Wood Quality of Shortleaf Pine

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Shortleaf pine (*Pinus echinata*) is one of the four major southern pines in addition to loblolly pine (*Pinus taeda*), slash pine (*Pinus elliottii*), and longleaf pine (*Pinus palustris*). All four tree species are commercially and ecologically important and they are grouped together because they share similar wood structure and properties and thus there is no clear way to reliably differentiate between them based on their wood anatomy (Panshin and De Zeeuw 1980).

Shortleaf pine's wood is typically used for lumber, plywood, composites, and pulp. When shortleaf pine is grown on a quality site it can reach heights of 100 ft with diameters of 36 inches; at 70 years heights of 130 ft and diameters of 48 inches have been recorded (Lawson and Edwin 1990; Alden 1997).

Figure 1. Straight, tapered bole of a mature shortleaf on a Georgia Piedmont site. Credit: Larry Morris

Wood Structure

Shortleaf pine is a resinous hard pine and the mature wood is straight grained with medium texture. Like the other southern pines, shortleaf pine wood has abrupt alternating bands of low density earlywood (lighter colored wood) that grows towards the beginning of the growing season and high density latewood (darker colored wood) that grows towards the end of the growing season (Figure 2 & 3). The mature wood from the southern pines are characterized as having a high percentage of latewood which results in the southern pine species group to have the highest density amongst the commercially important softwoods in the United States (Hoadley 1990). The wood is resinous and thus contains canals that secrete resin; these resin canals are easily seen without a hand lens or microscope (Figure 3). The wood contains dentate ray tracheids and pinoid pitting which is used to distinguish between other non-southern hard pines such as red pine (*Pinus resinosa*) which grows in the upper Midwest and Canada (Figure 4).

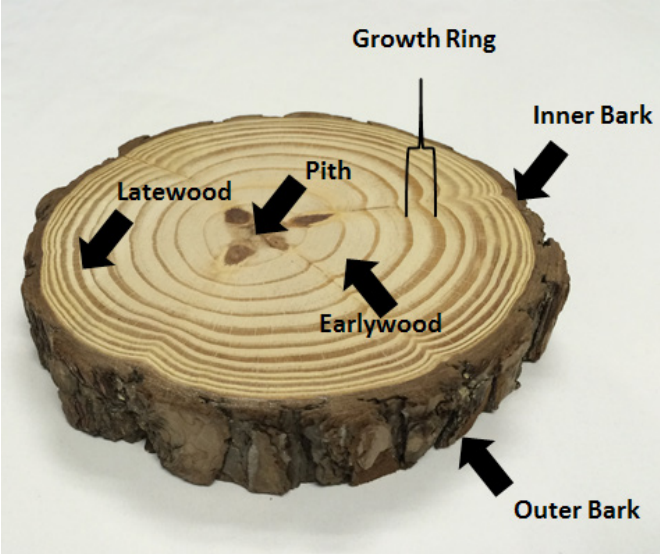

Figure 2: Southern pine wood disk illustrating the wood pith, growth rings which include both a lower density earlywood component and a higher density latewood component, and the inner and outer bark. Credit: Joseph Dahlen

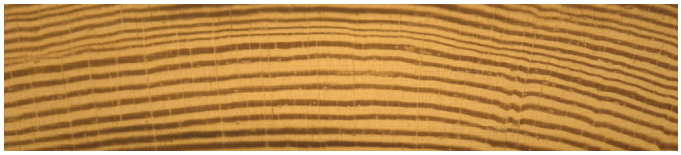

Figure 3: Transverse view of shortleaf pine; note the alternating bands of lighter color earlywood and darker color latewood and the resin canals which appear as white dots in the latewood. Credit: Joseph Dahlen

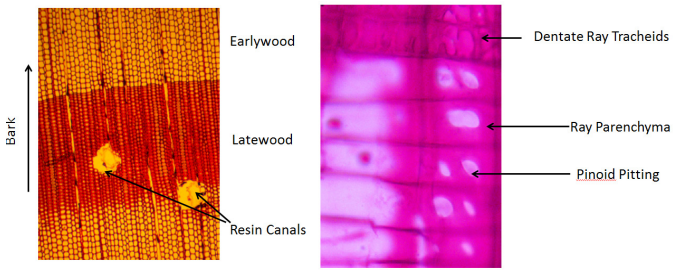

Figure 4: Left: Transverse section of shortleaf pine as viewed on a microscope. Right: Radial section of shortleaf pine as viewed on a microscope. Credit: Joseph Dahlen.

Physical and Mechanical Properties

Basic specific gravity averages 0.47 and at 12% moisture content the specific gravity averages 0.51 (Kretschmann 2010). The specific gravity of shortleaf pine is comparable to loblolly pine but less than slash pine or longleaf pine (Kretschmann 2010). Thus the average dry density of the wood would be 35.6 lbs/cubic foot (Kretschmann 2010). On the stump the moisture content of the sapwood averages 122% (oven-dry moisture content basis) (Glass and Zelinka 2010) and thus for every 100 pounds of wood the water in the tree would weigh 122 pounds. The average radial, tangential and volumetric shrinkage rates average 4.6%, 7.7%, and 12.3% which is comparable to the other southern pines (Glass and Zelinka 2010); for a North American softwood these rates are relatively high which is one reason why warp concerns exist for southern pine during the drying process. After drying the wood is relatively stable.

The mechanical properties follow a similar trend with shortleaf pine and loblolly pine being similar given similar ages. Overall shortleaf pine has similar properties to loblolly pine; if grown on longer rotations such as 50 years the lumber quality of shortleaf pine would likely be excellent given that the wood would have a small juvenile core which is associated with low stiffness and low strength wood. The mature wood from shortleaf pine can be described as having high strength and stiffness (Alden 1997).

Wood Utilization

Utilization of shortleaf pine is similar to the major pines and end-products include lumber, composites and paper. When lumber is produced from shortleaf pine the pieces are graded based on the Southern Pine Inspection Bureau's rules for southern pine (SPIB 2014). Kiln drying can be done with traditional (<180°F) or high temperature schedules (>212°F). The color of the wood is yellow similar to the other southern pines (Figure 5). The wood is not decay resistant and thus needs to be treated prior to outdoor exposure. As the wood ages over 20 years heartwood begins to form but the heartwood is not decay resistant. When used for non-structural purposes such as indoor paneling the wood of shortleaf pine can be attractive due to the yellow color and the alternating bands of lighter colored earlywood and darker colored latewood. Pulp quality is high when used for dissolving pulps as well as packaging based pulps.

Figure 5: Tangential section of shortleaf pine showing lighter colored and density earlywood and dark and higher density latewood. Credit: Joseph Dahlen

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