Tall yellow-poplar seedlings still three years ahead of others

by
David T. Funk,[1] G. A. Limstrom,[2] and Paul R. Laidly[3]

Sixteen years after outplanting in southeastern Ohio, yellow-poplar seedlings with original top length over IS inches have outgrown those that were less than 10 inches long. The tall seedlings survived better and produced trees with greater height and diameter and better form. They have consistently reached a given height 3 years in advance of the short seedlings.

In the nursery bed, yellow-poplar *(Liriodendron tulipifera L.)* seedlings are commonly grouped into two rather distinct size classes. Sometimes more than half the year-old seedlings from one seedlot are less than 8 inches tall while perhaps 10 percent are 15 inches tall or taller. A reasonable explanation for at least part of the height-growth difference is that the tall seedlings result from advantageous cross-pollination[1] (4). In young plantations in the Ohio Valley, we have found that large yellow poplar seedlings survive and grow better than small ones (5, 3).

A number of authors have cited the advantages of using large planting stock, but most describe greater survival and growth only in young plantations (4 years old or less). The "record'"for hardwoods seems to be Clausen's (2) report of the distinct advantage of large seedlings of two birch species in a 9-year-old Wisconsin plantation. lie found that survival, height, and diameter of both *Betula pubescens* Ehrh. and *B. pendula* Roth were greatest for the large grade of planting stock, less for the medium, and poorest for the small grade. Among conifers, Clark and Phares (1) reported that larger grade shortleaf pine *(pines echinata* Mill.) planting stock produced greater cubic volume and fence post yields in 20-year-old plantations in Indiana and Missouri than small stock. In this note, we report the continuing advantage of tall over short seedlings in a 16-year-old yellow-poplar plantation in southeastern Ohio.

The Study

Planting stock or this study was grown in the Ohio Division of Forestry Nursery at Marietta from seed collected from four good stands in southeastern Ohio. Five-tree plots for each source and for each of two seedling size were replicated three times in a split-block design. To avoid creating a possible competitive advantage, large and small seedlings were planted in separate plots.

After culling, run-of-the-bed seedlings were divided into two classes: top length greater than 15 inches and top length less than 10 inches. Seedlings between 10 and 15 inches long were not used. The tall seedlings probably averaged 16 to 18 inches in top length and about 1/3 -inch root-collar caliper: the short seedlings were about 5 or 6 inches long and 1/5-inch caliper (these dimensions are estimated from measurement of other seedlings in the same lot).

Seedling roots were pruned to about 8 inches before planting. The tree were planted in April 1956 with a mattock on an east-facing slope, part of an old field in Noble County, Ohio.[4] No site preparation was necessary before planting. but we have since cut the few invading hardwoods before they began to compete. European black alder *(Alnus glutinosa (L.)* (Gaertn) seedlings were planted on the plot boundaries in 1962, 7 years after the yellow-poplar.

Results

After 16 years, in February 1972. the trees that grew from large stock were still larger than those front small stock (table 1). Variation in both height and diameter due to planting stock size was highly significant: seed source had no effect. A consistently larger percentage of straight trees occurred in the tall seedling groups: this could lead to an important advantage in sawtimber quality over the next 30 to 40 years.

The growth cures for short and tall seedlings are similar except that the tall seedlings consistently attain a given height 3 years ahead of the short ones.

We fitted a forth of the Gompertz equation to the height/age data for the two groups of seedlings to predict height through age 60 (fig. 1). Our assumptions maintain the 3-year height advantage of the tall seedlings into advanced age

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1 Principal plant geneticist. Forestry sciences laboratory, North Central Forest Experiment Station, USDA Forest service, Carbondale, Ill. (maintained in cooperation with Southern Illinois University).
2 Formerly research forester with the Central States Forest Experimentation, Columbus, Ohio, now retired.
3 Mathematical statistician, North Central Forest Experiment Station, USDA Forest Service, St. Paul, Minn. (maintained in cooperation with the University of Minnesota).

classes, even though the differences in predicted height became slight.

