PURDUE UNIVERSITY

PURDUE EXTENSION

FNR-435-W

EXPERT REVIEWED

Manufacturing and Marketing Eastern Hardwood Lumber Produced by Thin Kerf Band Mills

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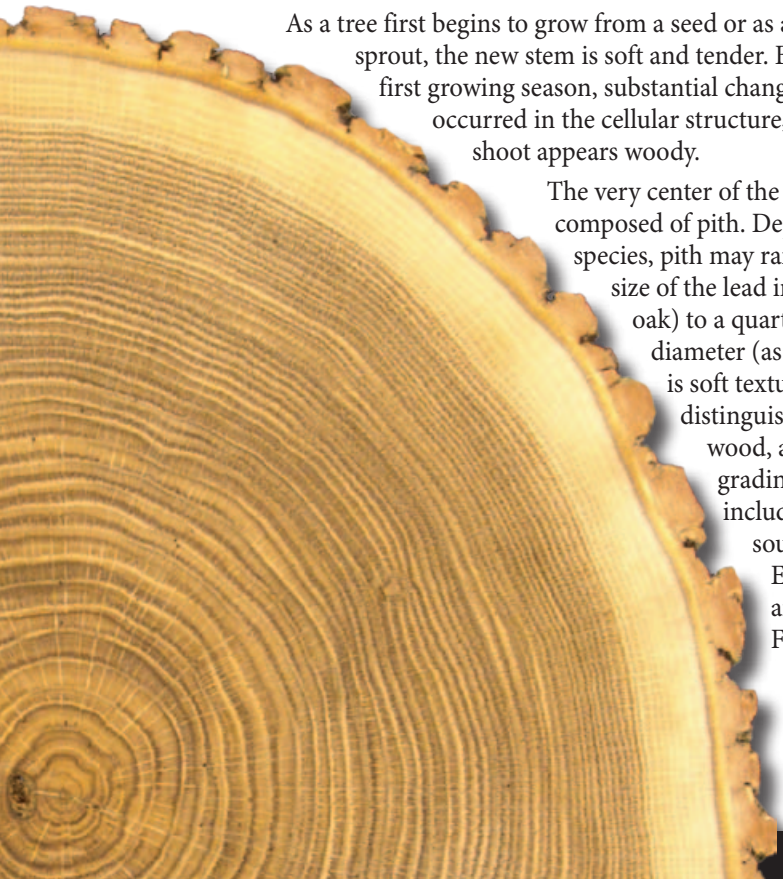
Hardwood trees are biological organisms that we see and enjoy everyday, but we seldom consider the complex nature of how they grow and of the many different uses that are often based on each species' unique features. Furthermore, the wood produced by each species is equally complex, but substantially different in its characteristics from one species or group of species to another. Without fully understanding the complexity and variability of wood, people have been successful in adopting it for many uses. An understanding of some of the basic characteristics and properties of wood, however, can help solve problems when they arise in current applications, help identify new uses or substitutes, and enable an even greater appreciation of the resource.

This chapter briefly describes the important characteristics of trees and wood.

Tree Growth



As a tree first begins to grow from a seed or as a root or stump sprout, the new stem is soft and tender. By the end of the first growing season, substantial changes have occurred in the cellular structure, and the young shoot appears woody.

The very center of the stem is composed of pith. Depending on species, pith may range from the size of the lead in a pencil (as in oak) to a quarter inch or so in diameter (as in walnut). Pith is soft textured, easily distinguished from solid wood, and in lumber grading it cannot be included in clear or sound cuttings. Examples of pith are shown in Figure 3-1.

Figure 3-1. Examples of a large chambered pith in walnut (left) and a solid pith in yellow-poplar (right). Pith runs the entire length of the stem but, due to irregularities, it usually weaves in and out of a board.

To the outside of the pith is a series of continuous layers of wood (Figure 3-2). Each year, a new layer of wood is formed, hence the term annual ring or growth increment. To the outside of the annual rings is the cambium, which is responsible for the formation of additional rings (wood) of tree growth as well as additional phloem and bark.

The cambium (Figure 3-2) may be viewed as a thin cylinder of just one to a few generative cells surrounding the woody portion of the stem and protected

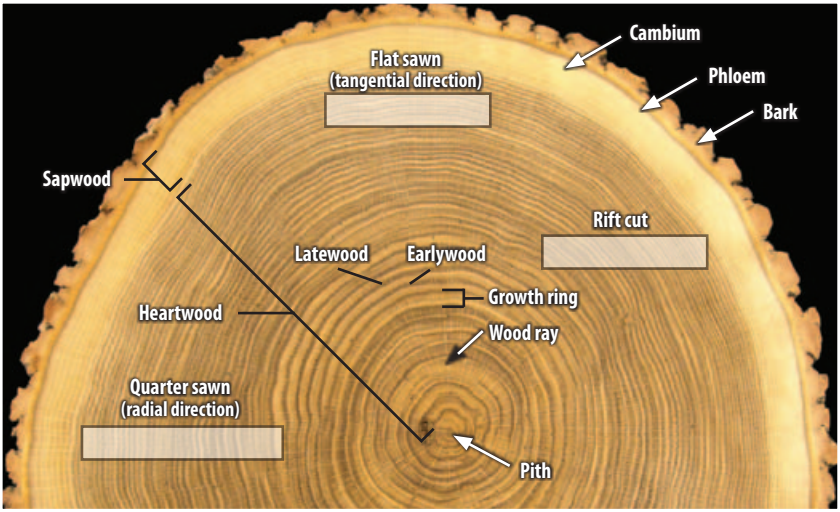


Figure 3-2. Cross section of a log showing several important features.

by layers of phloem. It cannot be seen by the naked eye. Each growing season the cambium forms a layer of wood and a much thinner layer of bark. The wood cells (xylem) become thick-walled and lignified; each new layer of inner bark (phloem) pushes the older, nonfunctional bark outward as the stem enlarges. Successive cork cambia are formed in the older portion of the bark to produce outer layers of suberized cork cells and lignified stone cells. Tissues outside the cork cambia die. They are eventually sloughed off. The activity of the cork cambium gives trees their characteristic bark patterns.

Water from tree roots is conducted upward through the outer portion of the woody cylinder by tensions created in the crown and distributed to the cambium and other living cells. Food in the form of sugar, synthesized in the leaves, is transported through the living inner bark to the cambium, where cell division takes place. Sugars are also conducted radially and stored, mostly as starch, in the horizontal rays. Rays (Figures 3-2, 3-4, 3-6, 3-8, 3-10) are so named because they radiate outward from the pith. They may be very fine and unnoticeable to the eye, as in gum or aspen, or they may be rather broad, as in oak, to produce the ray fleck pattern so characteristic of quartered oak. End checking of logs and lumber usually occurs at the interface of a ray and adjacent longitudinal tissue. For more information on end checking, see the chapter entitled "Wood Moisture and Drying."

Height and lateral growth of trees occur through the meristimatic regions of the buds on the limb tips. In these regions new cells are added during each growing season; the cells elongate, thus adding height and breadth to the tree. A spike driven in a tree at 4 feet above ground level will remain there regardless of how high the tree grows or how wide its branches may extend, since height