

Big Trees, Little Trees — Is There Always a Correlation with Age?

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“Big trees are usually older than smaller trees.” Although there is some logic to this statement, the premise is not necessarily true, especially in mixed species stands.

Most hardwood trees regenerate from a disturbance, creating even-aged stands. These disturbances could be acts of nature such as tornadoes, windstorms, fires or catastrophic pest outbreaks. Or they could be human-caused disturbances such as timber harvesting, which creates openings where sunlight can reach the forest floor. As with agronomic crops, most trees grow best in full sunlight.

Different species of trees grow at different rates. Fast growers differentiate (grow their crowns) above the slower growers, occupying the growing space and receiving most of the sunlight, shading the slower growers. The shaded trees persist in the lower canopy, but their crowns are sparse, and growth is minimal. These trees are not vigorous and many succumb to mortality. Often, they are the same age as the faster-growing trees, having regenerated at the same time, but the faster-growing overstory inhibits their growth. In contrast, single-species plantations have trees with similar diameters because each tree is the same species with the same growth rate and the same amount of growing space.

Popular sentiment is that, when released, the small trees in the lower canopy will become the large trees of tomorrow. This assumption has been perpetuated in diameter-limit harvests that have led to what is called high-grading today. The largest and the best trees are harvested leaving the smaller, inferior trees to perpetuate the next stand. In most cases, the trees being released are the same age as those being cut. The smaller, released trees did not have a chance to prosper in competition with the faster-growing, overstory trees. These released trees have diminished growth with their small, unbalanced and spindly crowns.

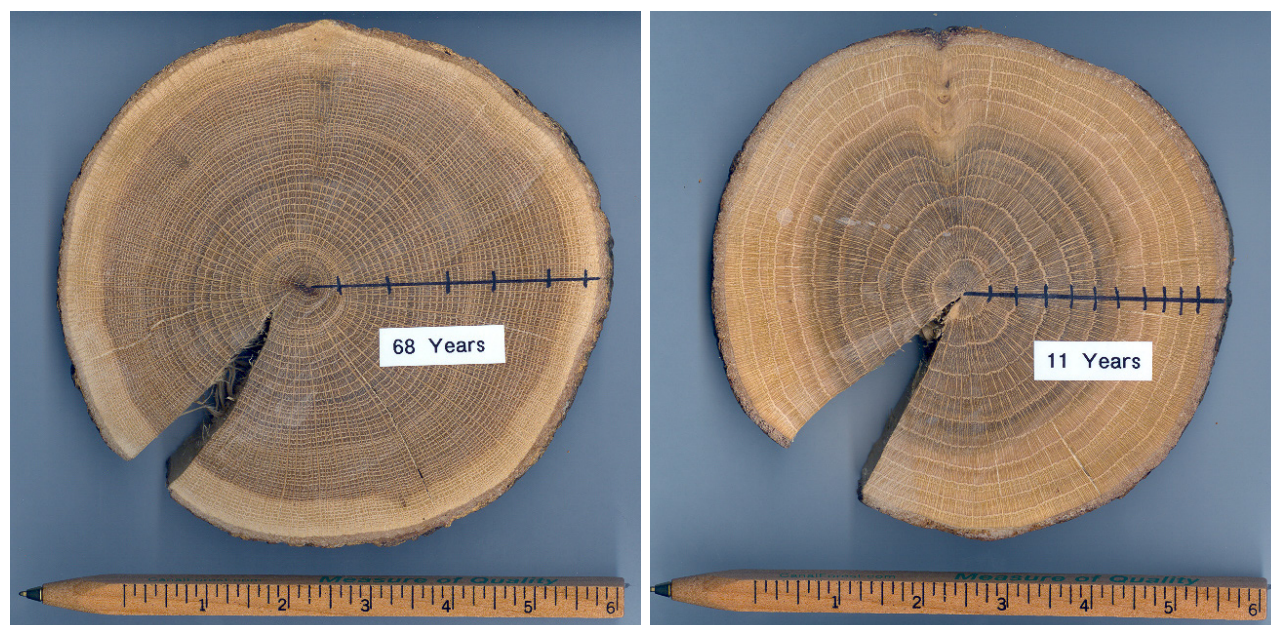


FIGURE 1. Two white oak trees that are of similar diameters from adjacent sites. The 68-year-old tree grew in the shade of larger, overstory trees. This older, slow-growing tree never had an opportunity to grow in full sunlight. Response to release is questionable for a sub-canopy tree of advanced age. If left after the harvest, the tree will intercept the sunlight and slow the growth of regeneration near it. The 11-year-old tree is a stump sprout from a clear-cut. The tree was never shaded by larger trees and has already reached the diameter of the older tree.

¹ McGee, C.E. and D.L. Bivens. 1984. A billion overtopped oaks – assets or liabilities? *Southern Journal of Applied Forestry* 8(4):216-220.

² Miller, C., S. Grayson, A. Houser, W. Clatterbuck, K. Kuers. 2011. Thirty-year assessment of released, overtopped white oaks. *Proceedings, 17th Central Hardwood Forest Conference*; Gen. Tech. Rep. NRS-P-78: 514-520. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.



FIGURE 2. Although these trees are of different diameters, they regenerated at the same time and are the same age.

Research on overtopped white oak trees illustrates this point^{1,2}. Thirty-year growth data after a harvest of the largest trees (approximately 80 years of age) show that the remaining, lower canopy trees were not an asset worth continuing. Height, diameter and volume growth were minimal. The remaining smaller diameter trees were the same age as those that were harvested. These trees did not respond to release to become future crop trees. A cycle of repeated high-grade harvests resulted in the development and perpetuation of a low-quality forest.

With an increment borer or by simply cutting a few trees and counting the annual growth rings, the age of these smaller diameter trees can be determined. If they are truly younger, a previous harvest or disturbance created large enough openings to allow these trees to regenerate and grow without being inhibited by the larger, adjacent trees. The crowns of these younger trees should be thrifty (not spindly) with a strong terminal leader and a balanced crown. These trees are capable of responding to a release treatment. About 30 to 50 well-distributed, younger trees per acre or in groups are recommended to have enough crop trees in the next stand. The overstory should be harvested, releasing these younger trees, taking care not to damage these smaller trees during the harvest operation.

However, most small-diameter trees are as old as or older than the overstory trees. If the small trees are the same age as the big trees or if enough truly younger trees are not present, then the stand should be regenerated. Regeneration sources will be from seed, sprouts and advance reproduction (small seedlings or saplings already present). Good visual indications that smaller trees (more than 10 inches in

diameter) are too old to respond to release include flat-topped (without a terminal leader), lopsided, spindly and small crowns. Cutting these trees will provide strong stump sprouts that could become future crop trees. Sprouts, with their larger root system, will usually have a growth advantage over seed or planted seedlings that must develop a root system before accelerated growth can occur.

The economic ramification of leaving small diameter trees with little capability of growing once released is substantial. Growth could be accumulating on a tree that is actively growing from a sprout (refer to cross-sectional disks). An older stem that is not responding to release and is usually of poor form is occupying growing space and not adding value to the stand.

The belief that larger trees should be cut and that the smaller trees will be released to become future crop trees can be a serious error. The lower canopy, smaller trees are often as old as the larger, overstory trees; they just did not have a chance to grow and prosper. Their weakened condition and advanced age are liabilities for the future.



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