

## THINKING *INSIDE* THE BOX

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Growing trees in boxes is the predominant way by nurseries in the desert southwest and west coast. Certainly, wood insulates the container sidewall and is superior to smooth walled black plastic conventional containers. Conventional containers are notorious for root circling and deformities, plus, my studies have shown that once a black plastic sidewall is exposed to full sun, roots against the inside are killed in as little as 15 minutes. Add in multiple sidewall exposures during shipping and handling and it is no surprise that plant death or slow establishment can be traced back to a significant loss of roots caused by excess heat.

### Box containers have three distinct weaknesses:

1. Wooden boxes are not great conservers of water. Wood is porous and water moves by capillarity from the container growth medium through to the exposed surface outside. And, water loss is accelerated by the desert environment.
2. By the time most trees in boxes are of salable size, typically the bottom has rotted sufficiently that shipping and handling is made more challenging.
3. Some air-pruning does occur between boards. But this has been minimal on the various trees I have grown in boxes. On the other hand, root circling is much reduced compared to smooth plastic pots, but still, roots commonly grow along a board, sometimes being guided by the wood grain, until they reach a corner, then assume some new direction. Following transplanting, these roots grow out into the surrounding soil. However, roots out into the soil are connected to the base of the tree by an L or Z offset created by the boards (Figure 1). Certainly the tree is less well anchored compared to roots designed to extend out from the trunk like spokes of a wheel and remain uninterrupted and continuing in the landscape.



Figure 1. When roots grow out and contact boards of a box, many turn and grow along the face of the board until they get to a corner or other obstruction. When planted into the landscape, these roots do a poor job of securely anchoring the tree.

### RootTrapper® box liners provide solutions:

With the development of the RootTrapper® material (patent pending), and various successes with other production procedures, it seemed that making a liner to go inside a wooden box might solve all three problems as well as provide other benefits (Figure 2). RootTrapper® fabric works by trapping root tips when they contact the material. Roots cannot grow through the fabric. When a root tip is trapped and can no longer extend, at first it becomes pudgy like the head of a match, and then slowly loses hormonal control over root branching. The result is a series of secondary branch roots extending out from the axis of the original root and back about four inches.



Figure 2. By lining the inside of a wooden box with RootTrapper® material, water loss through the sidewall is near zero, root tips are trapped and prevented from turning and growing parallel to the sidewall, plus with minimal moisture the boxes last longer.

- I. Water conservation is substantial since water does not move through the RootTrapper® fabric. Insulation of the outside of the fabric by the boards helps keep roots cool and reduces evaporation from the exposed upper surface. Further, the fact that root branching with each root tip trapped extends back into the container growth medium about four inches, adds additional protection and increases efficiency of the root system in accessing water and nutrients.
- II. By limiting contact of water and nutrients inside the container growth medium with the wood sidewalls, deterioration is minimal except at the very bottom. When water applied is carefully matched with water used by the plant and lost by evaporation, little water exits the bottom.

III. If the young plant placed in a wooden box with a RootTrapper® liner has a fibrous and non-circling root system, [that is: grown with the RootMaker® system from seed germination or rooting of cutting] roots grow out, contact the inner fabric wall and branch. This further increases root branching inside the box and leaves roots poised to grow in all directions following planting into the landscape. Having vast numbers of small roots poised to extend in all directions of the compass as well as downward provides maximum anchorage and access to water and nutrients in the soil.

Additional benefits:

IV. Plants grown in boxes lined with RootTrapper® material can be shipped, boxes removed (Figure 3). Boxes remain at the nursery to be reused.



*Figure 3. At time of sale, trees can be easily lifted from the boxes. White stretch wrap around the outside or simply a few strips of nylon reinforced shipping tape and the root ball is ready to go. The white outer surface reflects light and heat thereby reducing temperature 20 to 25 degrees compared to a black plastic pot, plus water loss from sides or bottom of the root ball is minimal. If white stretch wrap is used and covers the surface of the growth medium, additional water is conserved.*

V. Exposed to sun, the white RootTrapper® container is 20 to 25 degrees F. cooler than a black plastic pot, thus preventing heat damage to roots during shipping and handling.

VI. During shipping, water is lost only from the surface of the root ball. More water is retained in the rootball during shipping. RootTrapper® containers are very water conserving.

VII. The RootTrapper® liner is easy to remove. The two sides simply overlap and are not sewn, yet are held in place by trapped root tips (Figure 4).



*Figure 4. Once on the job site, the white RootTrapper® fabric is easily removed and can be returned to the nursery and used again.*

VIII. The RootTrapper® box liners can be used over and over.

Plants grown with the RootMaker® system start to finish and include the RootTrapper® box liner grow faster in the nursery and typically have fewer problems. In addition, the long term health and landscape performance is greatly improved (Figure 5). Plant health can be improved and it begins with the root system.



*Figure 5. After removal of the RootTrapper® fabric, the root ball looks like it had been grown in a box with one distinct exception; the root system is much more fibrous and there are no roots growing parallel to the sidewall (left). If some of the container growth medium is washed away, the very fibrous root system can be observed (right). This shumard oak tree had been propagated in the 18 cell RootMaker® tray, and then shifted to a three gallon RootMaker® plastic container, then into the 24 inch box.*