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RELEASE SPEEDS GROWTH OF BOTTOMLAND HARDWOODS

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This article reports early changes in growth rate brought about by partial cuttings in two bottomland hardwood stands. Better information will be forthcoming as re-measurements are made over longer periods. Indications are, however, that the acceleration of growth caused by release is large enough to be a vital factor in planning future cuts.

Release in Mixed Hardwoods

One stand of timber from which information was gathered lies near Vance, Mississippi. On the higher land, or "ridges", the most common trees are cherrybark oak, cow oak, Delta post oak, white ash, hickory, and blackgum. On the lower land or "flats", sweetgum, bottomland red oak, willow oak, soft elm, hackberry, green ash, and bitter pecan are most common. Cutting in these stands was done as part of a cooperative study being made under the supervision of the Delta Branch of the Southern Forest Experiment Station.

Before cutting, the volume of timber in logs 14 inches and larger in diameter at breast height averaged 2,900 board feet, Doyle scale, per acre. Characteristically, the forest was made up of irregular groups of sapling, pole, and saw-timber trees (18 inches d.b.h. and up). The basal area averaged 105 sq. ft. per acre in trees of all kinds, qualities, and sizes from saplings to large saw-timber. There were 125 trees per acre six inches d.b.h. and larger.

The 1947 cut removed 1,500 board feet per acre, or 25 feet of basal area. Some of the timber was mature or over-mature, but the bulk of the volume came from an improvement cut in smaller saw-timber trees that were of poor form or vigor, had serious defects, or were competing with better trees. Since many trees that should have been removed to benefit the stand were unmerchantable for standard hardwood lumber, thinning and spacing were incidental considerations--as they will be in most first improvement cuts in this sort of timber.

In November 1949, increment borings were taken from 200 trees on sample strips through a quarter-section that was logged in June and July 1947. The sample trees were divided into four release classes--heavy, medium, light, and no release. The differences between these classes varied with the position of the trees in the stand. For overtopped trees, light release removed less than one-third of the effective

competition, medium release up to one-half, and heavy release more than half. Among intermediate or co-dominant trees, light release took away one-fourth to one-half the competition, medium up to three-fourths, and heavy release over three-fourths. For dominant trees, light release removed up to two-thirds of the competition, while medium release took greater amounts. No heavy release was recognized for dominant trees.

In evaluating release, removal of over-topping trees was given more weight than elimination of competition from the side. Culls and trees completely overtopped for so long that they gave no reasonable promise of recovery were not included in the sample.

Slightly less than two-thirds of all sampled trees six inches d.b.h. and larger were found to have received some release. Light release, however, did not prove appreciably more effective than no release, and data for these two classes were therefore combined. Only 45 percent of all trees sampled received medium or heavy release.

Effect of release.--For trees that received heavy release, average rate of diameter growth has been 26 percent higher in the two years since the cut than in the ten years before (Table 1). Trees with medium release have increased only one percent in average rate of growth, but it is possible that these trees--especially the larger ones--need more than two years to make their full response.

Trees that had light or no release have decreased 17 percent in average rate of diameter growth. This probably represents the slowing down that would have taken place throughout the stand if no cut had been made. Since the average decline in growth rate for all the trees sampled regardless of release was only four percent, it is apparent that the cutting has served to hold loss in rate of growth comparatively low.

Practically all of the cut was in medium and large saw-timber trees. If all sizes of logs had been merchantable, many more small and medium trees would have been released. As small trees are most responsive to release in stands like this, the diameter growth of the entire stand would have been speeded considerably.

Release in Cottonwood

Release of cottonwood was studied in a stand on the Mississippi River batture near Vicksburg, Mississippi. The tract was a 200-acre glade of excellent timber, running 12,000 to 20,000 board feet, Doyle scale, per acre. In the spring of 1948, the stand was 55 years old. Since diameter growth had dropped sharply in 1936 and continued a gradual decline thereafter, the stand was judged to be about 12 years over-mature.

Such stands are usually clear-cut to arbitrary diameter limits. However, the owner, Mr. W. R. P. Taylor of Eagle Lake, decided to try a selective cutting. Marking was done by the Anderson-Tully Company of Memphis in collaboration with the Delta Branch Station.

