

Planting Trees and Shrubs When Roots Aren't Right

Why it happens and what to do about compromised root systems

A. Our aim is to promote discussion. We *hope* to make a difference

- Once an exception, bad root balls are now common; life expectancy's way down.
- As end users, planters of individual trees: Here's what we see, what we're doing

B. We start from common ground. Let's see and agree:

1. We do not plant the tree. We plant *roots*.
2. What a good root system looks like
 - Roots grow *out* more than down. Radial. Like spokes.
 - Much wider than branches
 - 4 - 11 "flare" roots form. AKA "first order-", "buttress-" roots
 - Only flare roots thicken rapidly near trunk. If lost, never replaced.
 - A tree stands because flare roots form buttress and there is great weight of soil over wide root system.

C. Production of root systems has changed

1. "Back when" trees and shrubs were grown in the field
 - Sold "bare root", planted and stayed put
 - Or were "lined out" at grower field, root-pruned regularly then sold "B&B."
2. Root pruning was standard for up-potting and growing-on.
 - When a root is cut, it branches
 - Where growing conditions are good, root growth is fast.
3. Past 40 years, container growing is the norm
 - Since the 1980's when grafting displaced seed-growing
 - Buoyed by customer demand for convenience of pots
4. Since 1980's, declining occurrence of good root systems in trees/shrubs
 - Over our 30 years, from less than half compromised to 90%
5. Follow a plant through production to retail:
 - Minimal handling to cut costs means no root-pruning.
 - Twisted roots are the norm
 - Flare roots cannot flare, stable buttress cannot form
 - Inherent to pots: Bottom is pot-bound
 - Up-potting without root pruning result is twists inside of twists
 - Narrow root space means no stability, plants up-potted too deep
 - Adventitious roots grow from buried trunk(s)
 - Growth of flare roots suppressed
 - Roots grow *up* into added soil, circle and "girdle" trunk(s)

D. Result can be seen by looking at trees planted in past 40 years

1. Trees & shrubs that struggle, disappoint, fail: Look at the roots
2. Look at symptoms of trunk, branches and canopy:
 - Whole plant unstable
 - Growth slows year by year, canopy thins
 - Trunk is flat on one side

- No flare at all
 - Leader's growth slows and side branches dominate; leader dies
 - Compare a suspect tree to the species' normal form
 - Plant fails to grow to potential (annual growth rate or overall size)
 - Foliage is chlorotic
 - Veins dark green, blade pale
 - Leaf may be stunted, edges scorched
 - Suckers form on trunk (often just above a girdling root)
3. Sad truth: *Majority* of new woody plants fail
- Studies say trees lasting 10-28 years
 - And never as vigorous and big as they should be
 - Five years ago, 80% had compromised roots
 - Nationwide, all plants, all sources
 - This year, 90%

E. So plan to correct roots on everything you plant. At least:

1. Remove all soil and roots above the flare
 - Locate the flare root level
 - Do not be fooled by swelling where root grew from the graft union
 - Do not measure for depth of planting hole until you find the flare
2. Cut off the potbound bottom and slice vertically down the sides
3. Remove all wrapping, cords and wire. All are proven girdles.
4. Provide thorough water for a year for every inch of trunk diameter
5. Mulch, but never over the flare or against the trunk
 - Mulch volcanoes just re-create problems of planted too deep
6. Stake: Rarely. When support is needed, use a prop or crutch.

F. Then go beyond to do more. Some tactics:

1. Bare root the plant. Prune or untwist roots. (Scary? Yes. Do it anyway.)
2. Make a thorough inspection for girdling roots. Remove them.
3. Make vertical slices deep, nearly to center of the root mass

G. Rescue what is already planted

1. Do not wait. If not growing well by one year, dig, fix or return.
2. Never too late to at least buy the plant time.

H. Seek good growers, smallest plants and bare root plants

Tell others about your sources.

