

# INFLUENCE OF THINNING AND PRUNING ON SOUTHERN PINE VENEER QUALITY

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**Abstract**—This paper presents the effects of intensive pine plantation management on veneer yields, veneer grade distribution and veneer MOE as measured by ultrasonic stress wave transmission (Metriguard). Veneer production trials were done at a commercial southern pine plywood plant to elucidate the effects of silvicultural treatments on veneer quality, yield, and modulus of elasticity. Forty-nine trees, totaling 1,312 ft<sup>3</sup>, were selected from an intensively managed, 50-year-old loblolly pine (*Pinus taeda* L.) plantation at the Hill Farm Research Station of Louisiana State University at Homer, LA. Trees were selected from each of four treatments, pre-commercially thinned (PCT), pruned (PRN), pre-commercially thinned & pruned (PCT&PRN), and control (CTRL)[no thinning or pruning]. Twelve trees were selected per treatment, except for the PCT&PRN treatment that had thirteen trees. Each tree was felled, bucked into a log 17-foot-long plus trim, transported to the plywood plant, scaled on the log yard, bucked into two 101.5-inch-long peeler blocks (butt and top), conditioned in a drive-in steam chest (vat), rotary peeled into 1/8-inch-thick veneer using the plant's normal production process, then dried in a veneer drier. The length and width of full-sized veneer sheets, full-length random width strips (including half sheets) and half-length fishtails and strips were recorded to establish veneer yields. Full-sized sheets were graded visually according to U.S. Product Standard PS 1-83 in the green condition and after drying to establish veneer quality and drier degradates [A, B, C, D, and U (Utility) grades were identified] and by a Metriguard veneer tester for MOE determination. Five Metriguard groupings were assigned as follows: G1 (0-435ms, 2.44x10<sup>6</sup> psi), G2 (436-475ms, 2.17x10<sup>6</sup> psi), G3 (176-525ms, 1.86x10<sup>6</sup> psi), G4 (525-700ms), and G5 (> 700ms). Only the G1, G2, and G3 groupings are used to produce laminated veneer lumber (LVL); hence, the G4 and G5 groupings were combined into a below grade category. When G1, G2, and G3 veneer classifications were combined, all intensive silvicultural treatments had a higher number of veneers qualify compared to the CTRL treatment in both butt and top blocks. Also, the number of veneers qualifying for LVL production in the top blocks exceeded that in the bottom blocks for all treatments. It is also interesting to note that the percentage of G1, G2, and G3 veneers in the top block exceeded that in the butt block in all treatments except the PRN treatment. Compared to the CTRL treatment, the PCT and PRN treatments had slightly faster average sound transmission times in veneers produced from both butt and top blocks, which corresponds to stiffer veneer. However, these faster transmission times did not significantly alter the MOE range (G-Rating). The percentages of qualifying G1, G2, and G3 veneers were about equal in each treatment, but the intensively managed trees produced more G-grade qualifying veneers. The top blocks produced more G-grade qualifying veneers in all except the pruned treatment. The average Metriguard grade for all treatments was G2. The relationship of MOE to visual grade is the subject of a future paper.

## INTRODUCTION

Research priorities change, but one area that continues to be a high priority among government, non-industrial, and industrial organizations is growth and yield. Maximizing growth and yield relies on proper timing of silvicultural operations such as thinning and pruning. In loblolly pine plantations, these treatments can be instrumental in improving log and lumber volumes as well as dry veneer yields. Increased volume is important, but equally important, if not more so, is the grade of the veneer produced.

Lynch and Clutter (1998) state "grade is an essential determinant of value for southern pine plywood." Phillips and others (1979) reported that loblolly pine yielded 54 percent of the original log volume in dry usable veneer, while slash pine produced 55 percent. They also found loblolly pine produced 5 percent A-grade, 12 percent B-grade, 37percent C-grade, and 46 percent D-grade dry,

