

Tree preservation – Five factors that can affect tree survival during construction

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Now that you have a seat at the table and have identified the barriers in the landscape that can deform root zones, it's time to consider how various factors influence the likelihood that a tree will survive construction activities.

Based on my 34 years of tree preservation planning, I have observed 5 factors that must be considered when finalizing your tree preservation plan.

1. Species tolerance to root loss
2. Percentage of critical root zone lost
3. Tree condition
4. Seasonal timing of root loss
5. The number of “sides” around the tree that are impacted.

In the Mid-Atlantic region, arborists roll their eyes when someone suggests tree preservation around a tulip poplar (*Liriodendron tulipifera*) or American beech (*Fagus grandifolia*). They know how difficult a chore that is. Alternatively, Willow oak (*Quercus phellos*) can endure extensive root loss and adverse conditions. Knowing the tolerances to root loss of trees with which you are working is critical. You can find lists of tolerances in many places including the ISA best management practices. However, it is also important to understand that species tolerances can vary by hardiness zones. Do your homework here to evaluate species tolerance to root loss in your region.

Many tree preservation ordinances stipulate a maximum acceptable percentage of root loss within the critical root zone (CRZ). Based on the ordinances where I work, these range from 25%-30%. Losses in excess of these figures usually trigger requirements for pre- and post-construction treatments. I don't recall research that supports these numbers; however, my anecdotal experience is that this range is a good baseline. Research does demonstrate that root pruning within 15X the trunk diameter will adversely impact tree recovery. (Benson) However, I have witnessed the removal of roughly 40% of a CRZ for a White oak (*Quercus alba*) in good condition, and with no perceivable decline in vigor over 5-years, post-construction. I believe that it was because the impact was on just one side of the tree. More research is needed on the cumulative impact of root loss, and on various species.

It should come as no surprise that trees in good condition fare better following root loss than trees in fair or poor condition. It should not be difficult for an ISA certified arborist to determine tree condition. It can be done by quantitative and qualitative methodologies. It is probably best to search out a quantitative formula until you can start to accurately evaluate tree condition qualitatively. A worksheet developed back in 1978 remains a good guide. (Webster) Ultimately, the easiest method is to use a qualitative evaluation and limit your ratings to good, fair or poor.

It has long been suggested that seasonal timing of root loss is an important consideration. (Coder) Specifically, as a tree emerges from dormancy the energy demands are at the highest. It follows that root loss during this time is extremely stressful. I understand from recent communication with researchers that this analysis is on-going and is bearing out these assumptions. So, for deciduous species, avoid root pruning from when buds start to swell in the spring until the leaves harden off. This is also true for conifers. Do not root prune a conifer as the “candles” are forming and until they are hardened off. The stress is lessened as the growing season progresses toward dormancy. Dormancy appears to be the least stressful time for root pruning. In fact, utilizing dormant season root pruning in your protection plans may be the easiest means of increasing the likelihood that a tree will survive construction impacts.

The final factor is one that is new for most arborists. It is the number of “sides” around a tree that are root pruned. The first root pruning trench through the CRZ is your first side, and it progresses from there. You can get into the weeds trying to determine what constitutes a side, but I’m confident that any practitioner can figure this out. What is important is that most trees tolerate root loss quite well on one side. Even two sides are well tolerated, however, when you root prune on three and four sides, this is where the impacts are amplified. (Watson)

But here is the catch – these factors do not act in isolation. They are interactive. This is the quantitative part of tree preservation. I developed a quantitative formula to determine how factors interact to predict tree survivability. This method has been accurate for me for the past 8 years. Unfortunately, the arboricultural industry appears to be stuck on using a qualitative approach. In my mind, this amounts to guesswork. There is very little certainty with a qualitative approach. In fact, this methodology has been the standard for almost 40 years of my career. The result has been uncertainty, and with much tree loss. I feel that this qualitative approach does a disservice to the tree owner, developer, locality and to the tree.

To be successful, a qualitative approach assumes that plan preparers have decades of experience. I have built this experience over 34 years and can pretty quickly prepare a

preservation plan that should be successful. But, how many arborists in the US have three and a half decades of experience in preservation? I suspect not many. And, yet, arborists with far less experience are preparing tree preservation plans based on qualitative methodologies.

Our planet is warming at an accelerating rate. As a result, we simply do not have three decades to amass enough arborist experience to produce reliable tree preservation plans. This is why we need a quantitative approach. We must remove uncertainty through quantitative analysis, and start saving mature trees in our landscapes now!

I urge arborists, landscape architects, engineers and anyone impacting trees during construction to consider the five factors mentioned here, and how they interact to affect tree survival. I developed a quantitative approach, which works quite well. If you want to discuss this approach, please reach out to me (keith@treematrix.com). If you decide to stick with the qualitative approach, then that's okay too. Either way, do your best to save trees and good luck!

References:

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