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Thinning & Economics Series Paper III
The Growing Value of Quality Southern Pines - Thinning Series Paper – Dodge County Slash Pine Including the use of two Pine Stumpage Price Scenarios

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Introduction

Many forest landowners in the southeastern U.S. are faced with thinning their pine stands at some point. Thinning is a tool of stand management and is a density regulator, a growth regulator, (Bennett and Jones 1981), and an inventory (tree quality) regulator. As a management tool, thinning is imposed at a time and intensity to optimize future biological (growth rate) and economic (best crop trees remain as inventory in stand) factors.

Among the many decisions a forest landowner has to make when thinning (along with timing and intensity), one can be particularly important. That is, do I keep my best quality trees (tree stems that have no visible defect) for final harvest or thin some of them now? Visible stem defects include, excessive sweep (greater than 3 inches in a 10 feet run up the stem), forks (especially below 17 feet), excessive branching (branch diameters and numbers of branches), ramicorm branching, and/or cankers. Typically the goal of the first thinning is to remove those trees with a visible stem defect that will always be pulpwood and those smaller diameter stems (that also are shorter in height and canopy position) that will not respond to the thinning when compared to the larger diameter, dominant and co-dominant trees in the stand. This paper discerns (1) the pine stand value differences by allowing the best trees to grow after the first thinning versus cutting them in a first thinning, based on one of three old-field planted, fast growing slash and loblolly pine plantations (two slash pine and one loblolly pine study areas) in Georgia and (2) does it still make economic sense to do so considering the recent trend of strong pulpwood prices and softened sawtimber prices (addressed by using two stumpage price scenarios)?

Objectives

(1) Determine diameter, height, volume/tree, volume/acre and tons/acre growth over 4- and 5-year period.
(2) Estimate pulpwood, superpulp, and chip-n-saw value per tree and 100 trees/acre over the study period.
(3) Discern value differences by cutting good trees with a 1st thinning versus their value 2-, 4-, and 5-years later using two stumpage price sets.

Study area

One study area from a collection of one loblolly and two slash pine fertilization old-field planted stands areas in Georgia was used for this paper. The old field planted slash pine study areas were located in Dodge County (age 12- through 17-years-old, thinned at age 13-years, old-field site, Wagram and Troup soils) and Toombs County (8- through 12-years-old, unthinned, old-field site, Tifton soil). The one old-field planted loblolly pine study area was located in Washington County (age 15- through 19-years-old, thinned at age 14-years, old-field site, Orangeburg soil). The Dodge County slash pine study area was used for this paper since we have 12-year old unthinned data as well as 13-, 15-, and 17-year old post thin growth parameter data.

For the purpose of this paper, the unfertilized plots tree growth parameters were used since the NP, NPK, and NPKSMgBCu treatments did not significantly improve growth on any of the three old-field planted loblolly and slash pine study areas over a 4 or 5 year study period. The growth parameters include mean diameter at 4.5 feet above groundline (dbh), total height, total volume/tree, total volume/acre, total tons/acre, mean annual

increment (MAI) pre-thin, periodic annual increment (PAI) post-thin, and merchantable volume/tree (pulpwood with a dbh of 4.6 to 6.6" and superpulp with a dbh of 6.6 through 8.5 to a 3" top outside bark (ob) and chip-n-saw with a dbh >8.5" to a 6" top ob.) are presented in this paper. Pulpwood (PW) trees are either small diameter trees or larger trees with some visible defect that will be hauled typically to pulp and paper mills or to pellet plants. Superpulp (SP) trees have larger diameters than the small diameter PW trees and have no visible defects. These SP trees will be primarily used for pulp with some dimension lumber usage (2"x4"x8's mostly). Chip-n-saw (CNS) trees have no visible stem defects and a larger diameter than SP or PW trees. Dimension lumber (2"x4"x8', 10' and 12's, 2"x6"x8', 10' and 12's, 4"x4"x8's) and pulp chips are the main products from CNS trees and historically have a higher per ton value than PW or SP.

To capture the impacts of various stumpage prices on thinning decisions, Timber Mart South (TM-S) first quarter 2005 (Table 2) and the average of the first through third quarter 2016 Coastal Plain Georgia (Table 3) pine stumpage prices are used in the economic analysis. These two sets of stumpage prices represent different types of market scenarios for timber products in the region. U.S. housing starts peaked in 2005 along with the demand for lumber and structural panels, driving up stumpage prices for sawtimber. As the housing market crashed and the general economy went into crisis in 2008, forest products markets were among the hardest hit. Consequently, sawtimber prices dropped to record low. Pulpwood prices have remained relatively strong due to demand for structural panel products, packaging products and reduced harvests. Despite the recent recovery, pine sawtimber prices in many parts of the South still have not returned to the pre-crisis level yet. The 2005 stumpage price set represents a scenario of standard pulpwood price and high sawtimber price (traditional) while the 2016 stumpage price set represents a scenario of strong pulpwood price and low sawtimber price (current). Third quarter 2005 pine pulpwood (PW) was valued at \$6.70/ton (\$18/cord, \$0.21/ft^3), superpulp (SP; 180% of pine pulpwood price) was \$12/ton (\$32/cord; \$0.37/ft^3), and chip-n-saw (CNS) was \$27/ton (\$72/cord; \$0.84/ft^3). First through third quarter averaged Georgia Coastal Plain 2016 prices were \$15/ton (\$40.20/cord; \$0.47/ft^3) for PW and \$21/ton (\$56.3/cord; \$0.65/ft^3) for CNS.

