Saving water and still growing healthy plants

By Charlie Mosse, April 2022

Water to a plant, particularly to a bonsai in a small pot for the size of the plant, means everything for the success of it growing to be a healthy bonsai. You can use the best pot, soil mix, fertilizers etc., but without good watering practices, it is obviously more difficult to achieve. So, watering will be talked about again since we are experiencing warmer weather in general and are coming into a what appears to be another dry year with looming water restrictions. There are suggestions in the article (but I also encourage members to seek out additional information) on techniques to reduce water use and still achieve what we are all striving for, a quality bonsai. So how do we save water while caring for our trees and still grow a healthy plant?

We all know that day length varies from season to season. A full day's sun in December (winter solstice month) is very different from a full day's sun in June (summer solstice month) by 4 hours and 19 minutes. Along with increase in day length also comes higher sun angles. This change in sun angle significantly changes the shaded areas, and in many cases the shade may disappear or, shade is created. These two conditions help to bring on the obvious warmer days. Warmer days also come with warmer nights that also increase water usage and soil drying. Now let's add in the heat waves and Santa Ana's that occur. These extend our heat season well into the fall and now we experience serious heat events in winter. This is not new news but the reality is that we will be using more water, therefore we need to be mindful of that and determine ways to save water and still grow healthy bonsai.

Good watering habits are a must for us and, at the same time, we need to protect our plants and soil/pots from excessive heat spikes and hot periods of long duration. As we know, soils dry out quickly in adverse conditions but one thing that is not commonly known is that several hours after watering, the soil begins to dry at what appears to be an exponential rate. This is due to the heating of the soil and the increased air movement in the soil as the water evaporates. Before we realize it, the soil is getting too dry. Basically, the rate of soil drying increases with time. So, on a very warm to hot day, and especially with the drying effects of wind, when you see marginally moist soil in the morning…water!!! During those times, one should definitely check later in the day for watering needs.

Water Source: In the past we have covered the fact that most of our water comes from the Colorado River, which is alkaline, meaning it has a lot of minerals that cause problems for us. Out tap water has a high pH, usually 8-9… too high for many plants. We can mitigate some of these negative effects but must be more careful since warmer weather exacerbates the effects of both problems. We can be very careful by using proper watering techniques or we can install deionizers or reverse osmosis systems to remove the minerals and even treat the pH issue. Most of us will use our existing tap water and work around those issues.

Watering technique: This is important. We cannot just water with one pass of the water wand or hose nozzle. It is best to do a light watering with the wand or fan spray to pre-wet the soil surface of all the plants. Then come back and water more thoroughly, avoiding runoff. The pre-wetting will wet the surface and help the next watering pass penetrate better, with less runoff, by breaking the surface tension of the water and increasing the absorption. This works very well for any very dry root ball of any soil type, whether in the ground or in a container. Reduce the flow rate to where you get good rain-like spray but eliminate "flash flooding" on the soil surface. This reduces runoff of water, dry fertilizers and surface soil particles. To get a thorough watering of the root ball, it is necessary to make 2-3, sometimes 4 passes with the wand or nozzle.

The additional waterings will also help to flush some of the accumulated minerals/salts out of the soil. Several applications of water over a short time period also helps to make the minerals and salts more soluble so they can be leached out. Just because water runs out the bottom on the first full application of water does not mean that the salts are solubilized immediately. The second and third applications flush out more salts and help to ensure the thorough wetting of the root ball.

Submersion is one of my go-to techniques for watering "hard to wet" root balls and for smaller kifu sized trees, shohin, mame, as well as accent plants. This is especially helpful during hot weather when proper wetting of the soil is a must! This technique will flush salts too, but normal overhead watering is the best method to flush salts. Submersion into a solution of fertilizer is also a great way to fertilize and water. The soil particles have time to better absorb the water and fertilizer. This has helped with the smaller trees and harder, impacted root balls. Submersion allows you catch the water that drains from the plants in the soaking container or in another container that you can pour onto other trees, other container plants, or into your garden. If you have access to rainwater for submersion, then salts will not be an issue.

Soil conditions: Soil surface condition is important. Eric Schrader of Bonsaify (Youtube) and Ryan Neil of Bonsai Mirai (Mirai Live) both have good videos on how to correct bad soil surface issues. This is huge and will save the time and money of a repotting and vastly reduce the runoff from a hard soil surface. Basically, the soil surface can become water repellent due to any or all of the following: tap water salt accumulation, dry organic fertilizers accumulating on the surface, other inorganic fertilizers accumulating in the surface particles or the breakdown of the soil surface/top layer of the akadama and bark. These all conspire to create a crust that needs to eventually be addressed.

Dry organic fertilizers: Many contain lots of particles that do not breakdown quickly. To help prevent the crusting of dry organics they should applied in piles say at the corners, or worked into the soil to breakdown more effectively or they can be put into tea bags and placed on the soil surface. One can get hardened pellets such as Bio Gold and apply in piles, or lastly, use liquid organics like fish, fish/kelp or digested

organic waste liquid types. Do not scatter dry organics on the surface. Eric Schrader has a good, short Youtube video on organic fertilizer application.