I. References

Articles, books, bulletins:

Prof. John E. Weaver (Search Weaver, University Nebraska site),

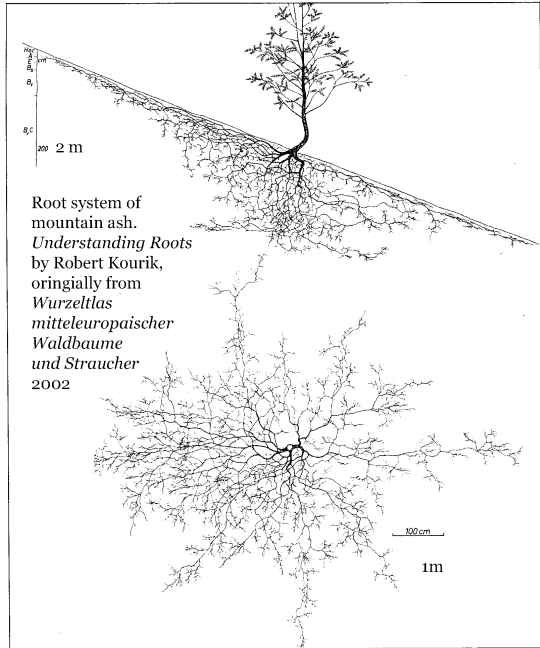
James Urban, JamesUrban.net, text *Up by Roots*

Prof. Ed Gilman, publications University of Florida, ISA-Tree

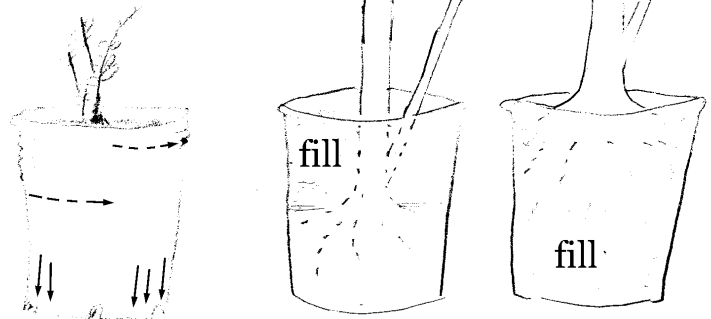
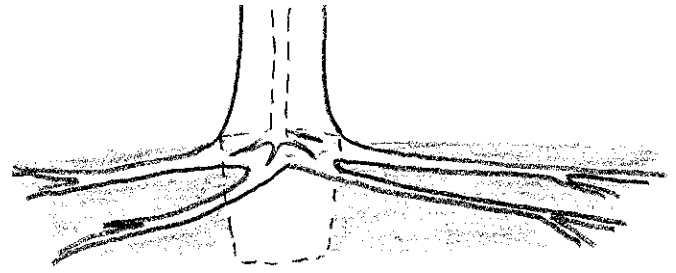
Gary Watson, publications Morton Arboretum, ISA-Tree

Robert Kourik, text *Understanding Roots*

Below and right: Healthy root systems are not pot shaped.



Left: Roots grow wide. Actual root system, young mt. ash.

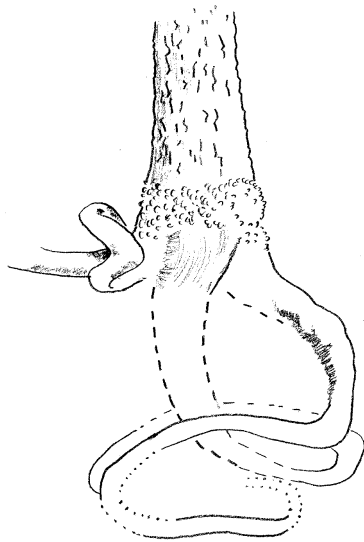
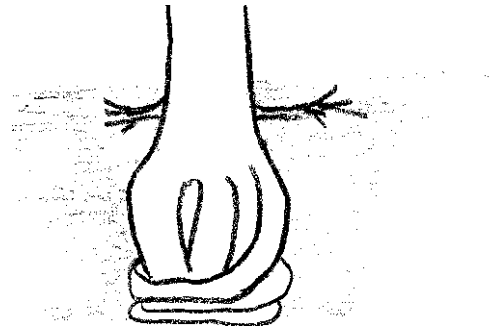


Above, center: In a pot, roots try to grow wide but turn at edge, spiral down.

