Southern Forest Experiment Station

Research Note

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Planted Pines do not Respond to Bedding on an Acadia-Beauregard-Kolin Silt Loam Site

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SUMMARY

Average height and volume of loblolly and slash pines were not affected by site treatment or soil differences 15 years after planting on an Acadia-Beauregard-Kolin silt loam site. Slash pine averaged 2.04 m more in height and yielded 22 percent more volume per hectare than did loblolly pine.

Additional keywords: Site preparation, *Pinus taeda, Pinus elliottii* var. *elliottii.*

INTRODUCTION

Bedding of wet, poorly drained, sandy flatwoods soils was first done in the Atlantic and Gulf Coastal Plains of the Southeast. Pine survival was higher, and yields were better on these bedded sites. As use of bedding moved west, pine performance needed to be evaluated on fine-textured, somewhat poorly drained, flatwoods soils in the West Gulf Coastal Plain. To fill this need, the Southern Forest Experiment Station established site improvement studies in central and southwest Louisiana. This report summarizes data for the 10th to 15th years on survival and yields of planted loblolly, *Pinus taeda* L., and slash, *P. elliottii* Engelm. var. *elliottii,* pinesfrom a study that was installed on an Acadia-Beauregard-Kolin silt loam site.

SOIL DESCRIPTION

The study area, located in Rapides Parish, La., comprises Acadia (Aeric Ochraqualf, fine, montmorillonitic, thermic), Beauregard (Plinthaquic, Paleudult, fine-silty, siliceous, thermic), and Kolin (Glossaquic, Paleudalf, fine-silty, siliceous, thermic) silt loam soils. These soils are acidic, have low natural fertility, and are common in flatwoods of Arkansas, Louisiana, and Texas. Generally, pine growth and yield would be lowest on the Kolin soil and highest on the Beauregard soil, but differences on this site were unimportant, so I ignored soil effects.

METHODS

The site was originally cutover, open-range longleaf pine, *P. palustris* Mill, land with a heavy grass rough that was mostly free of woody vegetation. Before site treatment the scattered pines and clumps of southern bayberry, *Myrica cerifera* L., were removed, and the site was fenced to keep out livestock.

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Treatments were replicated three times with each species in a randomized block design. Site treatments were:

Check- Seedlings were planted in a heavy grass rough.

Disked — 2.13-m wide strips were double flat-disked with a heavy-duty offset plowing harrow that cuts about 10 cm deep.

Bedded — 2.13-m wide strips were double flat-disked; then continuous beds were made with a terracing harrow. Mounds were about 30 cm high before settling.

Furrowed — Furrows 8-10 cm deep and about 1.22 m wide were cut with a fire plow.

Furrowed and disked strips were spaced 2.44 m apart, center-to-center. Furrowing was done in March 1963, and the disking and bedding treatments were done in July 1963.

Freshly lifted, graded, 1-O slash and loblolly pine seedlings were planted by hand at a 2.44 m by 1.83 m spacing on 0.166-ha plots during February 1964. Water was 2.5 to 8 cm deep in many of the furrows at planting.

At stand age 15, I measured heights of all surviving trees to the nearest 30 cm and diameters to the nearest 0.25 cm at 1.37 m above groundline (d.b.h.), and I noted bole fusiform rust [*Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme* Burdsall and Snow] galls.

The formulas used to get individual-tree volumes were:

For loblolly pine

$V = 0.13698 + 0.0023035D^2H$ (Hasnessand Lenhart 1972).

For slash pine

$V = 0.0399 + 0.002645D^2H$ (Moehring et al. 1973).

where:

V = volume per tree, outside bark, in cubic feet.
D = d.b.h. outside bark, in inches.
H = tree height in feet

Table 1. — ***Results at stand age 15***

Species and site treatment	Survival	D.b.h.	Height of dom. and codominant trees: Total height	Height of dom. and codominant trees: Height growth 1 Oth-15th years	Volume per ha outside bark
	Percent	*cm*	*meter*		*m*³
Loblolly					
Grass rough.	80.8	13.97	11.80	2.68	150.01
Disked.. .	81.8	14.14	11.95	2.53	152.28
Bedded.	64.2	15.16	12.37	2.57	145.03
Furrowed.	83.1	13.29	11.77	2.38	141.17
Average.	77.5	14.14	11.97	2.54	147.12
Slash					
Grass rough. .	58.9	15.92	13.72	4.11	171.02
Disked.. .	67.6	15.75	14.68	3.83	200.05
Bedded..	52.6	16.09	14.08	3.83	163.93
Furrowed.	73.8	14.73	13.55	3.42	185.29
Average. .	63.2	15.62	14.01	3.80	180.07

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I converted cubic-foot volumes to cubic-meter volumes.

I analyzed pine survival, mean d.b.h., height per surviving tree, mean height change from the 10th to 15th year, and cubic-meter volume (outside bark) per hectare with analyses of variance (0.05) and preplanned orthogonal comparisons. I transformed survival percentages into arc sine $\sqrt{\text{proportion}}$ before analysis.

RESULTS

The 14-percentage point difference in survival between slash and loblolly pines at stand age 15 was significant (table 1). For both species, survival on bedded plots was significantly less than survival on disked or furrowed plots.

Average pine d.b.h. was inversely related to percent survival (table 1). Slash pines averaged 1.48 cm greater d.b.h. than did loblolly pines. Loblolly pines on bedded plots had greater d.b.h. than they had on the other three treatments. But slash d.b.h. did not differ significantly by treatment.

Once d.b.h. was adjusted for survival by analysis of covariance, average slash pine d.b.h. was not significantly larger than average d.b.h. of loblolly pines. Nor did loblolly pines on bedded plots have greater d.b.h. than did loblolly pines on the other three treatments.

