The Root of the Problem

Paul Hetzler, ISA Certified Arborist

April showers bring May flowers, a chorus of spring peepers, a flurry of migrant songbirds, and backhoes of course. Spring is construction season, which for arborists and trees means root-damage season.

From a tree's perspective, root injury is the source of nearly all evil. I have to admit that beavers, chainsaws and forest fires aren't exactly kind to trees. But no matter what sorts of worrisome issues a landscape tree may develop, whether early fall leaf colour, tip dieback, slow growth, a sparse crown, or even many diseases and insect infestations, the problem is below ground in almost all cases.

Root damage is especially pernicious because it takes a number of years for symptoms to show up. Three, five, or ten years out from a construction project, few people think about root damage when their tree looks sick, because the causative event seems like ancient history. Also, more often than not, root damage is irreversible. By the time symptoms develop, it's generally too late.

Part of the reason root damage is widespread stems from a flawed understanding of tree biology. It is safe to say that most people assume tree roots are deep, and that they extend as far as the canopy projection, or drip line, at most. Both those assumptions are far from the truth.

Although oaks and other nut trees have substantial taproots when they're young, in maturity their root systems have a profile like a pancake, the same as other tree species. The next time you notice a tree which has been blown down in a storm, have a look at the roots. You won't find a monster taproot. It's no coincidence the flat root mass one sees on a windthrown tree is referred to as a root plate.

About 90% of tree roots are in the top 25 cm of soil, and 98% are in the top 46 cm. A tree's roots extend, barring an obstacle like a road or building, two to three times its branch length. This is a tree's root zone: a broad, shallow, vulnerable network of roots.

Sadly, a false perception of tree biology has dreadful health implications. For trees, anyway – who knows what it may portend for our well-being. If we believe tree roots are deep and like it that way, we won't think twice about adding fill, paving, or otherwise covering the root zone.

To survive, roots need oxygen, which can be in short supply. One would think all parts of a tree would be well-oxygenated, given that we know leaves make 0_2 through photosynthesis. All living cells in a woody plant, those in the branches, trunk and roots, take in oxygen and give off carbon dioxide. Trouble is, trees can't move 0_2 from their leaves to the customers which need it – they're on their own. Roots depend on soil pores to allow oxygen to seep in from the surface.

Soil compaction from vehicles or equipment operating within the root zone can mash those pores shut tight, especially if soil moisture is high, like it is in springtime. In wet soil conditions, even excessive foot traffic can cause enough compaction to close soil pores and exclude oxygen. When that happens, roots slowly suffocate. Obviously, construction damage can go beyond compacted soil. Roots are severed by excavation and trenching.

Depending on a lot of things such as how vital the tree was prior to construction, its age and species, whether the soil is sandy or clayey, and the extent of damage, impacted trees may begin

to show symptoms one to ten years post-event, with four to five years as the average. Because of the time lag, secondary, opportunistic agents often get the blame.

A strong, happy tree is able to respond to insect feeding by producing chemicals known to scientists as Bad-Tasting Stuff to repel them (bugs, not scientists) at the site of feeding injury. It will endure some loss due to insect feeding, but it will be able to keep the balance in its favour. In a similar way, vigorous trees make more antimicrobial compounds at the site of a wound than root-damaged trees.

It would be fair to ask how trees in little concrete tree pits in the sidewalk manage to survive. The answer is that they're put there as little tykes, and adapt to survive with stunted roots. In technical parlance, they are "unhappy." Mature trees whose large root systems suffer grave damage are referred to as "dead."

A plan for preserving trees on a construction site must be made at the very inception of the project. It is important to hire an ISA Certified Arborist to write a tree-protection plan. She or he can help see that it is being followed at various stages of the endeavour.

If you have a small undertaking and only one or two trees to consider, at the very least you must cordon off the root zone to the tree's drip line with a sturdy fence (not survey ribbon) a few weeks before you expect workers on the site. Keep in mind that even stockpiling material under trees hurts their roots. If driving near trees cannot be helped, add at least 15 cm of coarse wood chips or gravel to the traffic lane. This should be removed by hand at the end of the project.

If excavation within the root zone is unavoidable, cut roots cleanly, flush with the trench wall. When possible, lay wet burlap over the root ends until backfilling is done. If over 40% of a tree's root system needs to be cut, it's probably best to remove the tree.

Mitigating damage after the fact is much less effective, and far more expensive, than tree protection. It's analogous to putting toothpaste back in the tube – messier and more time-consuming than keeping the cap on. You'll need to hire a Certified Arborist to assess the situation. They can break up compaction with high-pressure water or air injection. Injecting beneficial fungi at the same time has been shown to be valuable. If this isn't in your budget, at minimum the affected area should be aerated on a 0.5-metre grid using a soil auger that is 3-4 cm in diameter, and at least 46 cm. long.

If part of the reason you like where you live is because of the trees, take as much care planning to save them as you do on the design of that garage, deck, or home addition. If your trees suffer root damage, it cannot be undone.

*Paul Hetzler has been an ISA-Certified Arborist since 1996, and is a member of ISA-Ontario, the Canadian Institute of Forestry, and the Society of American Foresters. His book "*Shady Characters: Plant Vampires, Caterpillar Soup, Leprechaun Trees and Other Hilarities of the Natural World*," is available on amazon.ca*