SOUTHERN FOREST EXPERIMENT STATION

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TIPS FOR MANAGING DROUGHT-STRICKEN COTTONWOODS ALONG THE LOWER MISSISSIPPI RIVER

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SOUTHERN FOREST EXPERIMENT STATION

Cottonwood trees with more than two-thirds of their crowns affected by dieback are unlikely to survive, and therefore should be marked for early cutting. Trees with less than one-third dieback are likely to recover. Those in intermediate dieback classes should be cut if their crowns are small or if a main leader or major branch is dead.

The period 1952 through 1956 was extremely dry in the lower Mississippi River Valley. At Stoneville, Mississippi, annual rainfall during these 5 years ranged from 3 to 14 inches below the previous 25-year average. As reported by Broadfoot,[2] the shortage of moisture caused considerable mortality and dieback in cottonwood stands. The greatest losses were on deep, excessively drained sands and on soils with stratified beds of silty clay loams, silt loams, and sandy loams over clay.[3]

The drought was broken during 1957. In August of that year, 200 cottonwoods were selected for study in a 20-year-old stand on the batture northwest of Vicksburg, Mississippi. The majority were between 10 and 16 inches in diameter. Each tree was measured at d.b.h. and tallied into one of three crown-size groups and one of 10 dieback classes.

Crown-size groups were: *large*—crown broad, usually full, umbrella-shaped, and comprising approximately one-fourth of total tree height; *small*—crown generally less than 15 feet across and sparse, usually comprising one-half to two-thirds of total tree height; and *medium*—crown wider than for *small* and usually not as sparse, generally comprising one-fourth to one-half of total tree height.

Dieback classes were based on the percent of total crown area affected, as determined by ocular estimates. In addition, observations

[1] The authors are stationed at the Southern Hardwoods Laboratory, which is maintained at Stoneville, Miss., in cooperation with the Mississippi Agricultural Experiment Station and the Southern Hardwood Forest Research Group.

[2] Broadfoot, W. M. **Soil-water shortages and a means of alleviating resulting influences on southern hardwoods.** In **Southern Forest Soils.** La. State Univ. Eighth Ann. Forestry Symposium Proc. 1959: 115-119. 1960.

[3] Broadfoot, W. M., and Toole, E. R. **What's causing the mortality in southern hardwoods?** Jour. Soil and Water Conserv. 13: 276-277, illus. 1958.

were taken on whether dieback was mainly in the periphery of the crown or in a main limb or leader.

A prism with a basal area factor of 9.7 was used to determine the degree of competition around each tree. Soils were Robinsonville silt loam and Mhoon silty clay.

Trees were observed each August from 1958 through 1963 and, when necessary, reclassified into another dieback class. Rainfall was average or above during 5 of the 7 measurement years.

RESULTS

By the third year of normal rainfall, all trees were dead that were going to die, and the others were steadily improving their crown condition (fig. 1). The factor most closely related to mortality was initial degree of dieback (table 1). Trees with more than two-thirds of their crowns affected generally died, whereas those with less than one-third dieback generally lived. In the middle ranges of dieback, mortality varied with crown size; that is, trees with large crowns were better able to recover than those with small crowns.

Table 1.—*Mortality by dieback classes*

Degree of dieback (percent)	Mortality
	Percent
0-19	2
20-39	13
40-59	33
60-99	85

Overall dieback classes, only 5 percent of the trees with large crowns died, while 9 percent with medium crowns and 38 percent with small crowns succumbed (fig. 2). None of the large-crowned trees had more than 50 percent initial dieback.

Although most of the survivors had extended their crown area and appeared relatively free of dieback 7 years after the drought, they had not necessarily recovered fully. The tree in figure 3, for example, appeared to have nearly a full crown in 1961. But the earlier photographs show that the main leader broke off in 1959, disguising the effects of dieback but also leaving an entrance for rot-inducing fungi.