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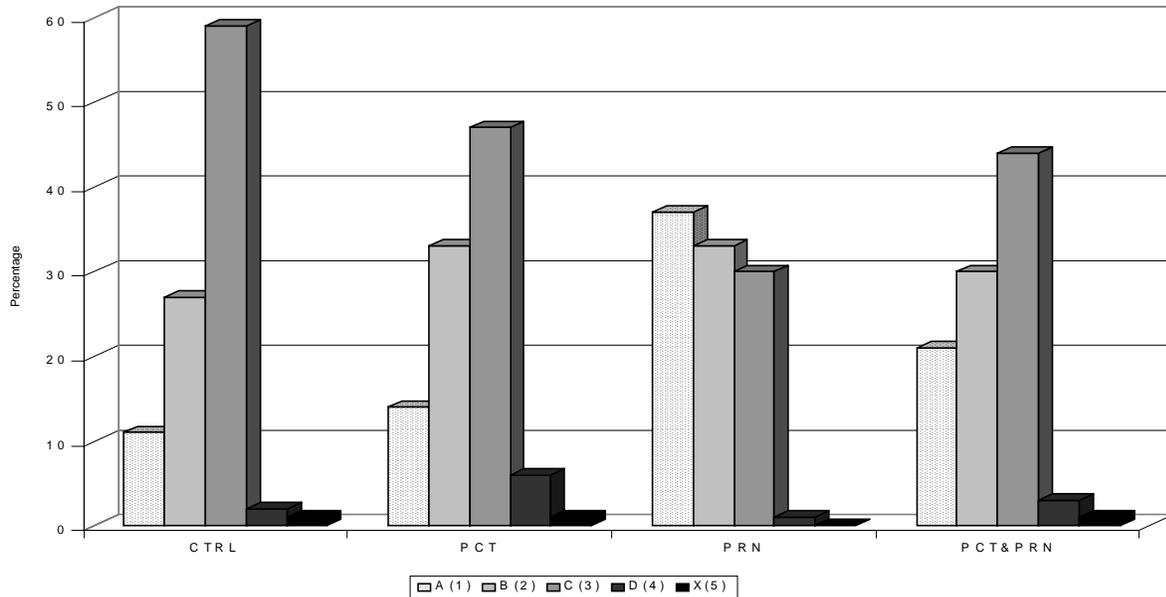


Figure 1—Dry veneer visual grade percentage yield by treatment (butt and top blocks combined).

untrimmed veneer. Woodfin (1973) reported that 55 percent of the total green plywood peeler block volume is recovered as dry, untrimmed veneer for four major western species. Funck and Sheffield (1985) indicated that dry veneer recovery was between 43 and 55 percent of peeler block volume. MacPeak and others (1987) showed dry veneer recovery of 48.3 percent for fast-grown 20- to 25-year-old loblolly pine, while “mill run” tree-length logs in a control group averaged 54.7 percent dry veneer recovery. Schroeder and Clark (1970) obtained a 60 percent dry veneer recovery when peeling 405 loblolly pine blocks. A more detailed description of the production process for rotary peeled veneer appears in Koch (1970, 1985).

This paper reports the results of a preliminary study designed to evaluate the effects of thinning and pruning on veneer yield, quality, and modulus of elasticity from an intensively managed, mature (50-year-old) loblolly pine plantation.

#### METHODS

Forty-nine trees were selected from an intensively managed, 50-year-old loblolly pine plantation located at the Hill Farm Research Station of Louisiana State University in Homer, LA. Trees were selected from each of four treatments, pre-commercially thinned (PCT) [average dbh 19.3 in], pruned (PRN) [average dbh 19.1 in], thinned & pruned (PCT&PRN) [average dbh 19.2 in], and control (CTRL) [no thinning or pruning, average dbh 15.6 in]. Twelve trees were selected per treatment, except for the thinned & pruned treatment that had thirteen trees. Each tree was felled, bucked into a 17-foot-long log plus trim, transported to the plywood plant, scaled on the log yard, bucked into two 101.5-inch-long peeler blocks (butt and top), conditioned in a drive-in steam chest (vat), rotary peeled into 1/8-inch-thick veneer using the plant’s normal production process, then dried in their veneer drier. The length and width of full-sized veneer sheets (53-inch x 101.5-inch green and 51-inch x 101.5-inch dry), full-length random width strips (including half-sheets) and half-length fishtails and strips were recorded in both the green and dry condition to establish veneer yields. The facility produces veneer for a laminated veneer lumber (LVL) plant and for a commodity plywood sheathing plant. The plywood production

Table 1—Cubic-foot log volume and veneer recovery percentage by treatment

Treatment	Volume yield		
	Log (ft <sup>3</sup> )	Veneer recovery Green (pct)	Dry (pct)
Control	237	60	58
Pre-commercial thinned & pruned	373	69	66
Pre-commercial thinned	358	72	69
Pruned	344	64	61
TOTAL	1,312	67	64

