Structural pruning shade trees

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Key concepts

A landscape filled with strong, long-lived trees is most easily achieved when appropriate species selection and placement are combined with high-quality, arborist-friendly nursery stock (Figure 1), good planting techniques, and appropriate follow-up pruning. This article describes key concepts and an approach to pruning that promotes a sound tree structure that resists failure, provides clearance, and improves aesthetics while promoting long life.

From training young trees to managing mature ones, **structural pruning to guide and manage tree architecture should be the primary goal each time a tree is pruned**. Removing or subordinating defective parts of a tree allows other parts to grow larger, which promotes the formation of a stable structure and attractive form. A well-structured tree is aesthetically pleasing, preserves the crown as it grows larger, is long-lived, and provides benefits at low cost (Figure 2). Poor tree structure or poor branch structure can be costly, leading to failure and early tree removal.

Structural pruning in the landscape has two primary goals: to develop and maintain a single dominant trunk with smaller branches distributed horizontally and vertically around it; and to reduce the likelihood of tree failure caused by defects in structure and poor weight distribution. Large trees are structurally sound when they are trained to maintain branches more-or-less smaller than about 1/2 the diameter of the trunk (Figure 2). Trees with branches smaller than half the diameter of the leader, and trees with branches spaced along the leader or trunk, are stronger than trees with large-diameter branches clustered together originating from one position on the trunk. Vigorous, upright branches that compete with, grow parallel to, or replace the leader often become a major part of the crown and may be weakly attached (Figure 3). These should be the focus of pruning efforts early (first 30- to 40 years) in the tree's life.

One of the most important applications of pruning is subordinating codominant branches (reducing their length) that compete with the central leader to create a single large trunk for 20 to 30 feet or more (see Figure 2). However, it is common for tree crowns to be raised by removing only small interior and low lateral branches. This practice fails to address the poor structure in the largest branches. As a result, large branches grow up at a steep angle into the permanent crown in a manner not seen in most trees growing in their native habitat. These trees take on a low-branched codominant form in which aggressive upright-sweeping branches become susceptible to cracking or breaking as they grow long and heavy. In some species, these branches may grow quite large, sag, and interfere with people and structures, requiring removal. Trees pruned as those in Figure 3 can ultimately lose large sections of their crowns, which leads to reduced aesthetic value, increased cost of management, trunk decay, and shortened life.

The Structural Approach to Pruning

Other than for clearance of obstructed views, much of the pruning that is performed today accomplishes little or nothing of merit to the property owner or the tree. Unfortunately, this approach wastes money by removing the wrong branches. The primary focus when pruning landscape trees should be to reduce conditions that contribute to weakness and to prepare the tree for removal of low branches. Established older trees in urban landscapes should be pruned primarily to reduce risk, preserve a tree structure that boosts amenity values, provide clearance, and improve the aesthetic value of the property. Achieving these objectives requires different pruning strategies for trees of different species, life stages, and sizes.

There are three basic steps to developing and maintaining a dominant leader:

- The first step is to identify the branch or stem that will make the best trunk. It should be among the largest in diameter and in the center of the crown (but it does not have to be straight), and free of cracks, openings, mechanical damage, large pruning wounds, inclusions, cankers, or other defects that could compromise its strength.
- The second step is to identify the branches that are competing with this branch (i.e., those with a large aspect ratio, i.e. those that are large relative to the trunk).
- The final step is to remove competing branches back to the trunk or subordinate them with a reduction cut, or a combination of both. Remove and/or reduce some branches that are clustered together and growing from the same point on the trunk.

<u>Establishing the Central Leader</u>

In structural pruning, only the parts of the crown that contribute to weakness are pruned, in order to direct future growth into one leader (Figures 4 and 5). Structural pruning redistributes mass within the crown by subordinating or removing branches that compete with the leader or have inclusions, reducing aggressive or long branches, and thinning uncharacteristically dense clumps of branches high in the tree. Rather than a one-time event, structural pruning should be thought of as a process that trains and improves tree structure over a period of time. In this sense, it is like raising a child.

