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Soil Moisture Distribution Between Trees in A Thinned Loblolly Pine Plantation

Comparisons of the soil moisture regime under different cover types have been made by various investigators, but little attention has been given to the distribution pattern of moisture under trees in forest stands. To obtain distribution information, soil moisture was observed in a 16-year-old loblolly pine plantation near Union, S. C.

Soil moisture samples were collected at the end of the first and second growing seasons following thinning when soil moisture had been largely depleted and when antecedent rainfall amounted to less than 0.7 inch for the preceding 4 weeks. Soil samples of the surface 4 feet were taken at 2-foot intervals along a line between trees. Six sets of two trees each were selected for study. Sampling began about three inches from one tree and ended at the base of a second tree approximately 20 feet away. Percent moisture by weight was converted into inches of available water and average soil moisture content was plotted over distance from the tree (Fig. 1).

Soil moisture was distributed fairly evenly between trees at the beginning of the growing seasons, as shown by the data collected in May. Water loss after the thinning was due to water intake by roots of the nearest trees and by evaporation. At the end of the 1957 and 1958 growing seasons the soil moisture content was highest midway between trees and lowest adjacent to the trees. In 1957 this difference in moisture levels was significant at the .05 probability level and in 1958 at the .01 level. In the surface 4 feet of a nearby unthinned plantation, the moisture content of soil remained relatively constant between trees during both years.

The difference in moisture levels between trees and under trees averaged 3 inches in 1957 and 2 inches in 1958, which may indicate that the effect of the thinning is decreasing. This could be caused by extension of roots into areas not occupied by living roots and/or increased evaporation between trees.

These observations illustrate a limitation of the use of random sampling methods for determining soil moisture. Random samples are valid for stands in which the amount of moisture does not differ significantly from place to place. However, during some seasons the amount of moisture under thinned stands may vary significantly at different distances from the tree and random sampling will give a biased moisture estimate. In such stands other sampling techniques, such as stratified sampling, can be employed to obtain unbiased moisture estimates and should be considered for use.

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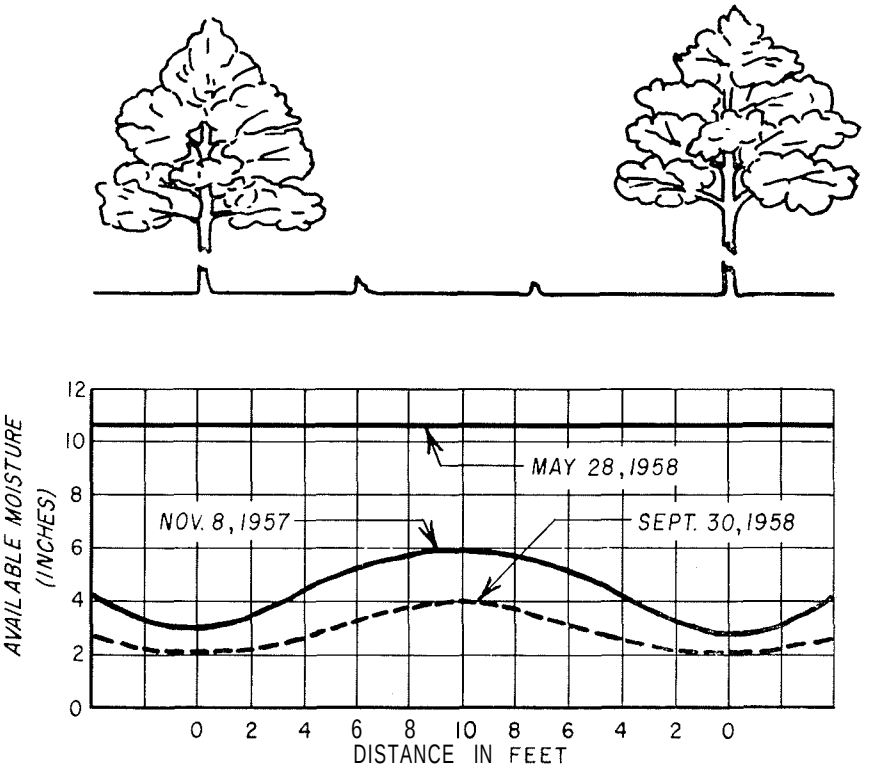

FIG. 1.—A comparison of the spring and fall distribution of soil moisture beneath a loblolly pine plantation thinned in March 1957.