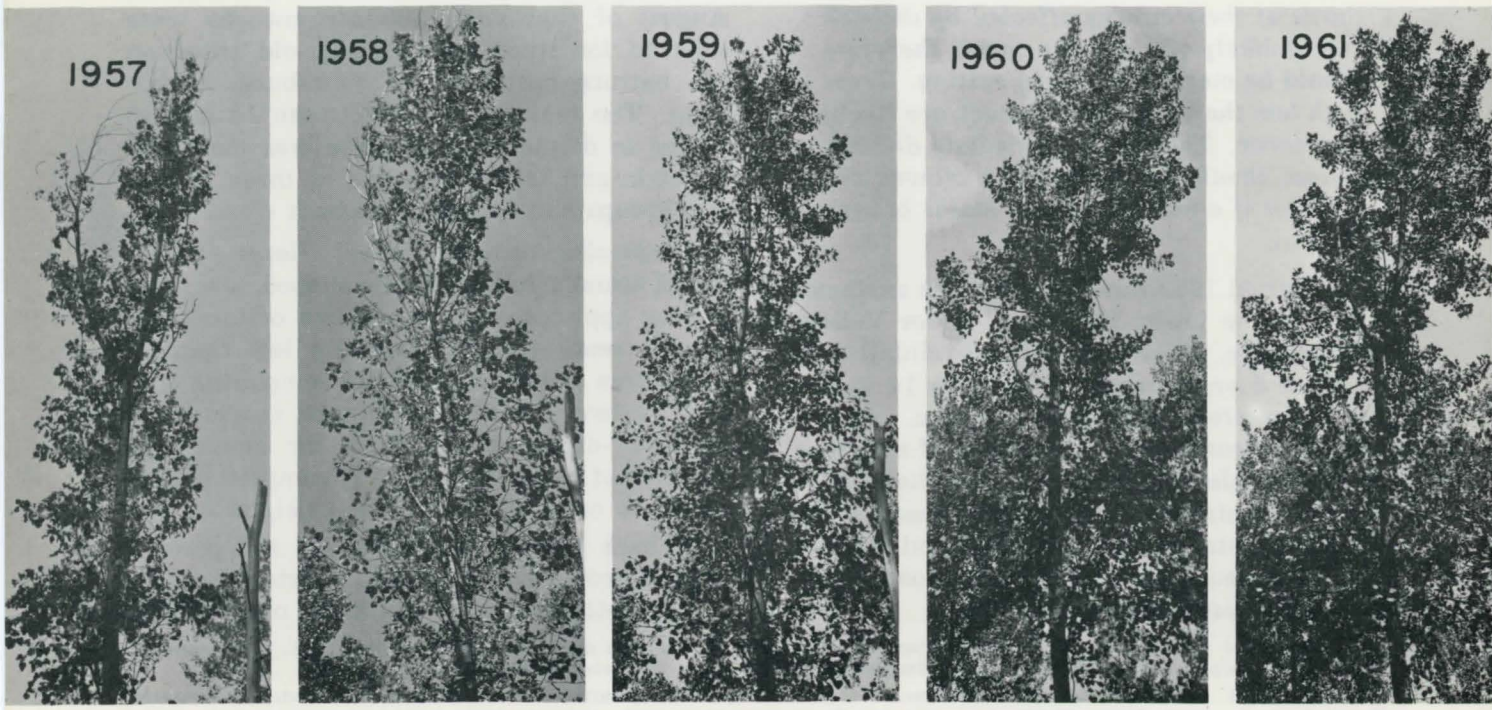
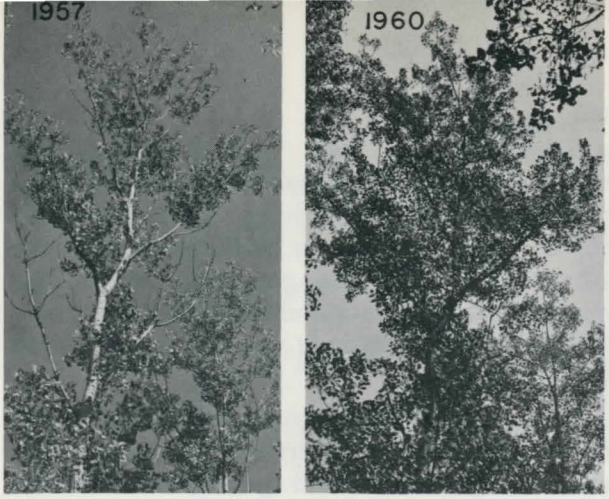
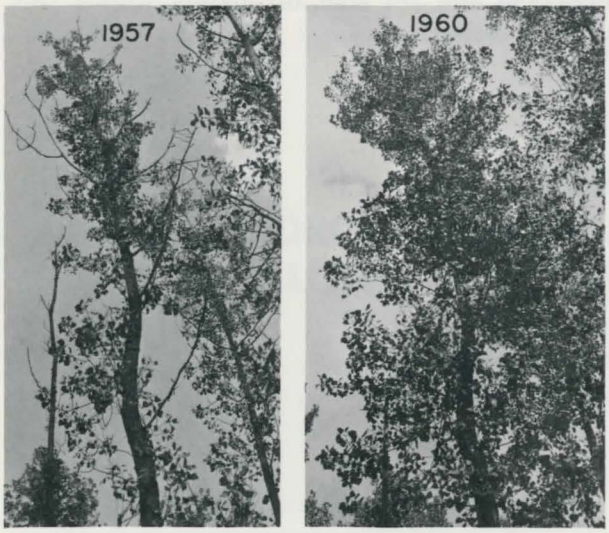


