Fertilizer Improves Poplar Growth

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Increasing demand for hardwood timber has prompted land managers to consider planting valuable hardwoods such as yellow-poplar on sites that are marginal for its production. The eroded soils in the Silty Uplands of Mississippi are good examples of such sites. While many are well suited for the growth of pine, most are presently too infertile and moisture-deficient for rapid hardwood growth. Application of fertilizer in plantations described in this paper improved the growth of yellow-poplar in this area.

In 1967 the Southern Hardwoods Laboratory, Greif Brothers Cooperage Company, and Anderson-Tully Lumber Company initiated cooperative fertilizer experiments in four yellow-poplar plantations in the vicinity of Vicksburg, Mississippi. All plantations were on the eroded phase of the Memphis soil series. Since yellow-poplar commonly occurs on the more productive sites of the Silty Uplands, it was thought that fertilization might make its production feasible on eroded soils of the area.

Plantations were established in 1964 (Site A), 1965 (Site B), 1967 (Site C), and 1968 (Site D). In May of 1967 and 1968, subsurface applications of 1,000 pounds of 13-13-13 fertilizer were made on Sites A, B, and C. In 1967, 0.58 pound of fertilizer was placed at the bottom of a 20-inch hole, 12 inches from each tree. In 1968 the same quantity of fertilizer was placed at the midpoint of a 20-inch column of partially decomposed sawdust in a hole adjacent to each tree. On Site D the fertilizer was broadcast in the spring of 1969 and incorporated by disking.

Height growth after treatment is shown in table 1. Fertilizer did not significantly (0.05 level) improve growth during the 1967 growing season. The lack of response during the first year may have been caused by placement of fertilizer below the depth of most feeder roots. The second application was at a depth of 8 to 10 inches, and during the next growing season fertilized trees produced 62 percent and 43 percent more height than control trees on Sites A and B, respectively. On Site B during 1969, fertilized trees grew 125 percent more than unfertilized trees.

Differences in growth due to treatment were not statistically significant in 1969 on Site A, which supports the oldest plantation. A broadcast application of fertilizer (Site D) resulted in a significant height increase the first season after treatment. Even though the difference was slight, it is important because a first-year response was not observed with subsurface application.

Over the 3-year period (1967-69) unfertilized trees on Site A grew 7.3 feet in height, compared to 10.5 feet for fertilized trees. Thus, treatment caused a 44-percent increase in height growth. On Site B growth of controls was 6.3 feet and that of fertilized trees was 8.8 feet. Sites A and B are on gently sloping eroded ridges. Site C has about the same slope, but it is slightly off the ridgetop and has more topsoil than A and B. Yellow-poplar did not respond to fertilizer on Site C, but growth of all trees was as much or more than that of fertilized trees on Sites A and B. The deeper surface soil of Site C probably makes it less nutrient-deficient than the other sites tested. Observations in the Silty Uplands have indicated that surface soil depth has a marked influence on the growth and vigor of yellow-poplar. The relationship between soil depth and fertility is probably associated with humus removal by erosion. In general, the surface 2 to 5 inches of a Memphis soil contains several times more organic matter than is found at greater depths. Since elements such as nitrogen and phosphorus are made available as organic matter decomposes, loss of the surface few inches can significantly reduce soil fertility.

The experiments show that fertilizing has some potential for improving eroded sites in the Silty Uplands. Since these sites are dry, maximum hardwood growth probably will not be achieved with fertilizer alone. The combined effect of fertilizing and increasing the supply of soil moisture should be impressive.

Table 1. Effect of fertilization on height growth of yellow-poplar.

Site	Treatment	1967 Growth	1967 Gain	1968 Growth	1968 Gain	1969 Growth	1969 Gain	1967-1969 Growth	1967-1969 Gain
		Ft.	Pct.	Ft.	Pct.	Ft.	Pct.	Ft.	Pct.
A	Control	1.7		3.1		2.5		7.3	
	Fertilized	1.8	6	5.0	62	3.7	48	10.5	44
B	Control	2.2		2.8		1.2		6.3	
	Fertilized	2.1	--	4.0	43	2.7	125	8.8	40
C	Control	1.3		4.1		5.1		10.4	
	Fertilized	1.5	15	4.4	7	5.3	4	11.2	8
D	Control	--		--		4.9[1/]		--	
	Fertilized	--	--	--	--	5.3	8	--	--

1/ Measurements for 1969 growing season only.

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