What's Causing the Mortality in Southern Hardwoods?

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WIDESPREAD DIEBACK AND MORTALITY of hardwoods has been noted in the South during recent years. In general, losses have been most severe in certain areas of cottonwood, sweetgum, and black willow. Some damage also has been noted in red oaks, especially Nuttall; and in elms, green ash, sycamore, and some less important species. On uplands, mortality has occurred in sassafras, hickory, sweetgum, oaks, and yellow-poplar. Drought is now understood to be the basic cause. This article discusses some of the conditions associated with drought, and some of the ways in which it kills trees. Some suggestions are made for land and water management to reduce damage.

Some dieback was noted in sweetgum ten years ago, but its severity and cause were not seriously considered until 1952. About a year later abnormal mortality was observed in some stands of black willow. Cottonwood joined the ranks of species suspiciously affected in 1954, after earlier sporadic mortality on sandy soils. Other hardwood species on a variety of sites were also dying off rapidly, but it was the severe and sudden losses in sweetgum and cottonwood that focused immediate attention on the problem.

Sweetgum Studies Give Clue

Work was started in the South in 1952 toward determining the extent of sweetgum "blight" and its cause, particularly whether a disease organism was involved. Negative results from this line of attack led in 1956 to a study of soil factors. These investigations revealed that certain chemical and physical properties of the soil were significantly related to blight intensity. Dieback was worse on the heavy clays of slackwater areas than on the coarser textured soils of natural levees. In general, high proportion of clay or a high concentration of soluble salts (conditions common to the slackwater soils) tended to be associated with severe blight, probably because these conditions limit availability of moisture.

Not all blight was associated with unfavorable soil attributes, however, and as study progressed it became more and more evident that the most probable cause of dieback and mortality was simply inadequate soil moisture. In turn, the scarcity of solvent may have rendered nutrients unavailable to tree roots.

In addition to hot weather and lack of rain, some causes of inadequate soil moisture are: a build-up of some soil property, such as soluble salts, that tends to increase the tension under which soil moisture is held; poor physical properties that adversely affect available moisture supply in the root zone; land drainage that lowers water tables; and physiographic conditions in the root-zone (such as topography and stratification) that create obstacles between roots and available moisture. In addition, man-caused conditions unfavorable to groundwater recharge, infiltration, or lateral movement may minimize benefits from rains.

Cottonwood dieback, and accompanying mortality, has been even more sudden and spectacular than sweetgum blight, though it has not been observed over so wide an area. Furthermore, it seems to be much more consistently correlated with soil conditions. Most cottonwood dying has occurred on recent natural-levee soils near the Missis-

Figure 1. Dieback and mortality in red oaks and sweetgum. In the same stand there is an occasional dead ash, honeylocust and American elm.

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sippi River. These soils vary from thin to thick stratified beds of silty clay loams, silt loams, and sandy loams over clays. There are also some deep, excessively drained sands. Stands on sandy sites show the most rapid and severe mortality in dry weather. On the average, sandy soils can hold a maximum of only six inches of available water in five feet of soil. Without recharge from rain or rising ground water, this amount of soil moisture is used up by well-stocked fast-growing timber stands in about 15 days. In the last few years many forest sites have suffered more than 15 days of drought, particularly in the early part of the growing season.

Siltier soils naturally can store more available water. A five-foot layer of silt loam can hold, when saturated, about 18 inches of available water. This amount, without recharge, would be a 60-day supply for growing timber. Dieback has been negligible on deep silt loam because drought of more than two months are infrequent.

Poor soil conditions, heat, or lack of rain are not always responsible, of course. A known cause of some mortality in 1955, particularly in hickory and oaks, was a hard frost that came after the trees had partially leafed out.

Man-caused shortages of water are localized, but quite important. Eroded ridges permit little recharge from winter rains. As a result some soils never reach field moisture capacity even during the rainy season. Deep canals have caused excessive drainage near their margins, and thus have reduced tree growth and have increased mortality in these areas. Along the banks of the Mississippi River asphalt revetments sometimes cover underlying outcrop sand lenses, and prevent or deter lateral movement and recharge of ground water when the river rises to root-zone level.

Suggestions for Minimizing Damage

Some principles and practices that might alleviate the loss of hardwoods follow: (1) Keep close check on the condition and vigor of the timber. When early signs of damage appear, thin the stand and salvage merchantable logs and pulpwood. (2) Build low dikes in the forest to impound winter rains. The impoundments help recharge depleted soils and thus increase moisture supply during the growing season. Especially where they contain acorn-producing trees, these impoundments also make for good public relations, for they tend to improve hunting by attracting ducks. Excess water should be released in the spring. (3) Deep drainage ditches and canals should be regulated by a system of gates to prevent too-rapid runoff. Some of the water delayed in the ditches will find its way into soil storage. (4) In uplands, runoff can be slowed by maintaining good ground cover.

Figure 3. Good 20-year-old cottonwood on silt loam soil. Available moisture has been ample to maintain this well-stocked stand during dry weather.

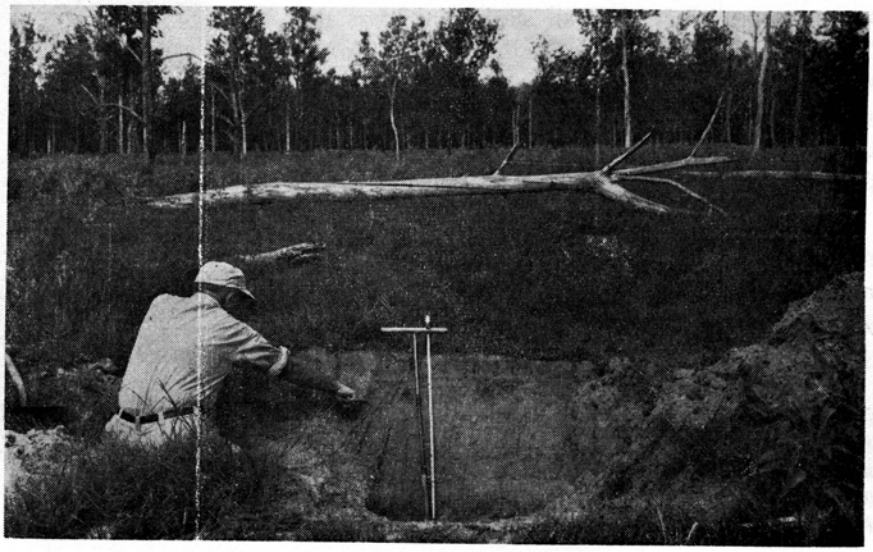

Figure 2. This deep sandy soil was covered with a good stand of 15-year-old cottonwood a few years ago. Stands on such areas were the first to die.