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Ice Damage in a Georgia Planting of Loblolly Pine from Different Seed Sources

Abstract. — After a severe ice storm in south-central Georgia, the degree of ice damage in a provenance test planting of 11-year-old loblolly pines varied considerably among the nine widely separated seed sources represented. Damage was less among trees from the colder, more inland locations than among trees from coastal areas where the climate is more moderate. In terms of volume growth, however, the superior growth rate of the trees from coastal seed sources more than offset the greater damage they sustained.

On December 31, 1963, a severe ice storm occurred in the south-central portion of Georgia, resulting in heavy damage to timber stands as far south as Tifton and Albany. Loblolly (*Pinus taeda* L.) and longleaf (*P. palustris* Mill.) pine plantings of the Southwide Pine Seed Source Study[1] located on the George Walton Experimental Forest in Dooly County, Georgia, suffered some breakage. The damage resulted in striking differences among the various seed sources in the loblolly planting but not among those in the longleaf planting.

Weather records for the experimental forest show that the accumulation of ice started with a low air temperature of 24° F. accompanied by rain. The temperature remained at 32° F. for the following 2 days. Both natural and planted stands of pines were affected by the heavy loads of ice. Large trees were uprooted, stripped of their branches, or snapped off along the bole. Man); trees of sapling size were bent to the ground and have never regained an upright position. Degree of stand damage varied with stand density, exposure, and tree size.

Trees in the loblolly planting of the Southwide Study were 11 years old at the time of the ice storm. Each of nine widely separated seed sources is replicated four times in a randomized complete-block design — a total of 36 plots. Each plot, planted with trees from a single seed source, consists of 11 rows of 11 trees each, with trees spaced 6 by 6 feet. Measurements and observations were restricted to the 49 trees in the interior of each plot, so that two border rows could be left around the test trees. Damage to the affected trees was generally confined to breakage of the upper 5 feet of the leaders. On each plot, the number of trees that had broken tops because of ice accumulation was recorded. For all seed sources combined, tenth-year mean d.b.h. was 3.9 inches, mean total height was 22.4 feet, and survival averaged 82 percent.

The number of damaged trees from the colder, more inland locations was less than the number of damaged trees from coastal areas where the climate is more moderate (fig. 1). This difference is further illustrated by the high correlation between ice damage and mean minimum temperature during January at the seed sources (fig. 2).

Because the pattern of variation of ice damage among seed sources is very similar to the variation Collins reported for tenth-year height,[2] the data were subjected to

[1]The Southwide Pine Seed Source Study was initiated in 1951 by the Committee on Southern Forest Tree Improvement to study how the inherent geographical variation in the four major southern pine species is associated with geographic variation in climate and physiology. The planting reported here is only one of 13 loblolly plantings in the study.

[2]Collins, Arthur B. III. Tenth-year results of loblolly pine seed source planting in Georgia. Southeast. Forest Exp. Sta., U. S. Forest Serv. Res. Note SE-20, 4 pp. 1964.

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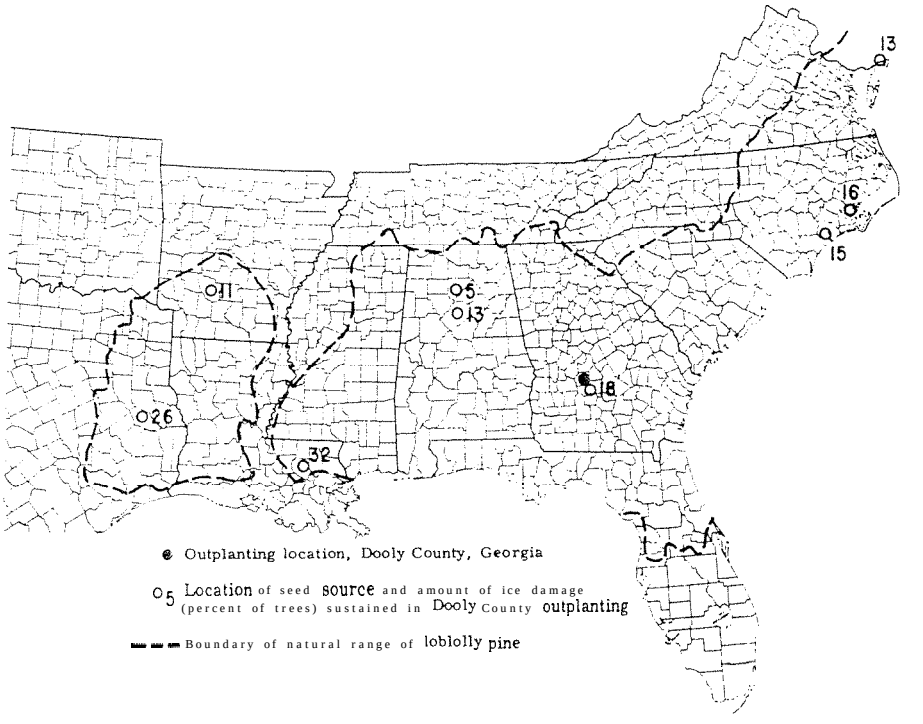

Figure 1. —Ice damage to loblolly pine trees in the planting in Dooly County, Georgia, varied among the nine seed sources represented.