Soil surface protection: The exposure of the soil surface to the sun is of course unavoidable. We can protect the plants by providing shade in some way and by covering the soil and pot in some manner. We just need to adjust what we do to protect our trees from sun exposure as the seasons change. A great spot for a tree in full sun in January is probably not be a good spot for the tree in August. However, if you have a large area covered by shade cloth this solves a lot of moving around of trees due to seasonal or heat events. Highly recommended if you can install a good shade area.

Another thing to remember is that the days are longer as we get closer to mid-June, therefore soil surface protection is particularly important from June through September along with the warmer days. All day sun in January is good with shorter days and lower sun angle but can be harmful from May through October with longer days, higher sun angle coupled with much warmer temps. Providing more shade can prevent the "cooking" of the roots in the container.

It is important to note that the part of the tree at and above the soil level can take the hot sun, but many times the roots cannot. This is particularly true of the root tips and root hairs where all of the absorption of nutrient and water take place. If they become damaged or die, then the plant suffers primarily from the lack of water to the foliage and secondly from the lack of nutrient uptake. The lack of water uptake, of course, causes the foliage to not be able to cool. Foliar damage can then occur depending on the variety of plant; maples are more susceptible while junipers are much more resistant. If the damage spreads, then entire roots can die which can lead to die back of branches and even dead tissue occurring on the trunk. Lack of nutrient uptake is a longer term issue if the roots take a long time to recover. Protection of the pot and soil must be part of one's routine during hot periods.

A container will get very hot with ambient temperatures above the mid-90's and is also slow to cool down, especially large pots. Then, if the tree is in direct sun, the pot gets even hotter, sometimes to the point of damaging the roots. The amount of damage can vary from slowing the plant down a bit, to stopping the growth for many months until the roots recover, to burned foliage, to all the way to dead roots and subsequently dead branches, even the entire plant dying. That's why protecting the pot itself becomes a priority for many days and weeks during the year, as needed. Reflected heat from walls should also be an important consideration. Reducing extreme temperature swings in the soil will make for a healthier tree.

Here are some suggestions for protecting the pot and roots to reduce watering needs:

Spray off the pot and soil surface during the heat of the day. Yes, this takes water so use a fine spray or mist to save on water for the task. Do not water the tree unless the soil is drying or is dry. Sometimes only a light watering is needed. One should also wet the pot covering material mentioned below to aid in cooling the pot and soil.

Examples of pot protection from direct sunlight on the container: freeze cloth, burlap, thin styrofoam sheets cut out to extend over the edge of the pot by 1", drainage screen on top of the soil that extends out about a 1" past the edge of the pot secured with homemade staples made with aluminum wire, long strand sphagnum moss held in place with aluminum wire staples. If it is really hot and/or dry, place trees on the ground in a more shaded area during the peak heat like under your display benches or other shade. The ground is a bit cooler and more humid due it being wet from watering.

Wind dries soil very quickly. Protection from wind can be accomplished by utilizing some type of wind protection. Examples are lattice, frost protection cloth, shade cloth, bamboo screen or woven screen (tennis courts). One can also use existing tall potted plants to provide wind screening. Note that good air movement improves photosynthesis whereas no movement or high winds do not improve photosynthesis. If it is very windy, place trees on the ground where possible since there is usually less wind close to the ground.

Place smaller trees in trays with small gravel and/or sand. Keep the medium moist or a bit wet. This does take water but reduces stress and watering needs for small trees, shohin, mame and accent plants. This also helps to keep the soil temperature a bit cooler than ambient temp due to evaporative cooling around the pot. A tray is not a cure-all for hot, low humidity days but it does help.

When was the tree in question last repotted? Newer soil will dry faster due to the increased air spaces in the new soil and there are less roots. As soils age, the particles break down, more roots will have grown taking up some of the space in the soil but will still have good water absorption and retention capabilities. Very old, compacted soil is very full of roots and fines causing reduced water absorption and retention capabilities. This, along with tree water usage, causes the soil to dry quickly.

What is the size of the tree relative to the size of the pot? Is the tree in development and has lots of soil vs. a tree in refinement that is in a smaller pot than what it was developed in? Then there are all of the scenarios in between. These differences in soil age and soil mix will demand that they cannot be watered the same way and frequency. Watering each of your trees the way it should be watered will save water and help to ensure a healthy tree.

Summary: Slow the water application from the wand or nozzle to reduce runoff and soil erosion. Replace hardened surface soil with fresh soil mix to improve water absorption and reduce runoff. Pre-moisten the soil surface before watering fully to also reduce runoff. Then do the multiple waterings per tree so the root ball is fully wetted. Provide some type of physical cover over the trees to reduce water needs and cover the soil surface and pot to conserve water and help to not cook the roots. Protect the trees from excessive wind. Creating as reasonable an environment as one can in their situation will help to ensure the health of one's trees and help you achieve the quality of bonsai for which you are striving.