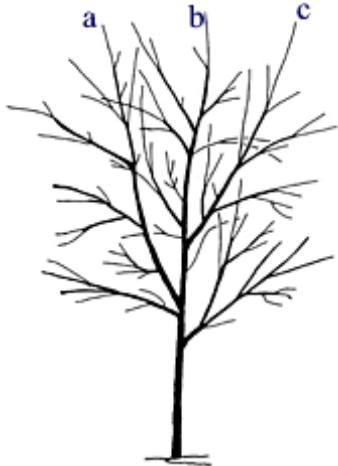
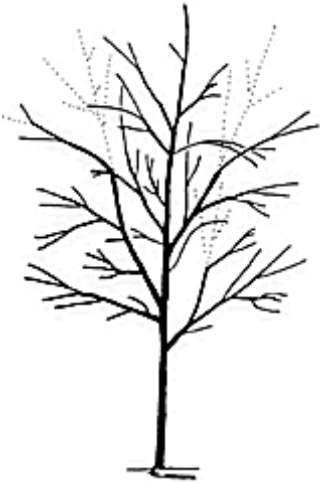
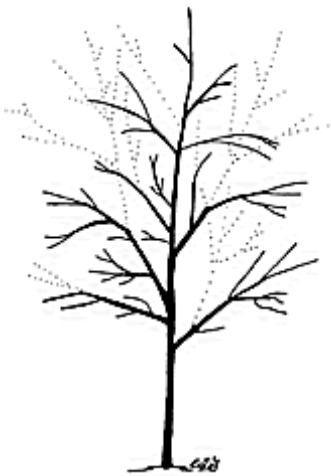


Structural pruning of shade trees

Edward F. Gilman¹ and Nathan J. Eisner²

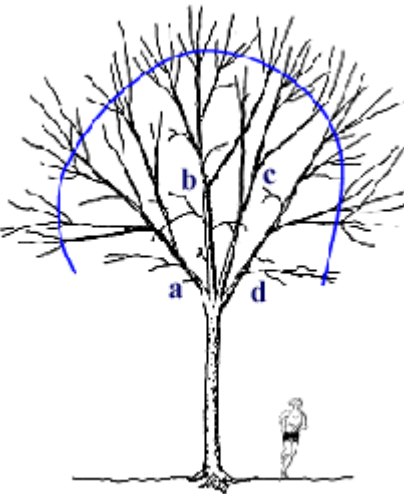
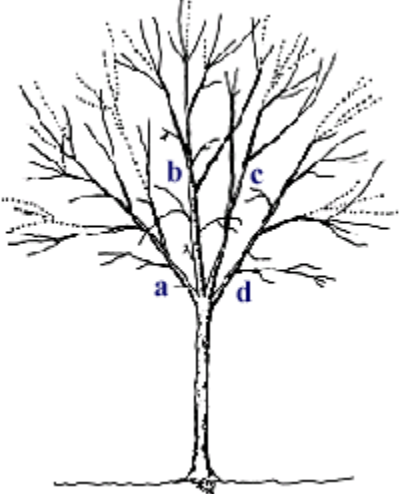
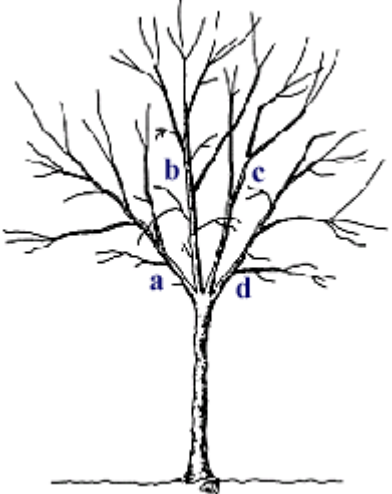
Introduction: Many shade trees in the forest grow straight, tall trunks as they compete with neighboring trees for sunlight. In the landscape, however, the abundance of sunlight encourages trees to develop multiple, competing trunks or leaders. This type of structure is susceptible to mechanical breakage and can reduce tree longevity. But trees with one, dominant leader and small, well-spaced branches, like trees in the forest, are less likely to suffer this type of mechanical failure. The dominant leader structure also makes trees better able to retard the spread of decay within the tree.

