

Sidewalk Options for Existing Trees



Advanced Tree Care, Inc.

Chuck and Danny Lippi are a father and son team who specialize in tree analysis, maintenance, and preservation. They are two of only 20 Board Certified Master Arborists in Florida and both hold Master's Degrees in Horticulture and Soil and Water Sciences, respectively.



Options for Sidewalk Repair Around Existing Trees

- Tree root-sidewalk conflicts are very common in developments. And the most commonly planted swale tree in many parts of Florida is the live oak (*Quercus virginiana*), which is a wonderful long-lived, sturdy tree, that simply requires more root and trunk space than the 6-foot swale designated by the designers. And as many homeowners and property managers have learned, the problem seems to escalate after the first 10 years as the trees begin to mature, and their root systems expand and try to grow out of the much-too-small space allotted between the street curb and the sidewalk.
- Obviously, it would be better to plant trees in larger spaces such as the front yard away from sidewalks and streets. But it is too late for many people who buy a home in a development that has already planted large, maturing trees in a narrow swale between the sidewalk and the street. This is a *landscape design flaw* in my opinion, that is creating significant maintenance costs for homeowners and property managers.
- Because removal of the trees by sidewalks is not practical, sometimes not allowed by local ordinance, and would remove an important environmental amenity from streetscape, I will primarily discuss options to accommodate roots on existing large trees, infrastructure-based strategies, not options for recently planted young trees by sidewalks that we refer to as root-zone based strategies. The goal is to adapt the infrastructure to accommodate the tree to reduce the sidewalk damage and increase the interval between sidewalk repairs.

Types of Damage

- Over the years we have observed swale trees (mostly live oaks in this part of Florida) lifting sidewalks usually at the seam or expansion joint. The lifting can occur anywhere between the slab next to the trunk to as far away from the tree as the third concrete slab which is about 15 feet from the trunk. Once the slab lifts over ½ inch, there is a serious liability issue — a trip and fall hazard.
- In addition to the lifting pressure caused by roots, the tree root flare of trees will slowly expand outward and even upward putting sideways and upward pressure on the sidewalk. Often the root flare begins to become a problem with nearby infrastructure when trees reach a diameter of around 20 inches. The root flare of a 30-36 inch DBH (Diameter at breast height) live oak can extend almost the entire width of the 6-foot swale.





Cutting Roots

- We have found that cutting roots is only a temporary solution. Severed roots regrow under a sidewalk within three years after being cut. In San Francisco and other cities, the interval between root pruning and renewed sidewalk lifting is about five years. This relatively short repair interval can create an escalating and compounding effect of needed repairs as the trees continue to grow.
- An additional problem with root pruning is the loss of tree stability. Trees have stability against wind throw because of the lateral roots. Tap roots are rare and quite small in most broadleaf trees and provide virtually no support. When the important lateral roots are pruned, tree stability can be reduced.
- Research at the Bartlett Tree Research Laboratories has demonstrated that cutting large lateral roots within the root plate, which is a distance from the trunk of three times the trunk diameter, can destabilize a tree. For example, a 20-inch diameter tree should not have roots cut closer than 60 inches from the tree ($3 \times 20 = 60$). In a 6-foot-wide swale with a growing tree, that does not allow space to root prune at the edge of the sidewalk.
- Root pruning should only be done as a last resort when all other methods have been judged as not feasible. And those ordering cutting of major lateral roots should be aware of the liability for tree failure that root cutting creates. There are consequences to cutting roots such as reduced tree health and destabilization.

A slab has been removed, and the existing roots are painted for identification.





Repairing Sidewalk Options

- There are several options to consider when repairing lifted sidewalks. These include options that sometimes can be combined with others. All the techniques except for Shaving and Slabjacking are used when removing and replacing sidewalk slabs.
- Shaving lifted concrete: Once a slab is lifted by roots, it can be shaved down several times until the thickness of the sidewalk is too thin to support the weight of pedestrians and golf carts using the sidewalk. This relatively inexpensive technique should be used at first to even out lifted sidewalks.
- Another version of shaving is the use of asphalt to level the sidewalk slabs where they have lifted. Asphalt on a concrete sidewalk is not a very aesthetic alternative.
- Slabjacking: This is a process where concrete is injected under high pressure beneath the low side of a lifted slab causing the slab to lift upward to match the lifted section of the adjacent slab. This process has been around for several years, but I have yet to speak with anyone who has had the slabjacking done.

