Second-year growth and bole quality response of residual poletimber trees following thinning in an even-aged bottomland hardwood sawtimber stand

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Introduction

To improve stand health and to provide intermediate income, poletimber trees are usually removed for pulpwood during thinning operations in sawtimber stands. Premature removal of these trees however, does not fully utilize the potential of certain individuals which exhibit future sawtimber merchantability. This could represent sizeable losses in potential sawtimber volume and revenue at the end of the rotation.

A newly developed tree classification system for southern hardwoods attempts to classify poletimber trees based on their current potential to produce grade sawtimber in the future, and could be used as a guide when marking poletimber trees for retention during thinning operations in sawtimber stands. The new system identifies five tree classes used exclusively for sawtimber: (1) preferred growing stock, (2) desirable growing stock, (3) acceptable growing stock, (4) cutting stock, and (5) cull stock; and creates two additional classes for poletimber: (1) **superior poletimber stock** and (2) **inferior poletimber stock**. The **objectives** of the study were (1) to compare the growth and quality responses of the two poletimber classes to several levels of thinning to determine their potential for sawtimber production, and (2) to identify a level of thinning which may successfully promote sawtimber production from residual poletimber trees in thinned sawtimber stands.

Poletimber trees are classified based on species desirability, current condition, and future log grade potential.

Materials and Methods

- The experiment was conducted in a 60 year old, even-aged bottomland hardwood stand in northwestern Louisiana. Prior to treatment, the stand averaged 119 square feet of basal area per acre in 110 trees 5.5 inches dbh and larger.
- In December of 2003, the following five treatments were applied to 2.0-acre plots measuring 5 x 4 chains and replicated 3 times in a randomized complete block design:
  (1) unthinned control,
  (2) desirable growing stock with superior poletimber (DesSupP),
  (3) desirable growing stock with inferior poletimber (DesInfP),
  (4) acceptable growing stock with superior poletimber (AccSupP), and
  (5) acceptable growing stock with inferior poletimber (AccInfP).
- Tree classes were used to form the cutting priority within treatments, such that each treatment was defined by the tree classes to be retained (**table 1**).
- Diameter growth and epicormic branching were assessed annually during the two years following treatment.

Table 1—List of five thinning treatments, including tree classes to be retained following application of thinning treatments

	Treatments				
Tree class	Control	DesSupP	DesInfP	AccSupP	AccInfP
Preferred	X	X	X	X	X
Desirable	X	X	X	X	X
Acceptable	X			X	X
Cut	X				
Cull	X				
Superior poletimber	X	X		X	
Inferior poletimber	X		X		X

Results

- Thinning intensities were defined by initial stand quality, expressed as tree class, and were not bound to predetermined levels of residual stand density. All four levels of thinning significantly reduced residual stand density relative to the unthinned control.

Figure 1—Residual stand conditions immediately following application of treatments

Table 2— Average 2-year cumulative diameter growth of all residual poletimber trees, residual red oak poletimber trees, and residual sweetgum poletimber trees, by treatment

	Cumulative Diameter Growth		
Treatment	All Trees	Red Oaks	Sweetgum
	----------inches----------		
Control	0.13 c[a]	0.19 a	0.14 a
DesSupP	0.49 a	0.48 a	0.41 a
DesInfP	0.25 bc	0.36 a	0.31 a
AccSupP	0.31 b	0.40 a	0.28 a
AccInfP	0.21 bc	0.23 a	0.27 a

[a]Means followed by the same letter within a column are not significantly different at the 0.05 level of probability using Duncan's New Multiple Range Test.

- Both levels of thinning (Desirable and Acceptable) have yielded significant increases in cumulative diameter growth of superior poletimber trees relative to the unthinned control, but only superior poletimber trees in the Desirable treatment grew more than their inferior poletimber counterparts during the first two years (**table 2**).
- Thus far, cumulative diameter growth has been greater among superior red oak poletimber trees (0.48 and 0.40 inches in the Desirable and Acceptable treatments, respectively). Slightly less growth was observed among superior sweetgum poletimber trees (**table 2**).
- Thinning has significantly affected the bole quality of superior poletimber trees in the Desirable treatment (10.1 new epicormic branches). Comparatively, production of new epicormic branches on superior poletimber trees in the Acceptable treatment has been notably less (**fig. 2**).
- Total number of epicormic branches on superior poletimber trees during the first two years has increased by < 3 branches in the Acceptable treatment, but has increased by > 9 branches in the Desirable treatment (**table 3**).
- Superior red oak poletimber trees in the Acceptable treatment averaged less than five epicormic branches large enough to constitute defects on a small sawlog (**fig. 3a**).
- Sweetgum poletimber trees averaged fewer defect-causing epicormic branches than red oak poletimber trees (**fig. 3b**).

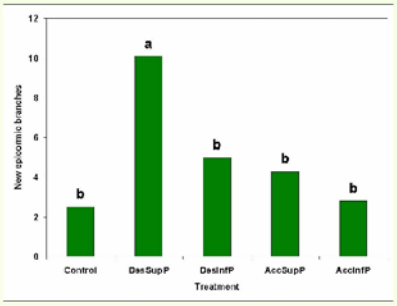

Figure 2—Average number of new epicormic branches produced by residual poletimber trees during the first two years following thinning, by treatment

Table 3—Average total number of epicormic branches on residual poletimber trees at post-harvest and 2 years following thinning, by treatment

	Total Epicormic Branches	
Treatment	Post-harvest	Year 2
	-----number-----	
Control	8.9 a[a]	8.6 a
DesSupP	3.1 a	12.2 a
DesInfP	6.7 a	10.1 a
AccSupP	3.7 a	6.5 a
AccInfP	10.4 a	12.1 a

[a]Means followed by the same letter within a column are not significantly different at the 0.05 level of probability using Duncan's New Multiple Range Test.

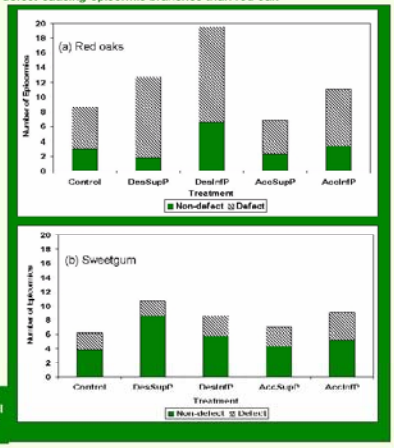

Figure 3—Average number of non-defect and defect causing epicormic branches on residual (a) red oak and (b) sweetgum poletimber trees two years following thinning, by treatment

Conclusions

- It appears that poletimber trees we initially classified as "superior" will yield future sawlogs in the thinned sawtimber stand. Sawtimber production from their inferior poletimber counterparts seems highly unlikely.
- The Desirable treatment has yielded the greatest diameter growth response of the superior poletimber trees, but has also adversely affected the bole quality of these potentially more valuable stems.
- Based on our preliminary results, we have concluded that the Acceptable treatment may provide the best combination of diameter growth and maintenance of bole quality for growing high quality sawtimber from superior poletimber trees, particularly from the potentially more valuable red oaks.