds to the nutrient capacity of a soil and increases both the ability of water to flow through the soil and the ability of the soil to hold water. In short, it makes the soil more "sponge-like", and plants thrive in soils with high humus content. This is why farmers and gardeners value rich, black, fluffy soils with high organic matter. Unfortunately, there is a limit to how much organic matter will remain stable in a soil over

time. When the organic matter fraction of a soil exceeds about 10 percent, the organic matter is typically broken down by the organisms living in the soil itself.

Slope matters because it affects drainage; the greater the slope, the greater the drainage. Thus, some slope is helpful on clay soils, which usually drain poorly, but can be detrimental on sandy soils, which often hold little water to begin with.

Clay layers and plow pans below the topsoil can interfere with drainage, causing water from winter rains to pool above the clay layer, which can drown roots in winter. Roots like water, but the roots of most plants also need access to oxygen. If the roots sit in flooded conditions for more than a few days, they may begin to die, or they become so weakened that they become susceptible to root diseases. Symptoms of root loss due to drowning or disease are usually not evident until water stress sets in the following summer, when the plant does not have enough roots left to keep up with demand. Thus, the reason your plant may be showing drought stress in the summer may not be because there is too little water, but because there is too much. Clay layers and plow pans contribute to these issues by pooling water at the soil surface, and limiting how deep the roots can penetrate into soil.

Shallow water tables can restrict oxygen flow to roots, particularly in winter when soils may flood. Because a significant amount of root development occurs in winter, this can cause trees to run out of water during the summer, as above for Clay layers and plow pans.

When to assess the soil If you're out testing soil just after a rain, almost all soils wil be "too wet". The weather and the time of year make a difference too. The biggest single factor in plant water use is how many hours of sunlight it gets. This varies with the time of year. All other things being equal, plants will typically use the most water around the longest day of the year, summer solstice (around June 21st.) Because early June corresponds roughly to the end of the rainy season in California, there is still usually abundant water in the soil at this time. However, as plants use the water at their highest rate, the water supply doesn't last long, so *the time to start checking your water is typically around early July, and lasts through August*. Even if the weather is hot and dry in October, the day lengths are so much shorter that a plant can often get by with less water than it would closer to the summer solstice.

There are many ways to apply the water, but one thing is certain: do NOT apply it at the base of a shrub or tree trunk. Water should be applied at the dripline of woody plants (the dripline is an imaginary line where water would drip from the outside edges of the tree or shrub canopy onto the ground). For larger plants, try using soaker hoses to make a circle at the dripline, and apply water until the soil is wet at a depth of ten inches. Depending on your soil (all those characteristics outlined above), this might take ten minutes, or it could take an hour. If the water begins to puddle and run off, as happens frequently with clay soils on slopes, it could take two twenty minute soakings.

Then you would re-sample every few days until you found that the soil eight to ten inches down was only just moist - perhaps a little crumbly. At that point, you'd apply more water just as you did before.

If you did this in early to mid-July, this would give you water use at what is typically the highest demand time during the year, but of course weather conditions can influence this too. If you happen to determine water use during a particularly cool, moist July, and then the next July is hot and windy, the water use you calculated the year before would be inadequate. Likewise, as a plant grows larger, its water demand will increase too. This is especially true for large trees. Thus, you'll need to either make some common sense adjustments, or re-determine the plant's water use requirements.

Water use during the remaining months of the year will be something less than what you calculated in July. Obviously, the tree is using next to no water when it's dormant, and this happens to be the rainy season in California, so water use is not an issue from November until about April. Because day length is the most important factor in plant water use, and because autumn day lengths are short and weather is typically somewhat cool, water use in September and October is not usually a concern. Water use in the spring is not normally a concern as ground water levels are quite high after the rainy season. Therefore, the most important time for monitoring soil moisture is this critical period from early July through August. If your plant is going to get water stressed, this is when it will most likely happen. Use common sense when applying these guidelines. If it has been a poor rain year with a particularly dry, hot spring, then you might need to start monitoring soil moisture in June. On the other hand, if it rained even an inch in June and the weather was cool, you might not need to start monitoring until mid to late July.

One last note on water: As they grow, trees and other large plants may find their own water sources in the form of septic leach fields, underground aquifers, leaky pipes, shallow water tables, etc. In these cases, the tree may do fine without supplemental irrigation. Thus, the most critical time for determining irrigation needs for larger landscape plants are either for the first two years after planting, or for a year or so following severe root injury (as might happen when trenching for sewer line replacement).

Finally, in California trees are best planted in the fall or winter, so that they have several months to establish their root systems before the stress of a dry summer. Planting in October will pay off handsomely in terms of the amount of work you save yourself and stress you save your tree.

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