

BASICS OF BONSAI REPOTTING – 22 April 2017

The following notes are a synopsis of topics covered in a repotting workshop conducted by Tom Anglewicz and Adam Johnson on Saturday, April 22nd, 2017. These topics and techniques are based on studies that both presenters have undertaken with Ryan Neil of *Bonsai Mirai* in Oregon.

Why Repot??

Repotting or transplanting bonsai is always stressful for the tree, which is why it's not generally a good idea to repot a sick tree; it may likely die. So we need to have a good reason to do so. Here are several reasons why you may want to consider repotting a bonsai:

- 1) Loss of water percolation.** When you see lack of percolation (i.e. water standing on the surface of the soil for a prolonged time when you water), the first step should be to clean the surface of the soil of decomposing organic fertilizer, moss and surface roots. This should be done every two to three years, or when there is obvious lack of percolation. When cleaning the surface of the soil, you need to take it down to where you see friable soil (i.e. the granular particles of the soil). Then you can backfill the surface with new soil and add fresh top dressing. **If you continue to dig down and find no friable soil particles, then the tree probably needs to be completely repotted.**
- 2) Decomposing soil.** This is actually similar to #1. If the tree has been in a soil mix for some time, the soil particles have broken down and the mix is no longer draining properly, that is generally a signal to repot.
- 3) Replacing nursery or native soil.** If you obtain a tree from a nursery there is a very good possibility that it is not growing in soil that is suitable for bonsai. Nurseries generally do not want to spend more time and money than they have to on watering, so their trees are likely to be growing in very dense mucky soil that is not conducive to the development of fine roots and may be conducive to root rot. The same may be true for field-collected trees. In the case of nursery stock, if the tree is healthy it is a good idea to get it into better draining bonsai mix as soon as possible, but see cautions below about how much soil to remove.
- 4) Change of style or planting inclination.** If the styling objectives for the tree indicate that it should be placed at a different angle or orientation with respect to the viewer, this can also be a reason to repot. Change of style can obviously also suggest a different container shape or size.

Preparation:

If you like to cook, you may be familiar with the French term, “*mise en place*.” Translated, these words simply mean “put in place” or set up. They refer to organizing and arranging the ingredients that a chef will require to produce the menu items that are expected to be prepared during a given shift.

“*Mise en place*” is also a very appropriate term for the repotting process. In order to repot a tree correctly, and to preserve its health in the process, you need to be carefully prepared and have everything at hand that you will require for this operation. The following is a checklist of items you will need; more elaboration will follow:

A Suitable Workplace – Repotting is a messy process, not generally something you want to undertake on your dining table. It’s not a bad idea to have a couple of trays or containers – one in which you can remove the tree from its present container and collect the soil to be discarded; and a second one in which you can place the tree and mist the roots while you are preparing its new container. You also need some table space for the other implements you’ll need during the process.

Soil – Appropriate mix for planting and for drainage, in quantities as necessary, sifted and sorted by particle size (See further description below).

Top Dressing – (See description and recipe below)

De-potting Tools – A small scythe or similar tool(s) used to free up the tree from its present container.

Root Hook and Chopsticks – To use in removing old soil from the root mass and combing out roots to be retained. (See notes below on definition of “chopsticks”)

Root Cutting Tools – This should consist of root cutters that can be used to remove a large tap root, for example, as well as some sharp shears appropriate for trimming back smaller roots in preparation for repotting. Since you’ll be cutting roots that are in gritty soil, you may want to earmark a pair of shears for this purpose that are not the same ones you use for pruning branches, etc.

Wire Cutters – To be used for cutting away existing anchor wires and for cutting wire hold-downs for drainage mesh and for new anchor wires.

Pliers (either jin pliers or conventional hardware store type) – To be used in anchoring the tree in new container.

Plastic Drainage Mesh – To cover drain holes in the new container.

Aluminum Wire – For drainage mesh hold-downs.

Galvanized Steel Wire – For anchorage of tree in new container.

Spray Bottle – To mist exposed roots after the tree has been removed from existing container.