Old-field Planted Tree and stand growth over time

Average annual total volume per acre and tons per acre growth ranged from 14% for the Dodge County slash pine (4-year increment post-thinning; age 13- through age 17-years) on a moderate fertility old-field to 39% for the Toombs County slash pine on a highly fertile former Vidalia onion field (age 8- through 12-years, pre-thin). The per tree change value can be dramatic in just a four or five year period as well (i.e., from \$1/tree to over \$7/tree in five years at the Dodge County site using the larger PW/SP versus CNS price differences of 2005).

The Dodge County Case – Old-field Slash Pine – Tree Growth

In the Dodge County case, the average slash pine diameter at age 12-years-old, prior to thinning was 6.9 inches and a height of 38.7 feet (Table 1) and a MAI of 7.4 tons/ac/yr prior to thinning. Post-thin (from age 13- through age 17-years) average total tons per acre growth was 25 tons (from 44 tons/acre to 69 tons/acre, Table 1). This is a 57% increase in tons per acre growth in 4 years. Post-thin average pulpwood (PW) and superpulp (SP) volume per tree (to a 3" top outside bark) increased by 73% in 4 years from 6.23 ft^3 at age 13-years to 10.8 ft^3 at age 17-years (Table 1). Mean slash pine dbh reaches chip-n-saw size (greater than 8.5 inches is assumed in this paper, local mill specifications may differ) of 8.8 inches by the end of the 17^{th} growing season with an average height of 53.4 feet (Table 1).

The Dodge County Case – Old-field Slash Pine – Tree Value Growth

A slash pine tree (pre-thin at age 12-years with a dbh of 6.9 inches) would be either a PW tree or a SP tree with a value of \$1.01 or \$1.79 depending on presence/absence of any visible defects at age 12-years-old (as PW or SP) using 2005 prices (Table 2) or \$2.27/tree using 2016 PW prices (Table 3). Post-thin, at age 13-years, average per tree values were \$1.30 (as PW) or \$2.32 (as SP) using 2005 prices (Table 2) or \$2.93/tree using 2016 prices (Table 3). At the end of the 17^{th} growing season the average tree dbh (8.8 inches) reached chip-n-saw size. If those trees that were left in the stand after the first thinning (occurring at age 13-years in this case) had no visual defects and a CNS volume of 8.46 ft^3 then the value per tree would be \$7.09 using 2005 prices (Table 2) or \$5.50/tree

using 2016 prices (Table 3). This post-thin change in value from $1.30 for a pulpwood tree ($2.32 for an SP tree) at age 13-years to a CNS value (assuming no visual defects) is an approximate 3-fold (SP to CNS) to 5.5-fold (PW to CNS) increase in value by age 17-years using 2005 prices (Table 2) and a 1.9-fold increase using 2016 prices (from $2.93/tree to $5.50/tree at age 17-years, Table 3).

Using Table 2 and third quarter 2005 pine stumpage prices, if 100 good quality trees (trees with no visible defect that, if allowed to grow would become higher valued chip-n-saw, sawtimber or poles) per acre were cut in the first thinning (along with a share of defective trees), in this case at age 13-years, the landowner would have received either $130 (@ a PW price) or $232 (@ a SP price) per acre for those 100 trees. If the landowner did not cut these 100 good quality trees per acre with the first thinning then they would have grown into $709 (CNS price) per acre by the end of the 17th growing season. This is a gain of $477 to $579 per acre from ages 13- through 17-years by allowing these 100 good quality trees to grow into the next product class and not cut them in the first thinning.

Using Table 3 and first through third quarter 2016 averaged Georgia Coastal Plain prices, if the same 100 good quality trees per acre (trees with no visible defect that, if allowed to grow would become higher valued chip-n-saw, sawtimber or poles) were cut in the first thinning (along with a share of defective trees), in this case at age 13-years, the landowner would have received $293 per acre for those 100 trees. If the landowner did not cut these 100 good quality trees per acre with the first thinning then they would have grown into $550 (CNS price) per acre by the end of the 17th growing season. This is a gain of $257 per acre from age 13-years through age 17-years by allowing these 100 good quality trees to grow into the next product class and not cut them in the first thinning.