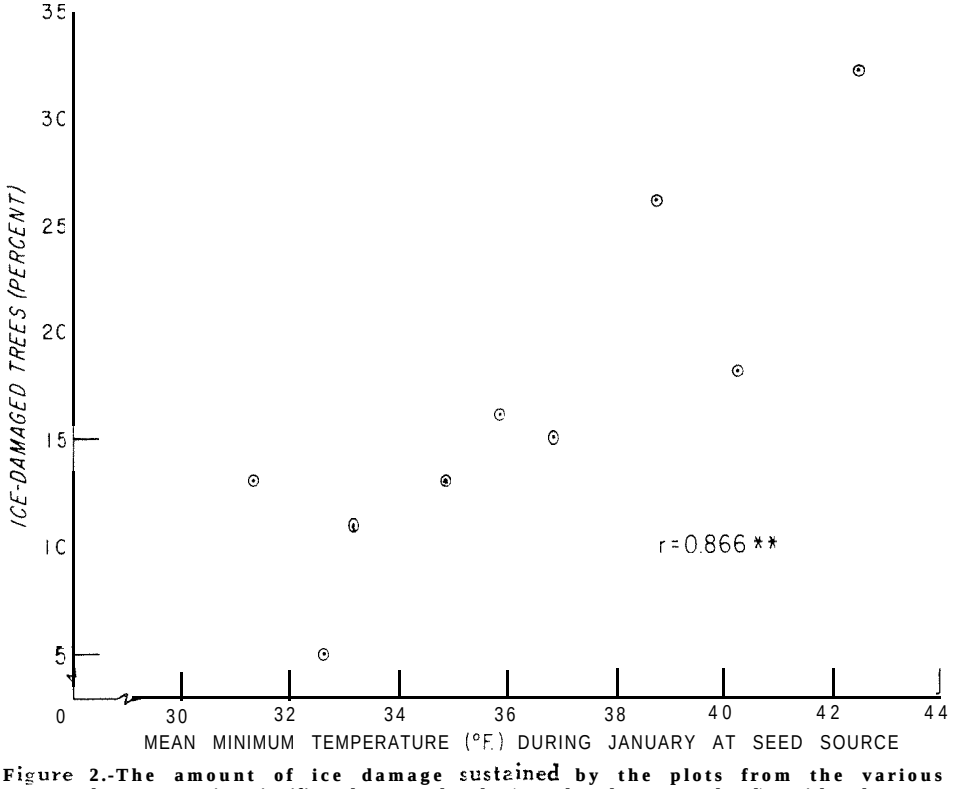

Figure 2.-The amount of ice damage sustained by the plots from the various seed sources is significantly correlated (at the l-percent level) with the mean minimum temperature during January at the seed sources.

covariance analysis to remove the effect of height. Differences in ice damage among sources were decreased by this procedure. but they were still significant at the 5-percent level. Factors besides height, perhaps luxuriance of foliage or wood strength, also help determine resistance to ice breakage.

Effects of ice damage on these loblolly plots were still evident at age 16, 5 years after the ice storm (fig. 3). Damaged trees developed harp-shaped crowns because lateral branches grew upward in place of the broken leader. These crowns occupied more than their proportionate share of radial growing space, but they were often overtopped by their undamaged neighbors. Few, if any, trees died as a direct result of ice damage. From age 10 to 15, diameter increment on 32 of the 36 plots was less on ice-damaged trees than on undamaged trees which were of similar diameter at age

Figure 3.-Deformed tops caused by ice damage were still evident in these isolation rows at age 16, 5 years after the ice storm. Most damaged trees were removed from the interior measurement plots in a thinning at age 15.

10; and, for all plots, growth averaged 0.25 inch less on damaged trees than on undamaged trees.

Although ice damage was heaviest among the trees from the warmer seed sources nearer the coast, measurements at age 15 showed that these trees are still producing a greater voiume of wood than are the trees from the inland seed sources. Volume and height at age 15 vary among seed sources in substantially the same pattern as did height at age 10.

The pattern of variation in ice damage reported here is similar to that recorded in northwest Georgia (Spalding County) in another loblolly pine planting of the Southwide Study,[3] and in a slash pine planting in Georgetown County, South Carolina.[4] So far, ice damage to the trees from the southern part of the loblolly range has not had a permanent, serious effect in the two loblolly plantings of the Southwide Study where it has occurred. Nevertheless, the tendency for trees from the warmer parts of the species range to be more heavily damaged by ice is a factor to consider if movement of loblolly seed into areas where ice storms are common is contemplated.

[3]Wells, Osborn O., and Wakeley, Philip C. Geographic variation in survival, growth, and fusiform-rust infection of planted loblolly pine. Soc. Amer. Forest. Forest Sci. Monogr. 11, 40 pp. 1966.

[4]Snyder, E. Bayne, Wakeley, Philip C., and Wells, Osborn O. Slash pine provenance tests. J. Forest. 65: 414-420. 1967.

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