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Silvicultural Research In the News

North Carolina Forest Service
To protect, manage, and promote forest resources for the citizens of North Carolina

Compiled by Bill Pickens—Conifer Silviculturist

A Synopsis on Juvenile Wood in Southern Pines

The NCFS plants a lot of loblolly pine for varying landowner objectives and wood products. We typically recommend genetically improved seedlings, intensive site preparation, and planting densities that increase growth. These fast growing plantations have shorter harvest rotations, and as a result a higher proportion of juvenile wood. Juvenile wood has undesirable wood quality characteristics. Trees with a high proportion of juvenile wood yield inferior solid wood products.

Wood quality issues in these fast growing loblolly pine plantations are a common discussion topic between foresters, and a concern for landowners. It's a complex issue that is difficult to understand.

I recently came across an excellent publication, *Formation and Properties of Juvenile Wood in Southern Pines - A Synopsis,* by Philip Larson, et.al.. This long publication is a great resource to help you understand how a tree grows wood, the characteristics of juvenile wood, other wood-related properties that affect quality, and how site, stand density, geographic location, and silviculture activities affect the formation of juvenile wood.

A few of many tidbits I gleaned from the synopsis follow.

- The size, distribution, and efficiency of the foliar organs (needles) indirectly controls wood quality because of how they influence cell formation in cambium where all wood is produced.
- Wood quality characteristics such as growth ring width, proportion of springwood to summerwood, and the structure of the tracheids are regulated by crown vigor.
- Springwood is favored during juvenile growth.
- Springwood cells produce large diameter tracheids with thin walls for rapid growth and summerwood produce narrow diameter tracheids and thick cell wall for strength and support.
- Juvenile wood differs from mature wood in that it has lower percentage of summerwood, lower specific gravity, and shorter tracheids with larger fibril angles.
- Slow growth does not eliminate juvenile wood formation but simply confines it to a smaller core.
- In one study the amount of juvenile wood in plantation grown loblolly pine decreased from 85% at age 15 to 55% at age 25 to 19% at age 40.
- Planting density does not significantly affect the age of transition from juvenile to mature wood, but does affect the diameter of the juvenile core.
- Juvenile wood has good paper properties when pulped except for low tear strength which, when mixed with mature wood, becomes less critical because the undesirable wood quality characteristics are averaged out.
- The characteristics of juvenile wood contribute to undesirable solid wood properties.
- Juvenile wood quality is exceedingly complex.

Abstract

To satisfy the increasing demand for forest products, much of the future timber supply will be from improved trees grown on managed plantations. This fast-grown resource will tend to be harvested in short age rotations and will contain higher proportions of juvenile wood than that of current harvests. In anticipation of this resource, definitive information is needed on the influence of juvenile wood on lumber properties so that grading rules and the associated allowable design stresses can be modified as needed. This document reports the results of an extensive review of the literature on juvenile wood in southern pines. This report defines and discusses the extent, occurrence, and characteristics of juvenile wood. It reviews the effects that environment and silviculture have on the amount of juvenile wood produced. Finally, the impacts that juvenile wood has on mechanical properties were quantified. The results of this quantification are significant to all producers of fast-grown plantations. Research has clearly shown that juvenile wood will have a detrimental impact on allowable design stresses for visually graded lumber. It is critical that methods are developed to more carefully manage fast-grown plantation wood for its most efficient use. This review should serve as an overall collection of knowledge pertaining to juvenile wood research in southern pines and should help in the decision-making efforts to improve seedling selection techniques and silvicultural practices to maximize the potential for fast-grown plantations of southern pines. Keywords: juvenile wood, southern pines

Citation

Larson, Philip R.; Kretschmann, David E.; Clark, Alexander III; Isebrands, J.G. 2001. Formation and properties of juvenile wood in southern pines: a synopsis. Gen. Tech. Rep. FPL-GTR-129. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 42 p.

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