Table 1. Dodge County slash pine growth through age 12-years and from age 13- through age 17-years-old on an old-field site, Wagram and Troup soils. The stand was thinned at age 13-years.

Age (years)	Dbh (inches)	Total height (feet)	Total volume /tree (ft3)	PW/SP[a] volume/tree (ft3)	CNS[b] volume/tree (ft3)	Cubic feet total volume/acre (tons/ac)	MAI/ PAI[c]	Tons/ac/ yr MAI/ PAI
12	6.9	38.7	5.03	4.82	-	2862 (87)	2.77	7.4
13	7.5	42.5	6.43	6.23	-	1465 (44)		
15	8.1	48	8.47	8.26	-	1843 (56)	2.20	6.0
17	8.8	53.4	11.0	10.8	8.46	2272 (69)	2.49	6.5

[a] pulpwood (PW) with a dbh of 4.6 to 6.6" to a 3" top outside bark (ob.) and superpulp (SP) with a dbh of 6.6 through 8.5 to a 3" top ob. (used for 2005 prices). For 2016 prices PW and SP trees were combined for the PW price.

[b] chip-n-saw with a dhh >8.5" to a 6" top ob

[c] MAI = mean annual increment of total volume growth up to 1st volume estimation (where unthinned), PAI = periodic annual increment of total volume in cords/ac/yr (86 ft3 of wood+bark = 1 cord) between measurement periods.

Table 2. Dodge County slash pine value using third quarter 2005 TM-S Georgia pine stumpage prices from age 12-years through age 17-years-old on an old-field site, Wagram and Troup soils. Stand was thinned at age 13-years.

Age (years)	dbh (inches)	Pulpwood $ value/tree		Superpulp $ value/tree		Chip-n-saw $ value/tree
12	6.9	1.01		1.79		-
13	7.5	1.30		2.32		-
15	8.1	1.73		3.08		-
17	8.8	2.26		4.02		7.09

Table 3. Dodge County slash pine value using first through third quarter 2016 TM-S Georgia Coastal Plain prices averaged from age 12-years through age 17-years-old on an old-field site, Wagram and Troup soils. Stand was thinned at age 13-years.

Age (years)	dbh (inches)	PW volume (ft3)	CNS volume (ft3)		Pulpwood $ value/tree		Chip-n-saw $ value/tree
12	6.9	4.82	-		2.27		-
13	7.5	6.23	-		2.93		-
15	8.1	8.26	-		3.88		-
17	8.8	10.8	8.46		5.08		5.50

Summary

Allowing your best trees to grow into the next product class makes economic sense (rather than cutting them in a first thinning) based on 2005 and 2016 TM-S Georgia pine stumpage prices. On good sites, slash pine tree volume growth during the early teen's period can be dramatic. In this case from age 13-years through age 17-years mean slash pine total tons per acre increased by 57% (an average of 14% per year). The 100 quality pines per tree average value increased by 1.9-fold (from $2.93 to $5.50/tree using 2016 prices, Table 3) to 5.5-fold (from $1.30/tree to $7.09/tree using 2005 prices, Table 2) during this same 4 year, post thin period. So why harvest some of your best trees in a first thinning when they can grow to the next product class (in this case from $6.70/ton PW and $12/ton SP to $27/ton CNS value using TM-S Georgia 2005 prices or from $15/ton to $21/ton using TM-S Georgia 2016 prices) during a period of relatively fast wood growth?

This study also shows that price differences between pulpwood (+ superpulp when the market exists) and chip-n-saw, when large (as in 2005), the benefit of keeping the quality trees to continue to grow can be substantial (5.5-fold). Conversely, as the price difference between pulpwood and chip-n-saw narrows (as in the case of using Georgia 2016 prices) the financial benefit of carrying those good quality trees to a second thinning or final harvest and NOT cutting them in a first thinning is lessened but still produces a financial benefit (1.9-fold). The key with thinning is to harvest all those trees that would always be pulpwood (those having a visible stem defect) and the smaller diameter (with lower heights and crown position) trees that would not respond to the thinning like the larger, good stem quality trees when there is a price difference between pulpwood, chip-n-saw and sawtimber.

Literature Cited:

Bennett, F.A. and Jones, E.P. 1981. Thinning and its effect on growth. p. 304-313 in Proc. Symposium on Managed Slash Pine Ecosystems, E.L. Stone, (ed.) School of Forest Research and Conservation, Univ. of FL, Gainesville. 434 p.

Timber Mart South (TM-S) ©. 2005. Third quarter 2005 Georgia average stumpage prices. Warnell School of Forest Resources, University of Georgia, Athens, GA

Timber Mart South (TM-S) ©. 2016. First, second, and third quarter 2016 Georgia Coastal Plain stumpage prices averaged. Warnell School of Forest Resources, University of Georgia, Athens, GA

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