Meandering Sidewalk

Meandering sidewalk:

- Move the repaired sidewalk out away from the tree by several feet preferably outside the root plate, which is the distance from the tree that is three times the tree diameter.



Moving the sidewalk away

Excavate Beneath

- Excavate beneath offending roots: Instead of cutting the offending roots that have lifted the sidewalk, leave the root intact and use an air excavation tool like an Air Spade or Air Knife to remove soil beneath the root.
- This void can be left open beneath the root or filled with clean pea gravel that will move out of the way as the root expands downward. Because the concrete sidewalk is being replaced above the root, the root should expand downward filling the void.
- This technique should be combined with reinforced sidewalks and possibly thicker sidewalks.



Bridge Over Roots

Bridge over roots:

- Sometimes the roots are too large to cut and have expanded above the natural grade. In these cases the root(s) must be bridged possibly creating a slight rise in the sidewalk where it passes over the root.



More Options

Use thicker concrete:

- Increasing the concrete thickness from 4 to 6 inches will make the sidewalk less likely to break or lift.
- This technique should be used with the reinforced concrete technique for best results.
- There is currently research being done to determine the best concrete thickness to use. But no data is available currently.

Clean gravel beneath sidewalk:

- Recent research has demonstrated that simply placing clean gravel beneath a sidewalk slab will cause roots to grow below the gravel not directly below the concrete slab.
- The large air spaces in the gravel cause any roots to grow below both the concrete sidewalk and the gravel layer. Consequently, the sidewalk is less likely to get pushed upward by the roots.

Another Option

Place sidewalk over a geogrid and gravel base:

- Recent research into roots and sidewalks has demonstrated that a geogrid mesh base placed on top of roots will spread the force of the upward pressure of the roots over a wide area. Then if we cover the geogrid with clean #57 stone for at least a depth of 3 to 4 inches, the concrete sidewalk can be poured on top of the stone.
- The stone should be covered with a geotextile fabric to help keep the sand and soil from filtering into the stones, which provide a partially flexible buffer to diffuse the force of lifting roots on the concrete sidewalk slabs above. This arrangement may cause the sidewalk to be higher than the original sidewalk.

Geogrid geotensar fabric has been used for years to protect roots and floating surfaces like sidewalks and parking lots.



Other options NOT Recommended

Root Barriers:

- Root barriers are sometimes useful on well-drained soils on new plantings if the root barriers are properly installed and at least 2 or 3 feet deep. The top of the root barrier must be slightly above grade or roots will grow over the top of the barrier and this root barrier protruding edge can be unsightly. Proper installation is very important.
- Root barriers are usually not appropriate where trees are already established.

Heavy crown pruning to slow tree growth:

- The extra expense of heavy crown pruning to keep a large-growing tree short and stunted is not practical.
- Large maturing trees will quickly grow to their genetically predisposed size once the excessive and expensive pruning stops.
- There are many other reasons, which I will not go into here, why heavy pruning will not work and is bad for the health of the trees.

Options that may not have merit

Tree Growth Regulator (TGR) Applications:

- Generally, arborists use TGR chemicals to slow top growth of trees. Electrical utilities have been using TGR's for over 30 years to control top growth of trees near power lines and extend the pruning cycle.
- Subsequently some arborists have been selling the relatively expensive TGR's to reduce pruning and slow tree growth in developments where tree root-sidewalk conflicts are beginning to be a problem.
- Ironically, the benefits of the most widely used TGR, paclobutrazol, is to divert energy from top growth into root growth. So TGR's may make the tree root-sidewalk conflict worse by increasing root growth even though top growth is being reduced.
- Until there is research indicating the TGR's are reducing sidewalk damage or increasing the sidewalk repair interval, I do not recommend TGR's as a viable solution.

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- Please visit their website to read all about trees and the wealth of information.
- <https://shadetreeexpert.com>
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