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COPPICE GROWTH AND DEVELOPMENT OF THREE BOTTOMLAND HARDWOODS THROUGH FOUR YEARS

Harvey E. Kennedy, Jr., and Roger M. Krinard

USDA Forest Service
Southern Hardwoods Laboratory
P. O. Box 227
Stoneville, Mississippi 38776

World-wide demand for wood products is increasing, along with demand for recreational and watershed uses of forest lands. While these demands are increasing, large areas of prime hardwood and pine forest lands are being cleared for agriculture, urban and industrial development, highways, and utility rights of way. Hardwood plantations, however, can provide great quantities of biomass. This paper reports quantitative 4-year data on coppice growth and development of three species, sweetgum (SG), sycamore (SY), and green ash (GA), following clearcutting of 7-year-old plantings. There were three spacings: 2x8, 3x8, and 4x8 feet.

Materials and Methods

The test site is in a coastal plains minor stream bottom in southeastern Arkansas. There are three replications of each species at each spacing in a completely random design, a total of 27 plots. Each species-spacing plot consists of 169 trees planted in a rectangular grid of 13 by 13 rows. The interior 5 by 5 rows were designated as permanent remeasurement rows, with the outer four rows serving as a buffer. The plantings were clearcut and allowed to coppice when mean annual increment (MAI) peaked after the 7th year.

Following each growing season after clearcutting, sprouts from five stumps in each plot were sampled. Stumps were systematically selected by starting in the southeast corner on the interior two border rows, and sampling the first five live tree stumps. Each successive year started where the previous year ended, progressively working around a plot. All sprouts in a clump were cut and counted. Leaves were then removed from the two largest sprouts per clump and leafy and woody material weights obtained separately for the two sprouts. The remaining sprouts were weighed with leaves intact. Total heights and diameters 1 inch above severance point were recorded. Leafy and woody material weights and ratios for sprouts where leaves were not removed were calculated using ratios obtained from sprouts on which the leaves had been removed. Survival was calculated from stumps in the interior 5x5 permanent measurement rows. Yearly analyses were made of total weight, stem weight, leaf weight, height, diameter, and survival at the 0.05 level, with species means compared by Duncan's multiple range test.

Summary and Conclusions

Species influenced stem, leaf, and total weight each year while spacing had no influence on weight (table 1). For all three weight variables, GA was always lowest for the 1st 3 years, but did not differ from SY in the 4th year. For both stem and total weight, SY was greatest in the 1st year, SG in the 3rd year, and the two species did not differ in the 2nd and 4th years. SY and SG also did not differ in leaf weight the 1st and 2nd years, while SG had greater leaf weight the 3rd and 4th years. There was no interaction between spacings and species. The low weights and small measurements of other variables of GA were mainly due to extremely heavy deer browsing all 4 years.

Table 1.--Means of some tree variables after four growing seasons

	Variable				
Spacing	Stem weight	Leaf weight	Height	Diameter	Survival
ft	lb/ac	lb/ac	ft	in	%
			Sweetgum		
2x8	9,873	2,055	11.6	1.2	83
3x8	7,772	1,440	11.2	1.3	89
4x8	9,576	1,681	14.3	1.9	97
			Sycamore		
2x8	10,714	1,474	11.2	1.1	89
3x8	3,884	571	8.6	0.9	97
4x8	4,979	891	13.4	1.4	88
			Green ash		
2x8	4,825	751	4.2	0.6	93
3x8	1,821	464	4.8	0.6	79
4x8	4,281	660	6.9	0.9	95

Spacing did not influence percentage weight in leaves, or conversely, percentage weight in stems, any of the 4 years except as an interaction the 1st year where percentage weight was linearly related to spacing for SG but not the other two species. For the 2nd through 4th years, GA had the highest percentage in leaves (or lowest percentage in stems) while SG and SY did not differ.

There were no differences in survival by species or spacing over the 4 years; overall survival was 90 percent for the 4 years.

Average total height did not differ between SG and SY all 4 years, and both were significantly taller than GA. Again, deer browsing kept down height of GA.

For average diameters, SY was largest the 1st year, SY and SG did not differ the 2nd year, and SG was largest the 3rd and 4th years. GA was always the smallest.

Spacing influenced both diameter and height growth. The linear component was significant all 4 years with maximum height and diameter at the widest spacing. However, the lack of fit component was significant 3 of 4 years with height and 2 of 4 years with diameter because 3x8 feet spacing values were numerically less than 2x8 feet spacing values. There is no logical explanation for this happening.

Results show that all three species can be coppiced at these spacings and have good survival. Total dry weights, stems plus leaves, of 2 to 6 dry tons per acre after four growing seasons may be expected from SG and SY (green weights would be a little more than double the dry weights). Height growth of approximately 3 feet per year appear average for SG and SY. GA may have performed as well as the other two species without the heavy deer browsing, but bottomland sites are good deer habitats, and species preference for browsing may need to be considered in coppice regeneration.