

## Diameter Growth of Southern Bottomland Hardwoods

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THERE is very little published information on average rates of diameter growth of southern bottomland hardwoods. Probably the best information of this kind is given by Winters, Putnam, and Eldredge,<sup>2</sup> who summarize forest survey data on average rates of diameter growth for 4 size classes and 20 species or species groups (including pine and cypress), and for all species together by 5 forest conditions. Diameter growth in 10 years was found to vary from 0.90 inch for cypress 30 or more inches in diameter breast high to 4.34 inches for cottonwood 6 to 12 inches in diameter. The average for all species, sizes, and conditions was about 2.0 inches, and the average for all second growth of sawlog size was about 2.7 inches.

Information on diameter growth of common bottomland hardwoods in mixed stands in the Yazoo-Mississippi Delta region has recently been obtained in connection with commercial improvement cuttings on the Delta Experimental Forest,

Stoneville, Miss. The stands in which the study was made were heavily logged about 30 years ago, leaving trees of all sizes up to 40 inches d.b.h. and all ages up to at least 300 years old. Ragged, irregular, and badly understocked with high-quality trees of sawlog size, the stands are typical of thousands of acres of mixed cutover forest on fair to good sites in the Delta bottomlands of Mississippi, Louisiana, and Arkansas.

During improvement cuttings made in 1943 for slack cooperage and sawtimber, average radial growth inside bark in the last 5 and 10 years was measured at the top of the first log of 350 trees of 12 species. Growth at the end of the butt log was converted to growth at breast height, outside bark, by applying the percentage or ratio that existed between the top diameter of the butt log, inside bark, and the diameter breast high, outside bark (i.e., the Girard form class). It was assumed that this ratio would be the same 5 and 10 years ago as in 1943—an assumption borne out by the fact that for most species this ratio was constant for all d.b.h. classes. Where the ratio was not constant, it decreased (or taper increased) with increasing d.b.h., and here the assumption of a constant ratio resulted in slightly underestimating the recent d.b.h. growth.

Radial growth was measured on from 2 to 4

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<sup>2</sup>Winters, R. K., J. A. Putnam, and I. F. Eldredge. Forest resources of the North-Louisiana Delta. U. S. Dept. Agric. Misc. Pub. 309. 49 pp., illus. 1938.

radii on each log, depending on the eccentricity of the cross section. Circular cross sections were scarce. Cedar elm had the most eccentric cross sections, usually triangular, nearly square, or deeply and irregularly scalloped. Cedar elm also has very indistinct annual rings, and the computed average growth rate of this species is accordingly subject to considerable error.

Table 1 summarizes the average d.b.h. growth of mature trees of the 12 most common species cut into logs. The data are abundant only for sugarberry, which is represented by 160 trees, but on the basis of observation of growth rate on many unmeasured logs the figures are considered representative for the other species listed.

Except for sugarberry, cedar elm, and water hickory the growth rates shown in the first column of Table 1 represent only trees marked for improvement cutting. Many of the marked American elms were wolf trees, which partly accounts for the high growth rate shown. On the other hand, many of the marked Nuttall and willow oaks classed as mature were on the verge of overmaturity and well beyond the age and size at which these species make their most rapid growth. On the whole, mature (but not overmature) trees marked to be cut should have

about the same growth rate as mature trees marked to be retained, since the marking of mature trees was based largely on quality and not on growth rate. In species where comparisons could be made, overmature trees were found to be growing about 75 percent as fast as mature trees. The average growth rate of green ash cut for improvement is unusually low because most ashes that were cut were almost dead.

Since for various reasons the growth rates shown in the first column of Table 1 do not accurately portray the growth that is likely to be obtained from mature, dominant crop trees in well-stocked managed stands, estimates of this growth are given in the last column. These estimates are based on all available data and observations made on 1,200 acres covered to date with improvement cuttings on the Delta Experimental Forest. The figures are applicable only to reasonably well-formed dominant trees—neither wolf trees nor badly crowded trees. Used in conjunction with data on average quality and market value, these estimates of growth rate have confirmed the grouping of species in the marking rules used on the forest. Nuttall oak, willow oak, cottonwood, green ash, and sweetgum are the favored species among those listed.

TABLE 1.—AVERAGE 10-YEAR D.B.H. GROWTH OF THE MOST COMMON BOTTOMLAND HARDWOODS OF SAWLOG SIZE AT STONEVILLE, MISS.

Species (Local name in parentheses)	Mature trees cut in improvement cutting		Mature dominant crop trees in a well-stocked managed stand
	Average	Maximum (approx.)	Probable average
	<i>Inches</i>		
Eastern cottonwood (cottonwood).....	..... <sup>1</sup>	6	3.5-4.0
Nuttall oak (red oak).....	2.3	6	3.5-4.0
Willow oak (red or pin oak).....	2.3	6	3.5-4.0
American elm (white or soft elm).....	3.3	6	3.0-3.5
Honeylocust (locust).....	..... <sup>1</sup>	5	3.0-3.5
Red maple (maple).....	2.5	4	3.0-3.5
Overcup oak (white oak).....	2.4	4	2.5-3.0
Sweetgum (sweet, red, or sap gum).....	1.9 <sup>2</sup>	3 <sup>2</sup>	2.5-3.0
Green ash (ash).....	1.0 <sup>2</sup>	2 <sup>2</sup>	2.5-3.0
Sugarberry (hackberry).....	2.0 <sup>3,4</sup>	4 <sup>3</sup>	2.0-2.5
Cedar elm (rock elm).....	2.1 <sup>3</sup>	3 <sup>3</sup>	2.0-2.5
Water hickory (bitter pecan).....	2.0 <sup>3</sup>	3 <sup>3</sup>	2.0-2.5

<sup>1</sup>Too few trees for a representative average.

<sup>2</sup>Based entirely on overmature trees since very few mature trees were cut.

<sup>3</sup>All merchantable trees cut. In all other species only marked trees were cut, and only very poor trees were marked.

<sup>4</sup>For trees 21 inches d.b.h. and larger. Trees 13-20 inches d.b.h. averaged only 1.5 inches.