SOUTHERN FOREST EXPERIMENT STATION

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SEED ORIGIN AFFECTS LONGLEAF PINE IN LOUISIANA PLANTATION

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SOUTHERN FOREST EXPERIMENT STATION

Seed source significantly affected both survival and height of longleaf pine *(Pinus palustris* Mill.) in a 5-year-old plantation in central Louisiana. Survival was correlated with mean annual temperature, and height with January-through-April rainfall at the source.

The plantation, situated on a cutover longleaf site in Rapides Parish, comprises longleaf series 4 and 6 of the Southwide Pine Seed Source Study *(4)*[1] planted adjacent to each other. Ten sources are included that cover most of the range of longleaf pine: two from Alabama, two from Louisiana, and one each from Virginia, South Carolina, Georgia, Florida, Mississippi, and Texas. Series 4 follows an east-west transect of the species' range; series 6, a north-south transect. Local (Rapides Parish, Louisiana) and Georgia sources are common to both series.

Preliminary analyses revealed that fifth-year survival and height in each series were significantly affected by seed origin; but neither survival nor growth was prominently related to climatic, geologic, or geographic characteristics of the sources. Therefore, the two series were combined in joint analyses, with means and variances adjusted by the technique of Gomes and Guimarães *(2)*. Duncan's multiple range test *(1)* was used to isolate means that differed significantly.

SURVIVAL

Adjusted fifth-year survival ranged from 81 percent for seed from Perry County, Alabama, to 29 percent for the Hillsborough County, Florida, source (table 1). Seedlings from Perry County survived significantly better (0.05 level) than those from Baldwin County, Alabama; Polk County, Texas; Washington Parish, Louisiana; and Hillsborough County, Florida. Those representing the Florida source survived significantly less well than trees from 7 of the 10 sources, and were equal in survival only to southeast Louisiana and Texas sources. Trees from Rapides Parish survived as well as any others, and significantly better than those from south Alabama, Texas, southeast Louisiana, and Florida. Other significant differences are indicated in the last column of table 1.

Multiple regression analysis revealed a curvilinear relationship between survival, mean

[1] Italic numbers in parentheses refer to Literature Cited, page 3.

Table 1.—*Fifth-year survival of longleaf pine, adjusted for differences between series*

Seed source	Series	Mean annual temperature	Fifth-year survival	Significance [1]
		°F.	*Percent*	
Perry County, Ala.	4	64	81	
Rapides Parish, La.	4 and 6	67	74	
Harrison County, Miss.	6	67	72	
Florence County, S. C.	6	64	72	
Treutlen County, Ga.	4 and 6	67	64	
Nansemond County, Va.	6	60	63	
Baldwin County, Ala.	4	67	59	
Polk County, Tex.	4	67	48	
Washington Parish, La.	4	67	43	
Hillsborough County, Fla.	6	72	29	

[1] Any two means not enclosed in the same bracket are significantly different at 0.05 level.

annual temperature of the source, and mean annual temperature squared. These variables accounted for 58 percent ($R = 0.759$) of the variation in fifth-year survival (fig. 1). The results confirm, at least for this plantation, the hypothesis *(4)* that temperature at the source influences planting survival. The curvilinear relationship seems logical, as the mean annual temperature of central Louisiana is intermediate among those represented in the plantation.

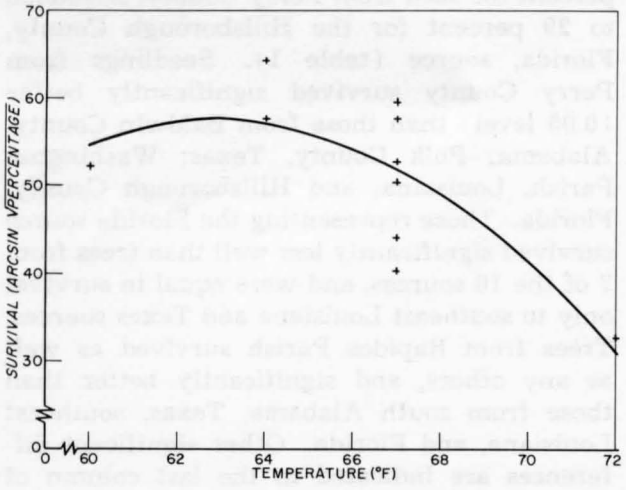

FIGURE 1.—*Fifth-year survival of longleaf seedlings in relation to mean annual temperature of their seed sources.*

