

Structural Pruning of Young Trees

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Structural pruning is a multi-step process guided by the goal of developing a strong and stable tree that is compatible with the site and client expectations. Without structural pruning, young landscape trees tend to develop defects such as overextended branches, co-dominant stems, and included bark, which all increase the likelihood of branch failures, conflicts with people and structures, and long-term costs [1].

Competition Influences Structure

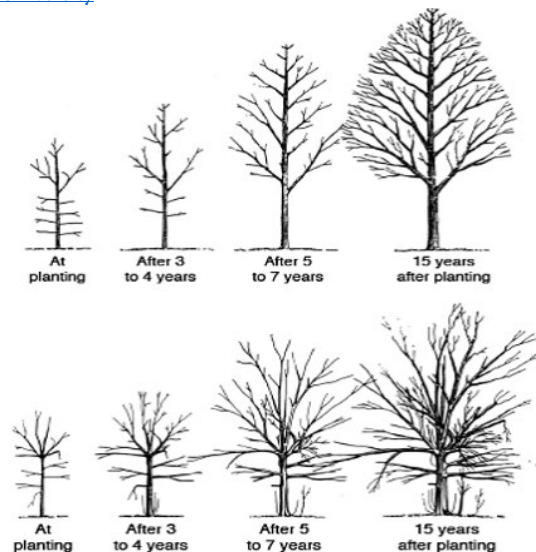
In forest settings, competition for resources between neighboring trees leads to a stable crown form. A tapered, central stem and short, strongly attached branches develop naturally as the tree grows toward light. Conditions are different in urban landscapes. The crown of a planted tree is exposed to full sun from multiple directions encouraging a broader, more complex form. As a result, multiple stems may compete for dominance. Branches often develop in close proximity to one another, and lower branches can increase in diameter and overextend. Certain species, particularly those with a decurrent growth form and opposite branching habit, are especially prone to developing structural defects.

Why Prune for Structure?

A tree with a structure compatible with its site and intended use can provide more benefits and cost less to maintain for a longer period of time [1] (Figure 1). When structural pruning is not performed, trees with weak or poor structure can result (Figure 1). These trees have a greater risk of failure, particularly during extreme weather events. Tree failures can lead to personal injury, property damage and a reduction in benefits. Furthermore, structural pruning can reduce future problems caused by tree growth that interferes with people, structures, utilities and views.

Figure 1: Examples of tree growth with structural pruning (top) and without (bottom)

Figure adapted from: Hillock and Schnelle, [Oklahoma State University](#)



Three Steps in Developing Tree Structure

Structural pruning should start early, preferably at planting, and continue every one to two years until the desired form is achieved. Three basic steps should be applied at each pruning:

1) Identify a single, dominant stem (central leader). This is usually the straightest, tallest, largest in diameter, and most central stem. Remove or reduce other upright-growing stems that compete with this dominant stem (Figure 2).

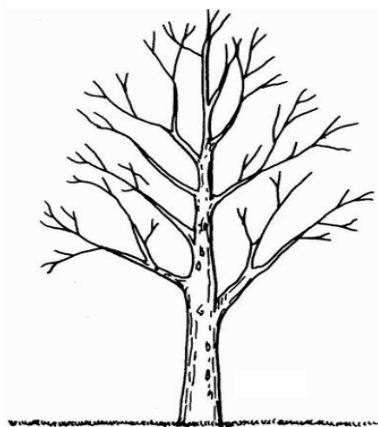
Figure 2: Young tree lacking a single, dominant stem



2) Identify the lowest permanent branches in the tree crown. Branches below this level are temporary yet important in producing energy for the tree, shading the stem, and aiding in the development of stem taper (Figure 3).

Figure 3: Good branch symmetry and stem and branch taper

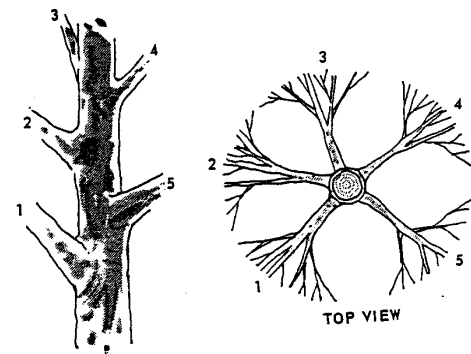
Figure adapted from: [International Society of Arboriculture](#)



During the initial structural pruning, temporary branches may be retained (especially on very small trees), reduced or removed. As the tree grows larger, more of these branches are reduced, and eventually removed.

3) Select permanent branches which develop from the central stem. In small-maturing trees, branches should be spaced at least 6 to 8 inches (15 to 20 cm) apart vertically. For large-maturing trees, branches should originate 18 to 24 inches (45 to 60 cm) or more apart vertically [1] (Figure 4).

Figure 4: Appropriate vertical and radial branch spacing



In addition, identify branches that are growing in a direction that will interfere with people, views, utilities, or structures. Typical vertical clearance for branches overhanging a street is 14 to 18 feet (4.3 to 5.5 m); over sidewalks and landscapes the clearance distance is 8 feet (2.4 m) [1].

Remove or reduce branches that are too close together or will cause interference while balancing these considerations:

a) Foliage is critically important for tree growth so retain as much leaf area as possible.

b) Branches that are smaller in diameter relative to the stem (i.e., less than 50%) have stronger branch-to-stem attachments than larger branches.

c) It is best to remove branches at the stem when they are smaller than 2 to 4 inches (5 to 10 cm) in diameter. Large pruning cuts are more susceptible to decay than smaller cuts. In some cases, larger

diameter branches can be reduced in size rather than removed (Figure 5).

Figure 5: Large diameter wounds left by whole branch removals are susceptible to decay



d) Generally, pruning should not remove more than one-fourth of the total crown volume on an annual basis [1]. This amount is variable and dependent on tree species age, health, and site [2]. The first time a tree receives structural pruning, up to 50% of the crown volume may need to be removed.

When to Prune

For most species, pruning can be done at any time of the year. Winter allows better visibility of branch architecture in deciduous trees, and some species should only be pruned in winter because fresh pruning cuts may attract certain insect pests or flow sap if pruned in the spring.

In a newly planted tree, broken branches and severe structural problems can be corrected when installed; otherwise, pruning should be delayed until the tree is well established and has resumed a normal growth rate [3]. Trees should be inspected on an annual basis and pruned as needed to provide desirable structure. Contact your Bartlett Arborist Representative to learn more about structural pruning.



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References

- [1] S. J. Lilly, E. F. Gilman, and E. T. Smiley, *Best Management Practices: Tree Pruning*. Champaign, IL: Premier Print Group, 2019.
- [2] E. F. Gilman, B. Kempf, N. P. Matheny, and J. R. Clark, *Structural Pruning: A Guide for the Green Industry*. Visalia, CA: Urban Tree Foundation, 2013.
- [3] E. F. Gilman, "Pruning *Acer rubrum* at planting impacts structure and growth after three growing seasons," *Arboriculture & Urban Forestry*, vol. 41, no. 1, pp. 11–17, Jan. 2015.