Of course, we cannot he certain that the growth of the two groups of trees will continue to follow the predicted curves, but at present the equations realistically describe the initial differences in height between the two groups and their existing growth pattern.

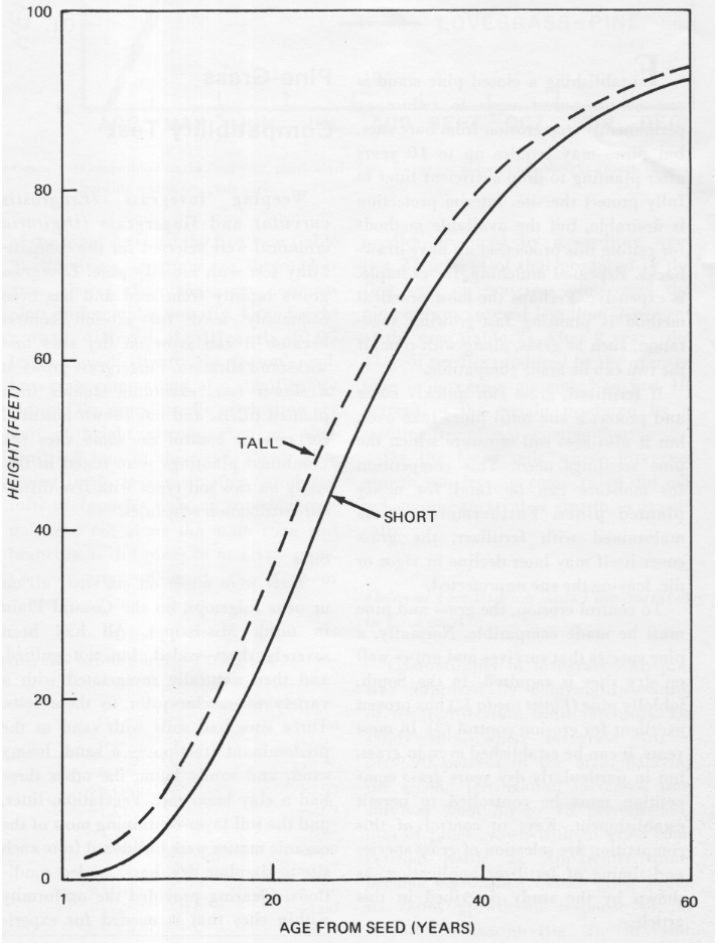
Planting tall yellow-poplar seedlings rather than short ones increases the "apparent site index" of this plantation by 2.5 feet at age 30. We assumed that a pulpwood harvest would he feasible when the trees were fi0 feet tall or a sawtimber harvest at 90 feet. The tall seedlings would he ready for pulpwood and sawtimber harvest at ages 30 and 51 respectively; the short seedlings lag 3 years behind in each case. Lundgren and King (6) point out that reducing rotation age by 3 years could justify a moderate increase in establishment cost under most assumed combinations of product value, site quality, and interest rate. A reduced establishment period and improvement in form resulting front use of large planting stock might be additional bonuses.

TABLE 1.—*Performance of short and tall yellow-poplar seedlings 16 years after planting*

Ohio seed source	Height		Diameter		Straight log[1]		Survival	
	Short	Tall	Short	Tall	Short	Tall	Short	Tall
	Feet		*Inches*		*Percent*		*Percent*	
Marietta	18.6	26.5	1.96	3.43	18	33	73	100
Athens (H)	18.1	25.3	1.70	2.63	19	47	73	100
Zaleski	21.8	27.5	2.26	3.18	42	58	93	93
Athens (G)	18.6	27.7	2.01	3.27	24	53	87	100
Mean	19.3	26.7	1.98	3.13	26	48	82	98

[1]Proportion of trees with a straight lower bole, up to at least 17 feet height.

Figure 1.—Height growth curves for tall and short yellow-poplar seedlings.



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