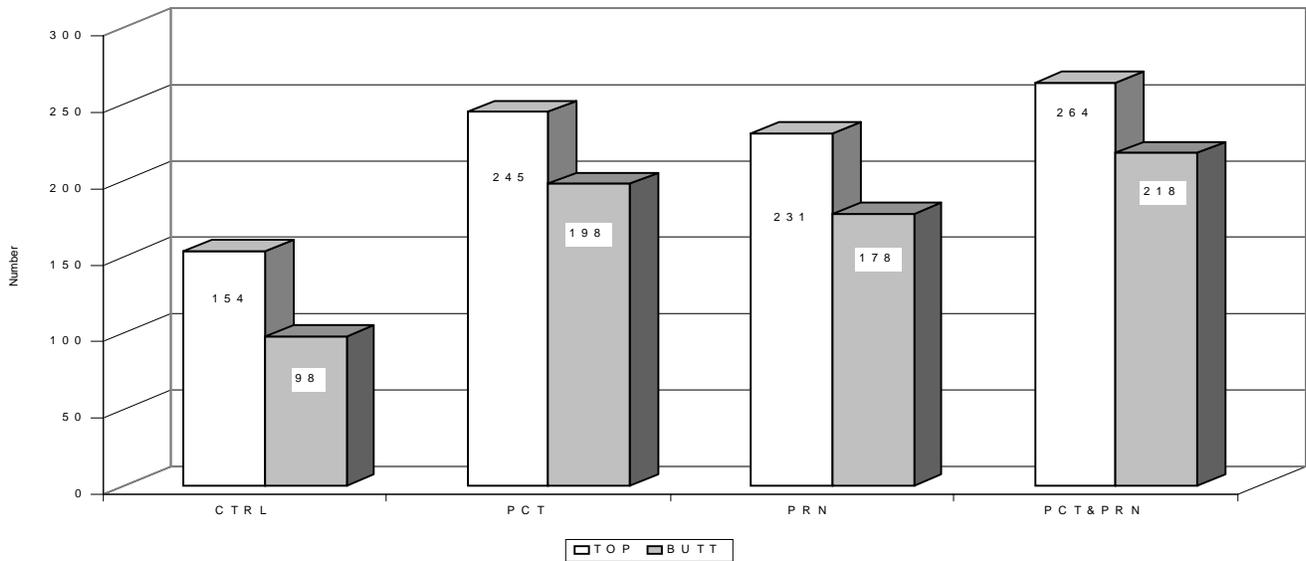


Figure 2—Number of full-sized veneer sheets qualifying for the G1, G2, and G3 grade classifications within each treatment for butt and top peeler blocks.

facility manufactures 245,000 ft<sup>2</sup> per 8-hour shift on a 3/8-inch basis. The LVL plant requires sorting the veneers by their modulus of elasticity values (MOE), which is done by a Metriguard Model 2600 FX veneer tester. The plywood plant requires visual grading for separation of core and face veneer as well as face veneer classification. Accordingly, the full-size sheets were visually graded according to U.S. Product Standard PS 1-83 in the green condition and after drying to establish veneer quality and drier degrades [A, B, C, D, and U (Utility) grades were identified] and by Metriguard for MOE determination. The correlation of veneer stiffness and LVL performance is constantly monitored by testing LVL samples and adjusting the acceptable ranges of veneer ultrasonic sound transmission rates. Five classifications (G1, G2, G3, G4, and G5) are assigned,

although only veneers in the G1 through G3 groupings are actually used to produce LVL. The five groupings correspond to the following Metriguard grades, millisecond ranges, and MOE values: G1 (0-435ms, 2.44x10<sup>6</sup> psi), G2 (436-475ms, 2.17x10<sup>6</sup> psi), G3 (176-525ms, 1.86x10<sup>6</sup> psi), G4 (525-700ms), and G5 (> 700ms). The G4 and G5 groupings were combined into a below grade category. A VHS camcorder was used to record both the Metriguard grade and the APA visual grade of the veneers. The plant provided a certified veneer grader whose grades were recorded onto the videotape. Metriguard readings and visual grades were transcribed from the videotape onto paper for entry into Microsoft®-Excel.