Small Hammer – For driving lengths of bamboo into root mass (see “chopstick tie-down” anchorage method, below).

Rubber Pads – To protect surface roots if the “wrap over rootball” anchorage method is used.

Several Potential New Containers – If possible, it is a good idea to have some alternative planting containers for the tree. Once the root mass is exposed and the new planting angle is decided, a final decision can be made about the most appropriate one.

A Watering Can and Place to Water – When the repotting process is completed, it is necessary to water the tree thoroughly with a fine spray that will not dislodge the new soil and top dressing. This is best done for the first time with a watering can that has a rosette with very fine spray. The container also needs to drain thoroughly, so there should be a place where this can happen without hindrance.

The Process:

- 1) **Removal from the Pot or Growing Box** – Check to see if there are anchorage wires holding the tree in its existing container; cut these away before you do anything else. Then use the scythe (or similar implement) to cut through the soil at the edges of the container. This should not be a “sawing” motion but rather a “raking” motion to remove soil and roots from the edges while the tree is tipped in a horizontal position (minor damage to roots at the edges is not a problem, since these roots will be trimmed to accommodate the new container anyway). When the tree is tipped for de-potting, it should be supported without holding the bark. Bark is an important feature, especially on conifers. Similarly, on deciduous trees their smoother bark can be marred or stained by gripping them. Also, the tree should be rotated during the unpotting, edge-raking process to avoid having the old soil dumping on the bark of the trunk (it gets into crevices and cannot be removed easily).

Remember that, once the tree is removed from its original container, roots must be misted to stay moist. Dry roots are generally dead roots!

- 2) **Adjusting Angle of Styling Relative to the bottom of the Root Pad.** The first thing to do after removing the tree from its old container is to determine the new alignment (horizontally) and the new angle (vertically) that the tree will have in its new container. This should be done even before the selection of a new pot and will determine how the root mass must be shaped, both laterally and vertically, to accommodate the new alignment of the tree, i.e. where is the new “platform.” Always remove soil first from the area that we know we want to modify or eliminate to create this new root pad. If the change to planting angle is severe, it may be necessary to prop up a portion of the modified root pad with blocks or shims that are rigidly wired into the pot (this is preferable to simply mounding potting soil beneath an elevated root mass because soil moves and shifts, and it may not provide adequate support for the tree, especially if the tree and pot are transported).
- 3) **Adjust Areas of Concern, working to reduce the root mass sides.** Once you have determined the new configuration of the root mass, work first to reduce the sides of the root mass that must be removed; then work the underside of the root mass to remove some of the old soil, large roots and some smaller roots to yield a level, new bottom “platform” or base for the root mass. **In working on yamadori, you need to start pruning the roots at the point of greatest limitation (e.g. extent of rootball in box to fit it into a bonsai container).**

NEVER COMPLETELY BARE-ROOT CONIFERS – THIS IS A RECIPE FOR DISASTER

- 4) **Work the Top Surface of the Soil** – Using a chopstick, remove decomposed surface material, surface muck, old moss, dead roots, etc., from the top surface of the root mass until you get down to friable, granular soil.
- 5) **Evaluate Container Selection** - Once we have the root ball shaped to the new configuration or alignment we are ready to evaluate selection of the container, based on appropriate size and an understanding of tree and container relationship (aesthetics).
- 6) **Determine Fit** - Then we need to determine whether the modified root mass will actually fit into the potential container, or whether we need to further modify the root mass (if practical). Never jeopardize the life of the tree simply to jam it into a selected pot. This is obviously a matter of judgment; we should strive to “push the envelope” rather than simply copping out and putting the tree in a larger pot, but there is a reasonable limit to how much we can carve up the root mass.
- 7) **Select container.**
- 8) **Prep Container** – Clean the pot. Determine which is the appropriate front of the pot, based on its relationship to the tree. Determine how the tree will be

anchored in the pot and what anchoring method(s) will be used. Drill additional wire anchorage holes in the bottom of the pot if necessary to accommodate the intended anchorage system (you can use a tile drill bit for this purpose, with water sprayed at the drilling site during the process). Install drainage screens over drainage holes. Install appropriate lengths of galvanized steel wire for anchorage (allow enough excess wire to facilitate anchorage tie-downs). Steel wire is recommended for this purpose because, unlike copper and aluminum, it does not stretch.

