

A Look At An 11-Year-Old Hardwood Plantation

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Accelerating demand for hardwoods in the Southeast has stimulated interest in planting the more valuable species. Because hardwood planting experience is limited in this region, a look at an 11-year-old plantation may be helpful to those considering a hardwood planting program.

Cherry-bark, Shumard, and

swamp chestnut oaks, yellow poplar, and loblolly pine were each hand-planted in six 0.4-acre plots (for a total of 30 plots on 12 acres) in February 1956 on the Santee Experimental Forest, located in Berkeley County, South Carolina. All merchantable saw-timber, largely hardwood, had been logged from the study area which was considered

fairly typical of mixed bottom-land hardwood sites found along coastal plain streams and small rivers. Soils included Coxville loam, Bayboro clay loam, and Chastain very fine sandy loam. The only site preparation was the deadening of residual cull hardwoods with a low volatile ester of 2, 4, 5-T in oil.

Survival and total height of the planted stock at five years were not outstanding, but neither could the planting be called a failure. Except for cherry-bark oak, all species had over 50 per cent survival. Among the hardwoods, swamp chestnut oak looked particularly promising, with nearly 75 per cent survival and an average height of eight feet. Loblolly pine and yellow poplar had attained average heights of 14 and eight feet, respectively, whereas cherry-bark and Shumard oaks averaged only four feet.

Eleven-Year Results

At age 11, we remeasured the planted trees and collected data on crown position (Table 1). Loblolly pine had only 43 per cent survival, but averaged 36 feet in height and 84 percent were either dominants or co-dominants in the stand. For hardwoods, the results were more disappointing. Yellow poplar was lowest in survival but had the best

Table 1.—Performance of planted species at eleven years

Species	Survival	Average Height	Dominants and Co-dominants
	(Per-cent)	(Feet)	(Per-cent)
Yellow poplar	32	21	39
Cherry-bark oak	33	10	4
Shumard oak	54	12	6
Swamp chestnut oak	75	14	5
Loblolly pine	43	36	84

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FIGURE 1.—A typical yellow poplar plot. Volunteer loblolly pine (left) and ash (right center) are growing much faster than the planted yellow poplar (held in hand).

growth; its stems averaged 21 feet in height and 39 per cent were dominants or co-dominants in the canopy. Swamp chestnut oak had very good survival (75 per cent), but its height growth, although better than the other oaks, resulted in only five per cent of the survivors being in the dominant and co-dominant crown classes after 11 years. Neither survival nor height looked very good for cherry-bark oak, and only 4 per cent were in the upper canopy levels. Shumard oak had tolerable survival, but relatively poor growth and a poor expression of dominance. Because the planted hardwood species were obviously not dominating the site, what were the competitors and how well were they doing?

Volunteer Vegetation

The volunteer vegetation on the planted site may be characterized by its large numbers, some 5400 per acre (Table 2). Although competition from this volunteer vegetation is undoubtedly one of the reasons for the poor showing of hardwood plantings, it is gratifying to see that nearly 1800 stems per acre are desirable species and 630 are 1.5 inches d.b.h. and larger. Sweet gum, loblolly pine, and yellow poplar account for 500 of the larger stems, and overwhelmingly dominate the oak plots and all but one yellow poplar plot. Most of the stems in the class listed as "other species" (Table 2) are non-desirable shrubs, such as wax myrtle, or shrub-like trees, such as dogwood and ironwood. These are no longer offering serious competition to desirable stems in the larger size classes, but continue to

Table 2.—Composition of volunteer vegetation

Species	Stems per acre		Stems per acre ≥ 1.5 inches d.b.h.	
	(Num- ber)	(Per- cent)	(Num- ber)	(Per- cent)
Loblolly pine	180	3	170	14
Sweet gum	440	9	260	21
Yellow poplar	180	3	70	6
Ash	740	14	60	5
Red maple	110	2	30	2
Black gum	60	1	10	1
Red oak	60	1	20	1
Swamp chestnut oak	20	Negl.	10	1
Total				
Desirable	1790	33	630	51
Other Species	3640	67	610	49
Total	5430	100	1240	100

hinder both planted and volunteer stems less than 1.5 inches d.b.h.

Volunteers Compared With Planted Trees

Because much of the volunteer vegetation consisted of rapidly growing, desirable species, we decided to

compare their performance with planted species on their respective plots (Table 3). Desirable volunteers tended to be more abundant and larger than the planted stock, with the exception of loblolly pine. The pine dominated on its plots and was

Table 3.—Comparison of planted species with desirable vegetation volunteering on plot

Species Planted	Stems per acre		Stems per acre ≥ 1.5 inches d.b.h.		Average d.b.h.	
	Planted Trees	Desirable ¹ Volunteers	Planted Trees	Desirable ¹ Volunteers	Planted Trees	Desirable ¹ Volunteers
			(Number)		(Inches)	
Yellow poplar	210	1120	130	500	2.4	2.7
Cherry-bark oak	230	2040	10	800	0.6	2.4
Shumard oak	360	1780	20	560	0.7	3.4
Swamp chestnut oak	330	1980	50	770	1.1	3.7
Loblolly pine	290	1300	290	410	5.8	2.1

¹Includes all species shown as desirable volunteers in Table 2.



FIGURE 2.—Planted yellow poplar outgrew its competition on this plot and now dominates plot.

over twice as large as the more numerous volunteers. And although generally poorer on most plots (Fig. 1), yellow poplar made an excellent showing and actually dominated on one plot (Fig. 2). All oak plantings made rather poor development com-

pared with the volunteers. Only 18 percent of all planted hardwood trees were over 1.5 inches d.b.h. at 11 years, whereas 38 per cent of their associated volunteers were in this larger size class. Due mainly to the rapid growth of natural loblolly

pine, sweet gum, and yellow poplar, the average d.b.h. of volunteers was almost three times that of planted hardwoods (Fig. 3). Conversely, all of the surviving planted pine was over 1.5 inches d.b.h. while only 32 per cent of its associated volunteers had grown to this size.

Conclusions

Do these results mean that hardwood plantations have little place in the regeneration of hardwoods in the Carolina coastal plain? Not necessarily. We do think, however, that a single, pre-planting site preparation treatment which may be successful for loblolly pine will not be sufficient for most hardwood plantings on these sites. Sweet gum, which did very well as a competitor, may be an exception. In another study on a similar site, planted sweet gum at five years was overtopping most of its competing vegetation¹. Slower-growing hardwoods, especially oaks, will need more help than this if they are to overcome their competition. Several cultivations or cleanings after planting (possibly using selective herbicides) will be necessary to prevent a jungle of volunteer vegetation from taking over the site and smothering the planted seedlings. In many cases (perhaps most) more gains may be made by encouraging natural reproduction of desirable species. But in certain situations the lack of desirable reproduction or desire for species conversion will necessitate planting, and here you must be prepared to spend money for intensive care of the planted seedlings.

¹Stubbs, Jack. 1963. Survival and growth of sweet gum, Shumard oak, and spruce pine planted on a creek bottom site in the Carolina coastal plain. *J. Forest.* 61:386-388.



FIGURE 3.—An extreme example of a volunteer cherry-bark oak (left) outgrowing a planted cherry-bark oak (right).

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