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The Myth of Wandering Weedkiller
"Glyphosate will move through root-grafts and kill non-target plants"

The Myth

An increasingly common concern in landscape restoration is inadvertent herbicide exposure of desirable, non-target trees and shrubs. To avoid herbicide drift from sprays, pesticide applicators often paint freshly cut ends of stumps and canes with glyphosate. The herbicide translocates through the phloem to the roots, ideally killing the target weed and leaving neighboring vegetation untouched.

A warning on the product sheet for Roundup reads "Avoid painting cut stumps with this product as injury resulting from root grafting may occur in adjacent trees." This warning has given rise to concerns that translocatable herbicides like glyphosate may cross root grafts and kill adjacent vegetation. Various websites make similar statements: "Instances have been documented where a herbicide has moved from a treated tree to another of the same species or genera through a root graft." If these claims are true, how can we continue to manage aggressive, invasive weeds like blackberry (*Rubus discolor*) and Japanese knotweed (*Polygonum cuspidatum*)?

The Reality

Though the above-ground portions of plants tend to grow in isolation as they compete for sunlight, the landscape below ground is radically different. Roots from the same, and sometimes different, species fuse as they contact each other. Threads of symbiotic fungal hyphae increase the connectedness of this underground community even further. The result is an intricate network of plant roots and their fungal partners among which water, minerals, and carbohydrates may freely move. This fascinating underground ecosystem appears to be responsible for the documented survival of completely girdled trees, which stay alive as a result of carbohydrate transport from intact neighbors.

Do herbicides move through these networks? There are only a few studies that have addressed this question, but fortunately each relied on evidence from hundreds or thousands of treated stems or trees. The first study was conducted several decades ago using sodium arsenate to prevent regrowth of aspen (*Populus*) and various oak (*Quercus*) species. Several hundred adjacent trees were studied for damage from root translocation of the poison, but no symptoms of herbicide poisoning were observed. More recently, researchers applied glyphosate, imazapyr, or triclopyr to control regrowth of cut stumps of ash (*Fraxinus*), sycamore (*Platanus*) and birch (*Betula*). Again, no evidence was found to suggest root translocation of any of the herbicides – applied to thousands of cut stems - to nearby untreated trees.

On the other hand, disease vectors (most notably the fungi responsible for Dutch elm disease, oak wilt, and other fungal diseases) do cross root grafts. Several independent studies have documented transmission of disease from infected trees through root networks to adjacent, healthy relatives. In such cases root disruption, or chemical or physical root barriers, are used to halt fungal spread.

Why do disease vectors move through root grafts, but herbicides don't? Pathogens, like those fungi mentioned earlier, require new hosts for their survival. As living organisms, they can evolve biochemical pathways that allow them to overcome natural plant barriers and attack fresh hosts. Herbicides, on the other hand, are not living organisms and do not change their chemical structure. Though we understand little about how substances translocate through grafted roots, it would not be surprising to find sophisticated barriers within grafted roots to monitor passage of substances from plant to plant. It is also

probably true that healthy trees are more likely to have intact barriers to chemical translocation, while those already impacted by fungal disease may not. It would not be surprising if herbicides could translocate through grafted roots already breached by fungal degradation; perhaps this is why the warning exists on Roundup.

Finally, it's important to realize that root grafts tend to be most common between trees of the same species, or occasionally within the same genus. It would be highly unlikely to find the roots of *Rubus discolor* or other weed species grafted to the roots of unrelated trees or shrubs. Therefore, glyphosate applied to the cut canes of blackberry or other common weedy shrubs would not be expected to move into neighboring vegetation.

The Bottom Line

- Unrelated plants are unlikely to form root grafts
- Field research indicates that glyphosate and other translocatable herbicides do not cross root grafts in healthy trees
- Fungal vectors can breach root grafts through degradative enzymatic activity
- Root grafts that have already been breached by fungi may serve as conduits for herbicide translocation as well

For more information, please visit Dr. Chalker-Scott's web page at http://www.theinformedgardener.com.