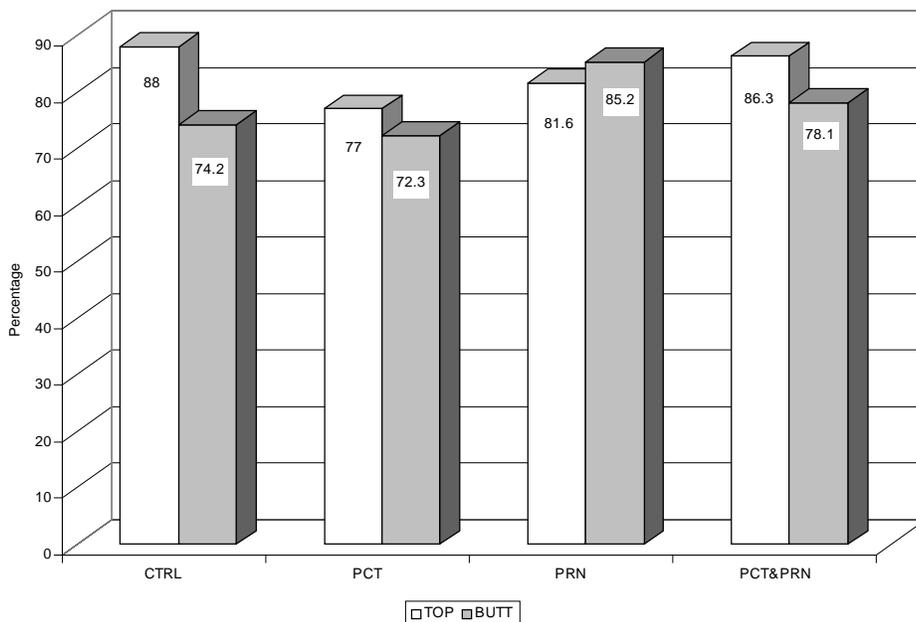


Figure 3—Percentage of full-sized veneer sheets qualifying for the G1, G2, and G3 grade classifications within each treatment for butt and top peeler blocks.

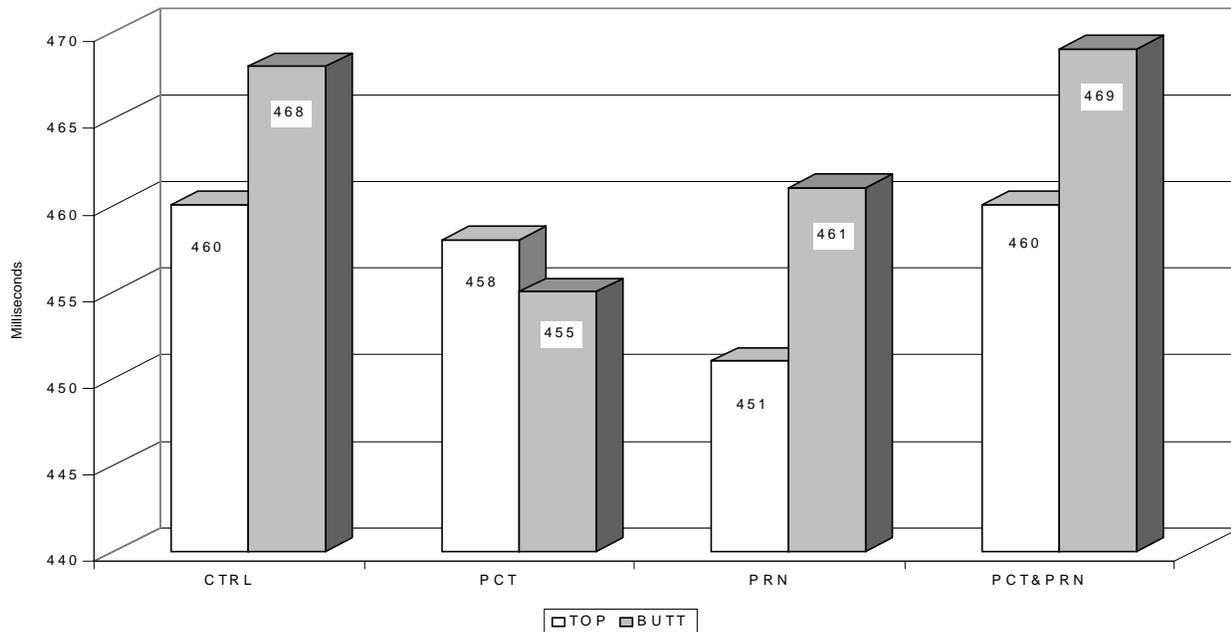


Figure 4—Mean metriguard millisecond transfer rate for full-sized veneer sheets in the G1, G2, and G3 grade classifications within each treatment for butt and top peeler blocks (faster transmission rates indicate stiffer veneers).