- 9) **Soil Prep** – After the pot has been prepped, lay in one particle layer of drainage soil, followed by one particle layer of planting soil, then a mound of planting soil at the location under the root mass. Note that drainage soil and planting soil are composed of exactly the same components; only difference is size of aggregates. Using two different soil compositions will actually inhibit drainage.
- 10) **Insert tree** – Insert the tree at the angle and front that is desired. Back away and check angle and position, then slide the tree side to side, front to back, then do two twists. That's it. You are not pressing down hard but applying enough pressure to feel the tree settle in.
- 11) **Anchor the Tree** - Tie down both sides loosely. Then work in additional soil at the perimeter as needed before cranking down the anchor wires. Chopstick the soil in using the wedge side of the chopstick toward the trunk. The smaller the space the smaller the chopstick; the larger the space the larger the chopstick. Always use a thinner, more delicate chopstick when working in tight spaces between the edge of the pot and the root mass where fine roots can be damaged.

Once the initial soil has been placed and gently pushed down under the root mass, place additional soil around the perimeter and begin to chopstick in earnest. The important technique to remember is to push the chopstick all the way to the bottom of the pot, then wiggle it side-to-side twice or three times, then work it up and down (without removing it from the soil) to enable additional soil to fall into that location. Force yourself to stay in one position at the perimeter until no additional soil will go down into that spot. Then don't touch that place again; move laterally to the next point and repeat.

If it is clear, from the way the planting angle was altered in the new pot and from the extent of old soil removal, that there are obvious voids under the root mass, use the chopstick at an angle into that void to make sure that the new soil is pushed under the root ball and there are no remaining holes. In other words, don't just chopstick at the perimeter of the pot if you know that voids must exist on the interior of the pot.

Also, if you are dealing with a repot of a tree that has only sparse, fine roots at the perimeter, use a thinner chopstick and work the soil more gingerly so as not to overly damage those important feeder roots.

- 12) **Deal with Exposed Surface Roots** – If after chopsticking the soil there remain exposed surface roots that should remain (not be cut), the larger ones can be held down using a root clip bent from a piece of aluminum wire with a “barb” on the end that is pushed into the soil and allowed to catch on something below the surface (these are much superior to simple “staples” that will not hold down larger roots.

Also, if there are exposed finer surface roots that need cover, apply soaked strands of sphagnum moss loosely over that area. This will function as a “matrix” to hold soil. Then spread some planting mix over the top of the wet moss and tamp down to conform to the desired soil contour. If there are pieces of sphagnum moss sticking out after this process, cut them off carefully, but don’t pull them because this will destroy the whole exercise.

- 13) **Contour the Soil** - to permit water to remain within the pot. This will likely require some removal of soil on the surface after it has been chopsticked. Then tamp the soil down gently to even out the contours and ensure that we have a water-catching “gutter” at the perimeter of the pot.

- 14) **Apply Top Dressing** – Apply a thin layer of a 50/50 mix of ground sphagnum moss and collected moss to the surface of the soil. This should not be so thick as to inhibit water penetration into the soil column. Mist the top dressing after it is applied in order to hold it in place

- 15) **Water the Tree** – Water the tree thoroughly until the water runs clear through the drainage holes, but water very gently so as not to wash away top dressing or disturb the soil contour. Initial waterings for a repotted bonsai are best done with a watering can that has a rosette with very fine spray.

Why is a “Chopstick” not really a chopstick?