HEIGHT GROWTH

Seedlings of the Baldwin County, Alabama, source excelled in height growth during the first 5 years. Their adjusted heights averaged 4.91 feet (table 2). Trees from three other sources—Texas, Mississippi, and Perry County, Alabama—also were significantly taller than those of local origin. Conversely, local source trees, with an average height of 2.44 feet, were taller than representatives of Washington Parish, Louisiana, and Hillsborough County, Florida. The latter averaged only 0.62 foot tall, and grew less in the 5-year period than trees from 8 of the 10 sources. The brackets in table 2 show other heights that differed significantly.

Heights were correlated with January-through-April rainfall at the source. A regression that included both rainfall and rainfall squared as independent variables explained 75 percent ($R = 0.864$) of the variation among individual source means (fig. 2). This correlation between height and early season rainfall supports Squillace and Kraus' *(3)* hypothesis that rapidly growing trees will predominate in areas where rainfall is optimum for growth, and that a race of superior growers should develop in these regions.

Table 2.—*Fifth-year heights of longleaf pine adjusted for differences between series*

Seed source	Series	Rainfall, January through April	Fifth-year height	Significance [1]
		Inches	*Feet*	
Baldwin County, Ala.	4	19	4.91	
Polk County, Tex.	4	17	3.75	
Perry County, Ala.	4	20	3.73	
Harrison County, Miss.	6	20	3.56	
Florence County, S. C.	6	13	2.58	
Rapides Parish, La.	4 and 6	22	2.44	
Treutlen County, Ga.	4 and 6	15	2.31	
Nansemond County, Va.	6	14	2.19	
Washington Parish, La.	4	22	1.35	
Hillsborough County, Fla.	6	11	.62	

[1] Any two means not enclosed in the same bracket are significantly different at 0.05 level.

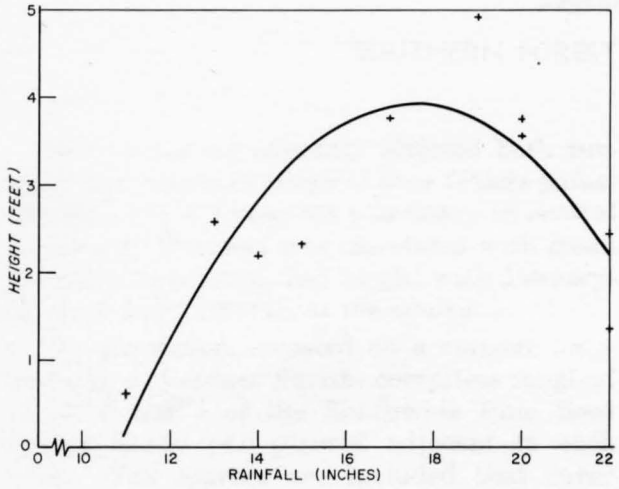

FIGURE 2.—*Relationship between fifth-year heights of longleaf seedlings and January-through-April rainfall of their seed sources.*

CONCLUSIONS

Obviously, fifth-year results of one local test are insufficient to verify the growth hypothesis. They do suggest, however, that similar appraisals of other seed source plantations be made to determine if some function of rainfall will facilitate delineation of seed collection zones. The correlation of survival with mean annual temperature should also be investigated further to learn if temperature at the source limits survival sufficiently to warrant consideration when establishing collection boundaries.

LITERATURE CITED

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