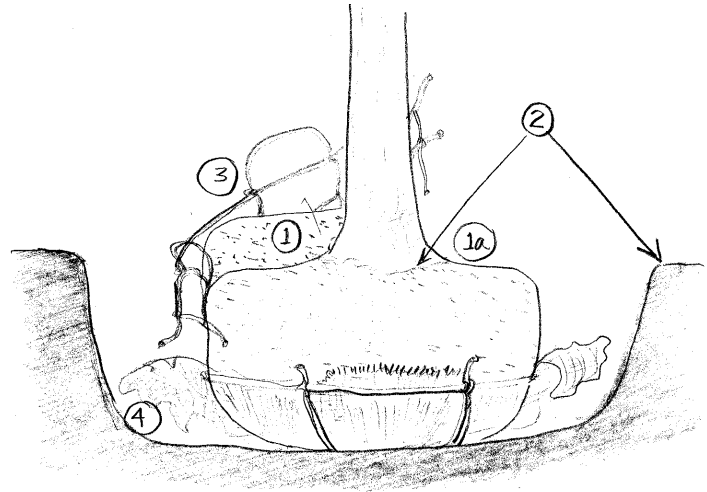
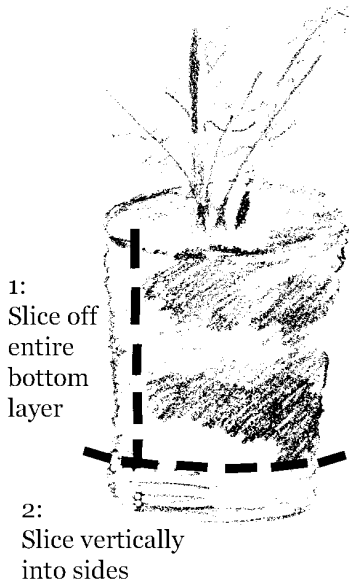
Above, center right: Plant with potbound roots is unstable and is commonly, wrongly, set deep in pot and soil filled above the flare.

Above, far right: Healthy up-potting sets a root-pruned plant atop new soil in the larger pot.

Right: The trunk will eventually be as wide as the plant's last container. Here, because main roots were restricted, never pruned at planting/up-potting, all flare roots are coiled, competing for same nutrients and girdling each other as they grow. New root growth is restricted to adventitious roots that grew from trunk buried in too-deep potting. Adventitious roots cannot flare, are unable to stabilize tree.

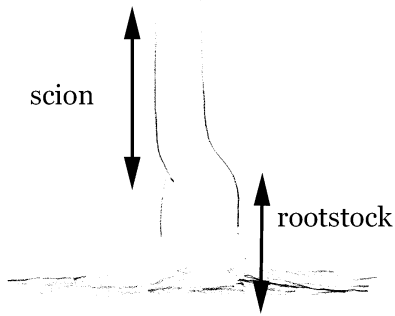


Left: 10 years after planting, a potbound tree has just one flare root that escaped potbound situation. Tree is unstable, tips repeatedly. Second root is wrapped over that flare root and around trunk, will eventually girdle both.

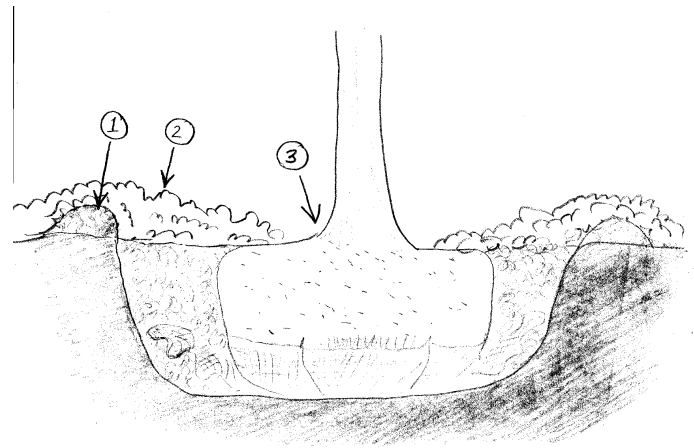


Left: Make at least these corrections to container-grown root mass before planting.

Above, right: Minimal corrections to B&B root system before planting: 1 - Remove all soil and roots above flare. 2 - Dig a wide hole and set flare at or just above ground level. 3 - Remove the cage. If necessary to use the cage to lower the plant into the planting hole, afterward cut away all but lowest part of cage. 4 - Cut away all wrappings and cord. May be pushed to bottom of hole if biodegradable.



Left: Graft union often appears as a swelling or crook in trunk. There may be a large root growing opposite the scion base. Do not be fooled by the thickness or the single root. This is not the flare!



Right and below: Completed planting: 1 - Watering levee. 2 - Mulch over roots and levee, never against the stem. 3 - Flare of main roots mulch-free.