Structural pruning in the landscape aims to develop the strong tree structure we see in the forest. Structural pruning selectively favors a single, dominant leader by suppressing competing leaders using reduction cuts. Reduction cuts shorten stems back to lateral branches at least one-third the diameter of the cut stems. Structural pruning on shade trees should occur regularly when the tree is less than about 20 inches trunk diameter to establish good form early. It is normally performed every few years to gradually encourage more growth in the selected leader. Proper structural pruning should be performed on most tree species that become large at maturity to promote longevity, decrease future maintenance costs, and reduce conditions in the tree that could place people or property at risk.

Before pruning	After light pruning	After moderate pruning
		
<p>Problem - Before pruning, the young to medium-aged tree has three developing leaders or codominant stems (a, b and c). These are likely to develop into multiple leaders, which are considered weaker than trees with one trunk. Large maturing trees usually perform best and last longest if they grow with one main leader. Structural pruning helps the tree develop one main trunk.</p>	<p>Solution - Reduce the length of (subordinate) leaders 'a' and 'c' using a reduction cut to encourage leader 'b' to grow faster. This will help leader 'b' become the dominant trunk by slowing growth on leaders 'a' and 'c' and allowing more sunlight to reach 'b'. In most cases on large-maturing trees, branches in the lower 15-20 feet of the tree should be kept smaller than half the trunk diameter using this technique.</p>	<p>Solution - This moderate pruning treatment is similar to the light pruning treatment. The main difference is here we are more aggressive. Larger holes are left in the canopy following moderate pruning. This might be appropriate if trees cannot be pruned for several years, or if they might never be pruned again. Up to about 40% of foliage could be removed on young trees if necessary.</p>

Objective: Increase structural integrity by pruning to one dominant leader.

Execution: Prune to maintain a dominant leader (one main trunk) by reducing the length of or removing competing leaders. Do not allow branches with included bark to grow too large because they could split from the tree. This is accomplished by shortening the branch. Regularly reduce the length of low vigorous branches and limbs that will be in the way later and have to be removed. Strive to prevent branches from growing larger than half the trunk diameter. Older trees (see figure below) can be pruned in a similar manner to create or preserve good structure.

Before pruning	Remove indicated branches	After pruning
		
<p>Problem: This medium-aged tree has four main limbs (a, b, c, d) all originating from one point on the trunk. Each limb appears to be equally dominant. This form is considered weaker than the single-trunk form where one stem dominates and is bigger than all others. Large maturing trees usually perform best and last longest if they grow with one main leader and trunk. This tree was tipped at about the position of the line drawn through the canopy causing the proliferation of sprouts at the canopy edge. Tipping also encourages development of codominant stems.</p>	<p>Solution: Reduce the length of limbs 'a', 'c' and 'd' using reduction cuts and removal cuts. After pruning, the tip of limb 'b' should be higher than the tops of all other limbs. This will help limb 'b' become the dominant trunk by 1) slowing growth on limbs 'a' 'c' and 'd' and 2) increasing growth rate on 'b' by providing more sunlight to 'b'. In most cases on large-maturing trees, branches in the lower 15-20 feet of the tree should be kept smaller than half the trunk diameter using this technique. And they should not be allowed to grow up into the tree to become a permanent part of the canopy. Note that no small diameter interior branches were removed.</p>	<p>Solution executed: Small holes were created in the canopy by removing branches from the outer portion of the canopy. These holes will fill with new branches as growth resumes. Trees can receive this light pruning treatment each year to encourage development of good structure. Regular pruning may be required for ten years or more to develop a structure that the tree can sustain. A more aggressive pruning treatment would be to make reduction cuts back to lower lateral branches than indicated above. This would leave larger holes in the canopy but would require less frequent pruning to reach the objective of developing one trunk.</p>