Fertilization of Tennessee Valley pines and hardwoods: response during the second 5 years after application

by

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Previous work with fertilization of pines and mixed hardwoods in the Tennessee Valley has demonstrated that nitrogenous soil amendments stimulate growth for at least 4 to 5 years (1, 2. 3). Since reporting this, we have monitored the growth of several tests for an additional 4- to 5-year period after application; this note summarizes these observations. Reference should be made to the initial reports (1. 2. 3) for detailed descriptions of experimental conditions and methods.

The Study

Planted Yellow-Poplar

In this factorial test (1), yellowpoplar *(Liriodendron tulipifera L.)* on a severely eroded silty clay loam in east Tennessee was fertilized with nitrogen and phosphorus at planting. The positive effects of phosphorus became nonsignificant after 2 years, but 5 years after application of 300 and 600 pounds of nitrogen per acre, plants were 39 and 70 percent taller, respectively, than controls (table 1). When the plantation was 9 years old, control plants averaged 12.7 feet, while nitrogen, applied at 600 lbs./acre, produced plants averaging 18.2 feet, or 44 percent taller than controls. Plot means ranged from 5.2 for a control plot on a highly eroded area, to 37.7 for fertilized trees on a less disturbed portion of the site. Thus, fertilized plants remain substantially ahead of unfertilized ones.

Northern red oak

In the northern red oak *(Quercus rubra L.)* planting (2) effects of both

TABLE 1.—Average total height (feet) of planted yellow-poplar as influenced by nitrogen fertilization at planting

Plantation age	Nitrogen, lbs./acre		
	0	300	600
(years)			
5	4.3	6.0	7.3
9	12.7	14.7	18.2

TABLE 2.—Average total height (feet) of planted northern red oak as affected by fertilization and size of planting stock

Plantation age	Large stock		Average stock	
(years)	Control	Fertilized	Control	Fertilized
4	3.4	5.6	2.4	4.3
8	8.5	13.0	6.8	10.5

TABLE 3.—Basal area (feet/acre) increment of southern pines and mixed hardwoods after fertilization

Time after fertilization	Basal area growth			Basal area growth per foot of initial basal area		
(years)	Control	Nitrogen	Nitrogen and phosphorus	Control	Nitrogen	Nitrogen and phosphorus
MIXED HARDWOODS						
0-5	14	22	21	.20	.31	.29
5-10	15	18	19	.16	.18	.18
SOUTHERN PINES						
0-5	19	28	36	.22	.34	.39
5-10	16	14	20	.15	.13	.16

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seedling size and fertilization have been observed for 8 years. The test site was an abandoned forest nursery characterized by a well-drained loam soil with a cover of fescue sod. Applications of ammonium nitrate were made during the first 2 years, and after the third growing season, all trees except controls received a commercial fertilizer (15:15:15) at a rate of 570 pounds per acre. After 4 years, the combined effects of seedling selection and fertilization produced plants which averaged 5.6 feet in height: controls averaged 2.4 feet (table 2). Height differences due to these treatments have continued through 8 years with the effect of the fertilizer outweighing that of seedling size. However, some differences at 8 years probably reflect increasing competition among plots, which had limited buffer zones.

Mixed hardwoods and pine

Response of established pine and hardwood stands to nitrogen (300 lbs./acre) and phosphorus (66 lbs./acre) amendment was observed at 37 locations in the Tennessee Valley (3). Of the 37 tests, 13 which exhibited the best response to nitrogen during the first 5 years were selected for measurement after 10 years. Three were in southern pine *(Pinus taeda L., P. echinata Mill.)* stands in northern Alabama, and 10 in mixed hardwood stands distributed throughout the Valley. Initial basal area in these tests averaged 80 feet per acre for hardwoods and 90 for pine. In the hardwoods-predominantly yellow-poplar and red and white oaks-nitrogen amendment stimulated a basal area increase about 50 percent greater than that of controls (table 3) during the first 5-year period after application, followed by a consistent decrease in response during the second 5-year period to around 20 percent. The decrease in response of pine was more dramatic than in hardwoods, and no significant difference between controls and treatments was noted during the second measurement period.

Conclusions

In the plantings of yellow poplar and northern red oak, the growth advantage gained from nitrogen fertilization has persisted well beyond the establishment phase. The degree of this total advantage at 8 to 10 years suggests that fertilization used in combination with large planting stock can he profitably incorporated into establishment procedures. On the other hand, diameter increment response to fertilization in natural stands was relatively short-lived, and further application will be required between 5 and 10 years if continued growth stimulation is desired. Whether such application is economically feasible will depend largely on stand composition and quality and soils, with the best returns probably being obtained from fertilization of species such as yellow-poplar and northern red oak on good sites.

Literature Cited

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3. Foster, A. A., and R. E. Farmer, Jr. 1970. Juvenile growth of planted northern red oak: effects of fertilization and size of planting stock. Tree Planters Notes 21 (1): 4.7.

News & Reviews

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Rootability of Hybrid Poplar Clone NE-222: Another View!

Dr. Ernest J. Schreiner, formerly with the Forest Service and now a forest genetics consultant at Durham. New Hampshire, questions the conclusions reached by Dr. R. D. Shipman in his report on hybrid poplar clone NE-222 which appeared in Vol. 25, No. 1 of Tree Planters' Notes. Dr. Shipman is Associate Professor of Forest Ecology at the Pennsylvania State University, Park, Pennsylvania.

Dr. Schreiner states that experience at the Northeastern Forest Experiment Station, USDA, FS, indicates that this hybrid has excellent rooting ability *without any chemical treatment.* Clone NE-222 is one of the 40 hybrid poplar clones distributed by the Station and is reported in the Proceedings of the Northeastern Forest Tree Improvement Conference, Volume 19: 108-116, 1971. The following quotations are from p. 110 of that publication:

"The most important criteria for the selection of clones for commercial poplar culture are rooting ability, rapid growth (volume production), and sufficient pest resistance to predict an early and profitable harvest.

"The 240 clones included in these tests had met the requirement for 95100 percent nursery rooting. This was based on 50 graded cuttings (12 inches in length and 3/16- to 1/2-inch middle diameter) derived from 1-yearold growth on nursery stools."

Clone NE-222 rooted 91 percent on an upland terrace site and 98 percent on an upland slope site without any chemical treatment of the cuttings.

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