



Woods Whys

*An Exploration of
Forests and Forestry*

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37 What Is Forest Stand Structure and How Is It Measured?

Once upon a time, forest stand structure meant age structure. Areas of forests containing similar-aged trees were called even-aged stands, and areas with trees of multiple ages were considered uneven-aged stands. It was all quite straightforward. Stand structure was defined by how many trees were present in each age class within a given stand. It was beautiful.

This view of stand structure saw tree diameters as a surrogate for something more difficult to measure: tree age. Foresters then set about trying to manage the number of trees in each diameter class according to some target age structure. Typically, each age class was supposed to occupy an equivalent proportion of the forested area in a way that was thought to ensure a regular output of wood over time. This was known as a “balanced age structure,” but of course it was really more a balance of tree diameters than tree ages. Here’s the problem: age and size are not the same. Sometimes, small trees are surprisingly old, and many large trees are surprisingly young. Nevertheless, for years this was how foresters referred to and managed a stand’s structure.

While a lot of good came from this method, conventional management approaches have changed. Today, foresters are increasingly aware of, interested in, and asked to manage for more than just the sustained output of wood. We are asked to sustain the forest itself and its capacity to serve many additional functions, such as providing habitat for a diversity of organisms. Accordingly, our current definition of stand structure is far more complex. We now see structure as the physical form of a stand, with particular emphasis on what you might call the verticality of the woods—the extent to which both living and dead plants occupy the layers from the ground through the mid-story to the tops of the tallest trees.

Picture the three-dimensionality of a forest stand, from the forest

floor and the herb and shrub layers, into the understory, and through the canopy to the tree tops. See all of that space and the varying amounts of vegetation within it and then look from side to side to see its full horizontal extent. That's stand structure. It is the vertical and horizontal arrangement of plants, dead and alive. Combine it all and you have structural complexity. Stands with more complex structures are thought to be more resilient and potentially even more productive. They assuredly provide valuable habitat for a greater diversity of plants and animals than do stands with less structural complexity.

But still, how would we measure it? Structure is not like tree diameter, height, or even tree age—all of which can be readily measured. Instead, structure is a stand-wide feature, and there is no one measure or even a good index to quantify or express it, at least not yet in use. And so foresters measure a variety of stand attributes—tree diameter, trees per acre, basal area, live crown ratios—that each contribute to a stand's overall structure but do not, individually, describe it completely. It is therefore insufficient, even meaningless, to simply add together our varied measures to produce some average quantification of stand structure. In this way, forest structure is like a good rock band: the whole is always much more than the sum of its parts. This is reflected in one of Webster's definitions of the very word, structure: "organization of parts as dominated by the general character of the whole."

The forester's job then is to assimilate all of our various individual measures into an integrated, coherent sense of the whole. In particular, we seek an understanding of a stand's full volume of growing space and the extent to which it is occupied. We often express this in generalities like patchy, dense, or multi-storied. It's not mathematical, but it begins to paint a more telling picture of the stand and its growing space and opportunity.

Sure, we still try to optimize the growth of useable wood in managed stands, and we still use diameters to approximate age when appropriate. But our view of a stand's structure has evolved to include vertical stratification and development through consideration of tree shapes, heights, spacing, and arrangement in addition to diameter and age. It's far more difficult, but even more beautiful.