In these notes, when we use the term “chopstick,” we are not really referring to the implement with which we eat sushi or chow mein, although we have all probably used that kind of chopstick when we first started doing bonsai. The chopsticks that we use for repotting are really segments split from a length of bamboo and shaped for this purpose. The shape of the “chopstick” is designed to facilitate the placement of planting mix into the container and to eliminate air pockets. By cutting these implements to different widths and lengths we can accommodate the various conditions in which they will be used, as described in the repotting process. Bamboo is also very strong and can be used effectively for tree anchorage, as described below.

Soil Composition and Preparation:

There is obviously a good deal of debate about appropriate soil composition and ingredients for bonsai, though it would seem that there is consensus about the fact that the bonsai planting medium should afford excellent drainage capacity. The following notes reflect a soil composition that is endorsed by a number of bonsai professionals, here and in other countries, and we have adopted it as our own. You may or may not agree; that is up to your judgment.

1. With that caveat, our recommendation is for a soil mix that consists of one third each of akadama, pumice and scoria (crushed lava rock). Each of these ingredients plays a different role in the mix. **Pumice** is an outstanding retainer of water; the particles act like little sponges. Pumice has a perfect balance of porosity and plant available moisture. **Scoria** is the soil component that provides **oxygenation** of the soil because it creates the spaces between soil particles. **Akadama** is important because it is one of the few soil components that has an excellent ability to bind nutrition to the particle surface (This is measured as CEC – Cat-ion Exchange Capacity). Other materials also have high CEC, but they turn to mush in a short time (like bark mulch, etc.)
2. **All** of these soil components must be sifted prior to use. Initially they should be sifted through a 1/8" screen to separate out the larger particles; place these in a container that will be used for your drainage mix. Then sift the balance of the material through a 1/16" screen to remove all fines and dust that can clog the soil and the drainage screens and inhibit free-flowing drainage. After the fines have been removed, the remaining particles will be used for your planting mix. This process should be followed for all three components of the planting mix, so you need a lot of buckets!
3. Once all of the sifting and sorting is completed, you can create drainage mix by combining one-third of each of the larger particles, and planting mix by combining one-third of each of the smaller particles. You can then store each of these in separate containers until you are ready to repot. Fines and dust should be discarded.

Anchorage Methods:

It is absolutely essential to solidly anchor the tree in its new container and soil mix.

Wrapping wire over the root ball is not the optimum method of anchoring and should be used only as a second or third choice. We want to have the shortest length of wire between point of anchorage and the tree, and we want the wire to pull straight down, not at an angle.

The strongest and most effective anchoring method is the “Chopstick Tie Down Method.” This should be used when we have a very solid root mass (including some portion of its original soil). When the new container is being prepared, we need to consider where the points of anchorage will occur. This will determine if and where lengths of chopstick can be driven into the root mass and also where the tie-down wires should be routed. All of this needs to be determined before we place soil in the container. If there is inadequate soil mass for holding chopsticks, we can sometimes use screws into dead wood below the soil line as points of anchorage. If drainage or tie-down holes in the selected container are not in the right place, it may be necessary to drill additional holes, using a tile drill bit.

The second best anchoring option is to use the “Wrap Over Rootball Method.” Tie down on top at opposite corners of the container, where optimum leverage can be obtained and there is solid root mass over which to secure the wire. Use rubber or plastic tubing to protect exposed nebari or other surface features of the tree. For this method and the one above it is critical that the anchor wires under the pot be placed in such a way that there is no excess wire under the pot and the wires under the pot are not crossing.

The third anchoring option is the “Flexed Bamboo Method.” This method can be used on its own or in combination with methods 1 and 2. Basically, the idea here is to create a “wedge” between the edge of the pot and the root mass, below the eventual level of the soil, to prevent the tree from rocking in the container. You have to employ a very strong piece of bamboo and make sure that it is locked between the interior edge of the pot and the root mass. This is generally easier to accomplish with smaller trees and pots, such as Shohin or Chuhin sizes. It is tougher to do with larger trees and pots. It also helps to have a pot that has a lip that turns back toward the trunk. In a rectangular pot, if the bottom is flat, we can utilize method #3 by wedging segments of chopstick between the interior corners of the pot and the root mass at opposite diagonal corners below the soil line.