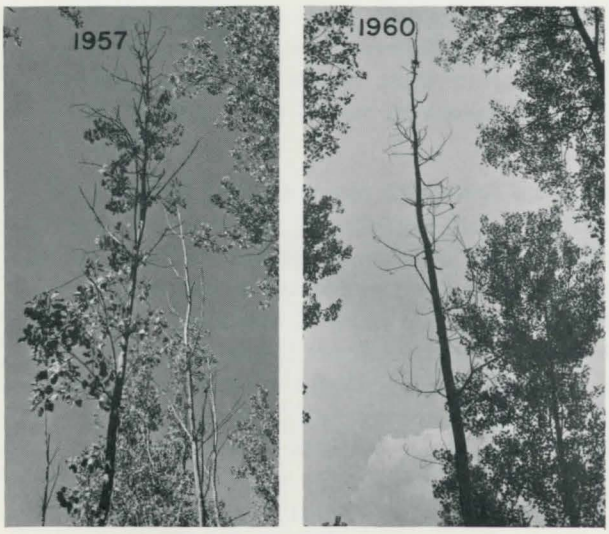
Figure 1.—*This tree completely recovered from crown dieback of 20 to 30 percent.*



Large crown, 10-20 percent dieback.



Medium crown, 30-40 percent dieback.



Small crown, 70-80 percent dieback

Figure 2.—*Crown size and amount of initial dieback largely determine whether a tree will die or recover.*

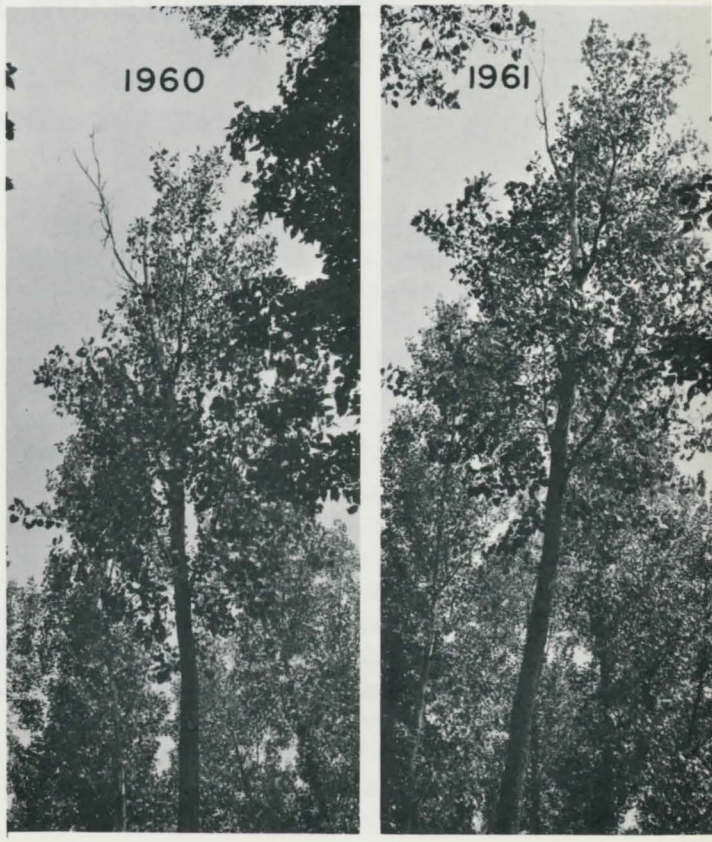


Figure 3.—*Dieback in the main leader or large limbs is often followed by breakage. Though regrowth may mask the damage, rot fungi usually enter and spread downward into the most valuable parts of the bole.*

RECOMMENDATIONS

When marking in drought-stricken cottonwood stands of the lower Mississippi River Valley, foresters should remove trees with two-thirds or more of the crown affected by dieback and may leave trees with less than one-third of the crown affected.

Whether to remove trees with one-third to two-thirds of the crown affected by dieback will depend largely on the trees' crown size. Large-crowned cottonwoods may be left even if one-half of the crown is dead. Trees with medium to small tops should frequently be marked when only one-third of the crown is gone. Often these trees are lower in vigor and smaller in d.b.h. than their neighbors and would be removed anyway in a normal thinning or improvement cutting. Competition may be an important factor in determining the future of drought-damaged trees, but in the experimental stand basal area did not prove to be a good predictor of whether a tree would live or die.

Regardless of their crown size, trees should be cut if a substantial portion of the main leader or a major crown limb is dead. Even though they may live and develop for several years, their potential as crop trees is reduced by the breakage and rot that ultimately follow this type of dieback.