## RESULTS AND DISCUSSION

### Log Cubic-Foot Volume Yield

Table 1 shows the mean cubic-foot volume yield of the logs by treatment. The pre-commercially thinned and pruned treatment yielded 57 percent more volume than the control. Pre-commercial thinning alone produced 51 percent more volume and pruning alone generated 45 percent more volume than the control. All silvicultural treatments produced volumes greater than that of the control treatment; however, volume in the pruned treatment was the lowest for all silvicultural treatments. One possible explanation for this decrease is the volume of pruned logs was affected by loss of crown area and the consequent decrease in photosynthate. Hence, less material was available for wood formation. Because thinning was not done in combination with the pruning, the growth rate was not stimulated sufficiently and resulted in less volume production.

### Dry Veneer Yield

Table 1 also shows the veneer recovery percentages of green and dry veneers by treatment, i.e., the percentage of the original log volume that became green or dry veneer. The pre-commercial thinning and pruning treatment produced 14 percent more dry veneer than the control. Pre-commercial thinning alone produced 19 percent more dry veneer than the control and pruning alone yielded 5 percent more dry veneer than the control. All silvicultural treatments improved veneer recovery above that of the control treatment.

### Visual Grade Yield

Figure 1 illustrates the dry veneer visual grade percentage yields for each treatment. A higher percentage of A-grade

and B-grade veneers were produced by the silvicultural treatments when compared to the control treatment. A-grade dry veneer yield in the pruned treatment was 236 percent greater than that for the control treatment. B & Better dry veneer grade yield in the pruned treatment was 69 percent of the total compared to 38 percent for the control treatment, a dramatic increase. The percentage of C-grade veneer was greatest in the control treatment.

### Metriguard Classification

Figure 2 compares the butt peeler block with the top block for each of the treatments. When G1, G2, and G3 veneer categories were combined, all intensive silvicultural treatments had a higher number of veneers qualify compared to the CTRL treatment in both butt and top blocks. The number of qualifying veneers in the top blocks exceeded that of the bottom blocks for all treatments. Top peeler blocks have less taper than butt blocks and consequently have fewer round-up losses during veneer production.

The percentage of G1, G2, and G3 veneers in the top block exceeded that in the butt block in all treatments except the PRN treatment as shown in Figure 3. The percentages of qualifying G1, G2, and G3 veneers were about equal in each treatment (figure 3), but the intensively managed trees produced a greater number of G-grade qualifying veneers (figure 2). Again, the top blocks produced more G-grade qualifying veneers in all except the pruned treatment (figure 3).

Compared to the CTRL treatment, the PCT and PRN treatments had slightly faster average sound transmission times in veneers produced from both butt and top blocks, which corresponds to stiffer veneer (figure 4). However,

these faster transmission times did not significantly alter the MOE range (G-Rating); hence, the average Metriguard grade for all treatments was G2.

## CONCLUSIONS

### Log Cubic-Foot Volume Yield

Log volume yield was highest in the pre-commercially thinned and pruned treatment (28 percent of the total volume, i.e., 57 percent more than the control) and lowest in the control treatment (18 percent of the total volume).

### Dry Veneer Yields

Dry veneer volume yield (recovery) was highest for the pre-commercially thinned treatment, 69 percent compared to 58 percent in the control.

### Visual Grade Yield

A-grade veneer yield in the pruned treatment was 236 percent greater than that for the control treatment. B & Better dry veneer grade yield in the pruned treatment was 69 percent of the total compared to only 38 percent for the control treatment.

### Metriguard Classification

When G1, G2, and G3 veneer categories were combined, all intensive silvicultural treatments had a higher number of veneers qualify compared to the CTRL treatment in both butt and top blocks. The number of qualifying veneers in the top blocks exceeded that of the bottom blocks. Compared to the CTRL treatment, the PCT and PRN treatments had slightly faster average sound transmission times in veneers produced from both butt and top blocks, which corresponds to stiffer veneer. The average Metriguard grade for all treatments was G2.

### Future Implications

The combined effects of increased log volume yield (45-57 percent above the control), higher dry veneer yields (5-19 percent above the control) and the dramatic increase in B & Better dry veneer grades (24-82 percent) support the potential for rotary peeling veneer mills to increase productivity, product yield and promote value-added products when they peel log supplies from intensively managed pine plantations.

## ACKNOWLEDGMENTS

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