The marked trees were cut just before the start of the 1948 growing season. After logging, six sample plots of one-fifth acre each were installed along a line through the most heavily timbered part of the glade. An inventory showed that 10,830 board feet per acre of large cottonwood had been removed from these plots. The remaining volume in good cottonwood was 8,930 board feet per acre. Also left behind were 530 feet per acre of poor-quality small cottonwood and other hardwoods, and 200 feet of good-quality hardwoods a little too small for commercial saw-logs. The original stand had 114 square feet of basal area per acre. Of the 69 square feet left after logging, 28 were in poor trees and outright culls which offered little or no competition to the better trees. All of the good trees appeared to have received either heavy or medium release.

As part of the inventory, and before increment borings were taken, the trees on the six plots were classed as being in either good or poor vigor. The estimates of vigor were based on crown size, apparent health, and the appearance of the bark. A total of 22 merchantable trees of good quality remained on the plots, plus a few stems not worth cutting commercially. Two of the 22 trees had been marked for cutting but had been missed. Of the remaining 20, 14 were classed as of good vigor and 6 were classed as being in poor vigor.

Diameter growth before and after cutting is summarized in Table 2. The trees that had been classed as being in good vigor were growing 50 percent faster in 1948 and 1949 than in the ten years before the cut. The larger trees in this group responded better--or at least faster--than the small ones. The trees that had been judged to be of poor vigor have so far shown an average increase in rate of growth of only 15 percent. The 1949 borings showed, however, that only three of the "poor vigor" trees have had an unsatisfactory growth rate since release. The growth rate of the other three "poor vigor" trees--and of the 14 "good" trees--makes them an excellent investment.

The two marked trees left by the loggers have declined greatly in rate of diameter growth. Although they are of very poor vigor and not necessarily representative of all the marked trees, they indicate what might have been expected of a substantial portion of the trees that were removed.

These data show that the growth rate of vigorous trees accelerates immediately and substantially. If high growth rates continue, they would justify changing harvesting methods in similar stands of cottonwood from a single cut to a system of two or more cuts about 10 years apart.

The most startling acceleration of growth rate following release on these plots was an increase of 181 percent in four small hardwoods--a sweet pecan, a sycamore, a green ash, and a hackberry. While they varied widely, their average diameter growth increased from 2.1 inches in the 10 years before cutting to a rate of 5.9 inches per 10 years thereafter. The trees are desirable growing stock but were only 10 to 18 inches in diameter when the cut was made. All received heavy release. Their response is gratifying, for such trees will form the stand after the cottonwoods are gone.

Table 1.--Diameter growth before and after cutting in a stand of bottomland hardwoods.

d.b.h. (inches)	Trees in sample	Trees per acre 1/	Average d.b.h. growth 1938-1947	Ratio of 1948 - 1949 rate to 1938 - 1947 rate
	--Number--		Inches	Percent
		HEAVY RELEASE		
6-10	13	4.3	2.1	131
12-16	24	4.0	1.9	122
18+	5	0.3	2.8	107
Total or average	42	8.6	2.1	126
		MEDIUM RELEASE		
6-10	15	5.0	2.3	101
12-16	17	2.8	2.8	105
18+	17	1.1	2.6	89
Total or average	49	8.9	2.6	101
		LIGHT AND NO RELEASE		
6-10	51	17.0	2.1	82
12-16	35	5.8	2.8	84
18+	23	1.5	2.4	87
Total or average	109	24.3	2.4	83
		ALL DEGREES OF RELEASE		
6-10	79	26.3	2.1	95
12-16	76	12.6	2.5	101
18+	45	2.9	2.5	90
Total or average	200	41.8	2.3	96

1/ Total trees per acre excluding culls and hopelessly suppressed trees. On the sample strips the stand was considerably lighter than on the tract as a whole.

Table 2.--Diameter growth in large cottonwood following release.

Tree d.b.h. (inches)	Trees in sample	Average increase 1938-47 1/	Average d.b.h. April 1, 1948	Average d.b.h. Nov. 1, 1949	10-year expansion of 1948-49 average d.b.h. increase	Growth rate increase
	No.	Inches	Inches	Inches	Inches	Percent
		TREES CLASSED AS OF GOOD VIGOR				
20-30	7	2.8	26.8	27.5	3.5	+25
30+	7	3.7	30.8	32.0	6.0	+62
20+	14	3.2	28.8	29.8	4.8	+50
		TREES CLASSED AS OF POOR VIGOR				
20-30	6	2.6	22.9	23.5	3.0	+15
		MARKED TREES LEFT				
20-30	2	3.0	22.8	23.1	1.5	-50

1/ Includes a 7 percent increase to take care of bark growth.