Height of dominant and codominant pines was the best criterion for determining differences between species and among site treatments, because height of the taller trees is not much affected by stand density. Dominant and codominant slash pines were taller than dominant and codominant loblolly pines by an average of 2.04 m (table 1). No differences in average height were associated with site treatments for either species, 15 years after planting.

From the 10th through 15th growing seasons, dominant and codominant slash pines grew 1.26 m taller than did loblolly pines (table 1). Periodic height growth of slash pines was greater on checks than on mechanically treated plots and less on furrowed plots than on disked and bedded plots. Periodic height growth of loblolly pine during the last 5 years did not differ significantly among treatments.

Slash pines had 22 percent more volume per hectare than did loblolly pines after 15 years (table 1). Volume per hectare did not differ significantly among treatments for either species.

Volume growth per hectare was good, averaging 9.808 m^3 outside bark yearly for loblolly and 12.005 m^3 outside bark yearly for slash pines.

DISCUSSION

Survival differences for slash pines were apparently not related to site treatment, because when Derr and Mann (1970) reported on this study at stand age 5, they found no important differences among treatments in survival of slash pines. But survival of loblolly pines was lower on bedded plots than on furrowed, flat-disked, or check plots. The incidence of fusiform rust at 5 years best explains later survival. Derr and Mann (1970) found that 32 percent of living slash pines on bedded plots had bole fusiform rust cankers, while only 14 percent of living slash pines on the other three treatments had bole cankers. They noted that 16 percent of the loblolly pines on bedded plots had bole infections, while an average of only 6 percent of loblolly pines on the other three treatments were infected. Such differences are not surprising since a high incidence of fusiform rust is associated with intensive culture (Dinus and Schmidt 1977).

By stand age 15, 42 percent of all living trees had bole galls, and there were no significant differences in the percentage of living, rust-infected trees between slash and loblolly pines or among site treatments. So fusiform rust should not cause differences in mortality past age 15.

Shoulders (1970, 1976) found that the growth and yield of slash and loblolly pine were often equal by stand age 25 despite a faster start by slash pine. So it is too early to conclude that slash pine is a better species for planting on an Acadia-Beauregard-Kolin silt loam soil.

The three methods of mechanical site preparation tested did not affect the growth and yield of loblolly pine. Amount of periodic height growth of loblolly during the last 5 years suggests that these results are not likely to change. Heights were also comparable for slash pine on check and mechanically treated plots. But amount of periodic height growth during the last 5 years suggests that slash pines on checks might now be outgrowing trees on mechanically prepared plots. Clearly, mechanical site treatments were unnecessary on this Acadia-Beauregard-Kolin silt loam soil.

A similar study, in Rapides Parish, La., was located on a Caddo (Typic Glossaqualf, fine-silty, siliceous, thermic) and Beauregard silt loam complex (Cain 1978). Height of the 100 tallest loblolly pines and total volume per hectare were greater on flat-disked or flat-disked, bedded plots than on check plots at stand age 15. But there were no height and volume differences between flat-disked and flat-disked, bedded plots. So added growth on mechanically treated plots was a response to competition control, which may have increased fertility by mixing organic matter into the soil and by creating better soil aeration. Bedding to increase the depth to free water was ineffective. Slash pine was unaffected by site treatment on this Caddo-Beauregard silt loam soil.

Derr and Mann (1977) concluded from six bedding studies located in Louisiana that bedding was not worth the extra cost. Gains in early height growth were modest, incidence of fusiform rust often increased, and bedding disrupted the natural drainage pattern on silt loam soils having gently rolling topographies.

Still, such results cannot be applied to all soils. The response of southern pines to mechanical site preparation can vary with differences in soil topography, drainage, and climate.

LITERATURE CITED

Cain, M. D.
1978. Planted loblolly and slash pine response to bedding and flat disking on a poorly drained site -an update. U.S. Dep. Agric. For. Serv. Res. Note SO-237, 6 p., South. For. Exp. Stn., New Orleans, La.

Derr, H. J., and W. F. Mann, Jr.
1970. Site preparation improves growth of planted pines. U.S. Dep. Agric. For. Serv. Res. Note SO-106, 3 p., South. For. Exp. Stn., New Orleans, La.

Derr, H. J., and W. F. Mann, Jr.
1977. Bedding poorly drained sites for planting loblolly and slash pines in southwest Louisiana. U.S. Dep. Agric. For. Serv. Res. Pap. SO-134, 5 p., South. For. Exp. Stn., New Orleans, La.

Dinus, R. J., and R. A. Schmidt, eds.
1977. Management of fusiform rust in southern pines. Symp. Proc. Univ. Fla., Gainesville. 163 p.

Hasness, J. K., and J. D. Lenhart.
1972. Cubic-foot volumes for loblolly pine trees in old-field plantations in the Interior West Gulf Coastal Plain. Stephen F. Austin Univ., Texas For. Pap. 12, 7 p.

Moehring, D. M., M. R. Holmes, and R. G. Merrifield.
1973. Tables for estimating cubic foot volumes and fresh weight of planted slash pine. Texas A&M Univ., MP-1079, 29 p.

Shoulders, E.
1970. Growth and yield of a mixed loblolly-slash pine plantation. U.S. Dep. Agric. For. Serv. Res. Note SO-99,4 p., South. For. Exp. Stn., New Orleans, La.

Shoulders, E.
1976. Site characteristics influence relative performance of loblolly and slash pines. U.S. Dep. Agric. For. Serv. Res. Pap. SO-l 15, 16 p., South. For. Exp. Stn., New Orleans, La.

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