Arid Zone Times

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Root and Soil Failure

Tree failure in high winds (wind throw) can have devastating consequences to the tree, surrounding property and pedestrians. While high winds are commonly associated with tree failure, trees can fall in the absence of winds in certain conditions. The two primary factors contributing to wind throw are root failure and soil failure. In some in-stances both factors are involved. Inspecting the trees after they have fallen can provide clues as to why the tree failed and what conditions were most responsible. Understanding why the tree fell is critical in developing a strategy for successfully replacing or replanting.

Soils fail when they lack the strength to keep the roots and subsequently the tree anchored. Examining trees that fail in this way reveals large amounts of soil adhering to the root mass and mostly roots 1 inch and smaller are broken. Environmental factors that compromise soil strength include saturated or waterlogged conditions (the results of heavy rains, excessive irrigation or both) as would a high water table that restricts down-ward and lateral root growth. During our summer monsoons, wind throw risk increases with the combination of heavy rain and strong winds coupled with typical summer irrigation schedules. Physical characteristics like hard pans or caliche, soil compaction (as a result of site construction traffic or natural conditions), thin or shallow soils (either naturally thin or made thin by site grading) or a rocky layer further reduce the ability of soils to effectively anchor tree roots. Horticultural practices also play a role, particularly when trees are planted too deep or if trees are root-bound when transplanted or have genetically defective root systems. Topsoil erosion, the result of incorrect site drainage, can reduce the volume of soil anchoring the tree and also contribute to wind throw.

Root failure is commonly associated with root decay or damage to the root sys-tem. The root mass of trees felled by root failure show broken large diameter roots or fractures that originate in the roots and extend into the wood of the lower trunk. Break-age is usually associated with root decay that may not be visible in the above ground portions of the tree. In very advanced states of decay, fruiting structures of the fungi that causes the rot will appear along the trunks and branches or mushrooms may grow out of exposed roots. Trees in this state are highly unstable and potentially dangerous. Root damage can also have mechanical causes like with the additions of hardscape elements around established trees, construction vehicle traffic or trenching and digging through the root ball to install plumbing, sewer or irrigation pipes.

Tree growth is a dynamic process that, in vigorous trees, proceeds geometrically. For example, if a tree doubled its mass in a single season the change when the tree is relatively small would not be significant (initial mass 100 lbs grows to 200 lbs). But as trees begin to mature the demands on roots amplify (initial mass 1000 lbs increases to 2000 lbs), at the same time the tree increases in physical size, offering increased resistance to winds. Except in the event of extreme winds, deficiencies in roots and rooting may not appear in smaller or immature trees and are only revealed when soil or root strength limits have been exceeded by the forces of wind or the mass of the tree.

It is unlikely that mature trees that have partially or completely blow over can be righted and staked in the hope they will remain viable. Appreciate that the soil and rooting conditions of mature trees that led to the blow over can rarely be corrected by righting and staking, making future failures inevitable. There is usually significant root damage that may, by itself, prove ultimately fatal to the tree. The other problem is subsidence, where new, disturbed soil accumulates beneath where the root-ball had been making it nearly impossible to bring the trees back to it original upright position. Younger trees can, in some instances, be righted and survive provided the soil conditions can be improved, the irrigation system can be modified to better distribute water to the roots and trees are pruned to correct imbalances with the roots.

The financial consequences of maturing and mature tree failure (property damage, personal injury, loss of the tree and its landscape value) make the expenses associated with proper planting technique (Tipton Method) and soil preparation at installation essential and very cost effective.

Reduce the Risk of Wind Throw

- Avoid layering of different soil types. (topsoil layered atop of rock or caliche.)
- Use the Tipton Planting Method by digging a shallow and broad planting hole
- Design an irrigation system that encourages progressive radial distribution of roots as trees mature.
- Promote a well distributed root systems by establishing irrigation schedules that take into account soil type and water penetration.
- Prune no more than 20% percent to open canopy, keeping top growth and foliage in proportion to root mass.
- Where possible careful schedule mature tree irrigations in anticipation of summer monsoon storms, ideally avoiding highly saturated soils prior to the arrival of a storm. This is accomplished with an irrigation system that allows separate water scheduling for trees and shrubs. For April thru July manually irrigate trees 4 to 8 hours once a month (depending on the GPH, water distribution and species of tree).
- Selection of tree stock from reputable nursery.
- Score root-ball sides at installation.
- Fence construction traffic away from trees.
- Irrigation schedules should allow soil and roots to drain and dry slightly before water is reapplied.