Other pruning methods on established trees, including crown cleaning (removing dead, touching, infested branches), thinning, reducing, and raising, can be applied according to desired objectives, while considering current structure, health, size, location in the landscape, species, presence of stress conditions, and other factors. A single pruning method need not be applied uniformly to the entire tree. For example, one side of a crown can be reduced to relieve a structural weakness, and the other side can be raised for clearance or thinned to balance the crown.

<u>Pruning Dose</u>

The pruning dose is the estimated amount of foliage or buds removed during pruning compared with the total amount on the tree prior to pruning. The ANSI A300 Standard recommends a pruning dose of less than 25% at any one year; however, this represents an

average of trees across all ages and health. Healthier and younger trees tolerate much greater amounts of live branch removal than do mature or unhealthy trees. **Large doses are necessary on certain branches or sections of the crown to improve structure or to reduce risk of failure.** For example, about 60 to 70% of the foliage and buds on a young to medium-aged tree may be removed from a large codominant branch to subordinate it. Pruning a branch slows growth on that branch in proportion to the pruning dose and directs future growth by invigorating parts of the tree that were not pruned. Other portions of the tree may be lightly thinned in order to mechanically or visually balance the tree to improve aesthetics.

A large pruning dose can cause many hardwoods to generate sprouts from latent buds and adventitious points throughout the crown, but many grow from points near pruning cuts. Sugars and other growth substances generated by sprouts help the tree resist decay behind pruning wounds. These substances also help replace the stored energy removed with the live wood, thus sprouting is an expected and normal condition when structural pruning. The growth rate of the most vigorous sprouts can be subsequently suppressed by reducing and removing them where necessary to prevent them from interfering with other branches and with each other. Less-vigorous sprouts should be retained to help the tree slow the development of decay behind the pruning cut. Resist the temptation to remove sprouts entirely because they are an asset to a structurally pruned tree.

Trees can become a more sustainable resource when they are trained with structural pruning. Long-lived trees appropriately placed in the landscape provide appreciable benefits to urban and suburban landscapes. Training young and medium-aged trees to a dominant leader with smaller-diameter branches is the most reliable method of developing a sustainable tree structure. Maintaining this basic structure throughout the life of the tree minimizes risk of failure and provides for large, structurally sound trees. Although methods other than structural pruning can be used on trees, none help train and guide the tree into an improved in branch structure.

<u>Further reading</u>

See *An Illustrated Guide to Pruning*, *Third edition* (2012) by E. F. Gilman, Delmar Cengage Learning, Inc., for a comprehensive resource for tree pruning.

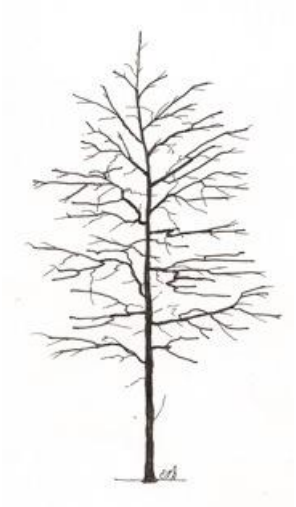

Figure 1. Arborist-friendly nursery stock with one leader to the top of the tree.

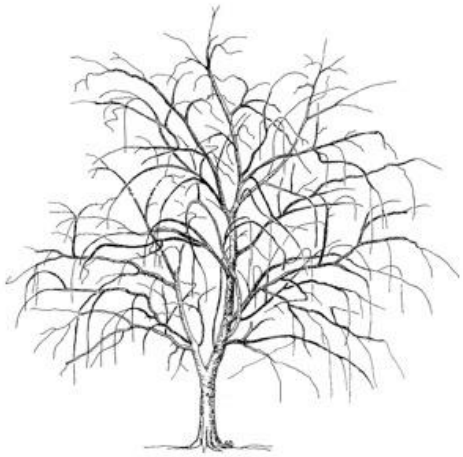

Figure 2. Good crown architecture with most branches considerably smaller than the dominant leader on 30 year old tree.

Figure 3. Poor tree architecture with two codominant stems borne low on a 30 year old tree.

Figure 4. Arborist is ready to make a reduction cut on a codominant stem (left stem) that is competing with the leader (right stem).

Figure 5. Tree has good structure with a dominant leader after making about 6 reduction and removal cuts.