field measurements, may have an appreciable influence on plant growth and development. The interaction of rainfall and drainage by gravity may help to explain the effects observed here. Following rainfall, which effectively cancels all moisture stresses, slow drainage extracts water from the top of the model while maintaining soil moisture at low tensions downslope.

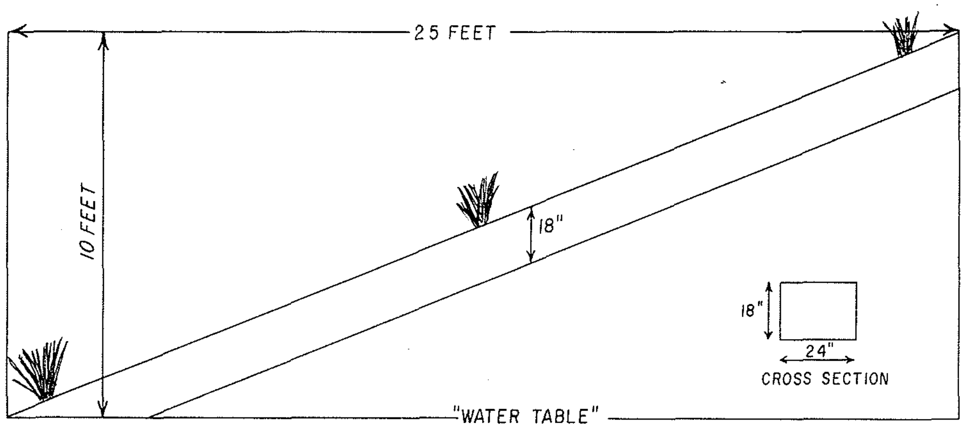

Figure 1. --Diagram of the soil model.

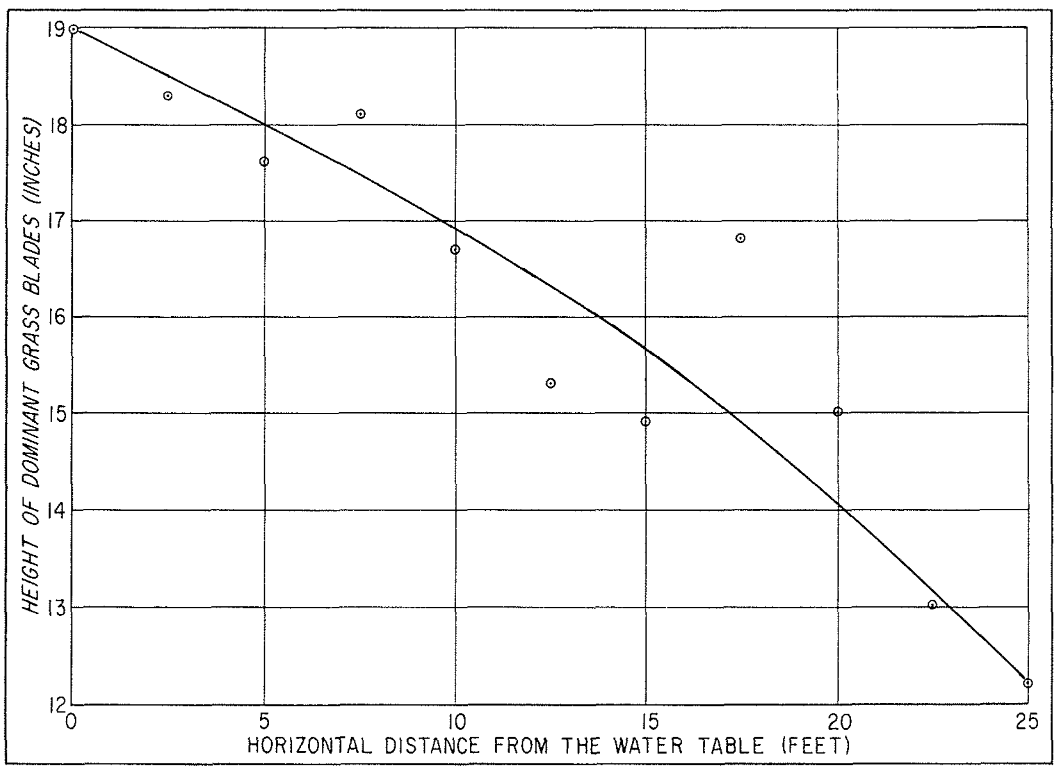

Figure 2. --Three months' growth of grass in relation to distance from the "water table."

John D. Hewlett
Coweeta Hydrologic Laboratory

RESEARCH NOTES
SOUTHEASTERN FOREST EXPERIMENT STATION
Asheville, North Carolina

Number 152 January 1961

RESPONSE OF FESCUE TO NATURAL MOISTURE GRADIENT ON AN ARTIFICIAL SLOPE

A study of drainage from a narrow, sloping, enclosed soil model planted to grass (*Festuca arundinacea*) revealed an interesting growth response to small moisture tension gradients (fig. 1). Although the model was well-watered during a 3-month observation period, growth of the grass was notably more vigorous at the lower end of the model, where a free-draining artificial "water table" was maintained. After 3 months' growth, average length of dominant grass blades decreased from 19 to 12 inches as elevation above the "water table" increased along a 40 percent slope from zero to 10 feet (fig. 2).

In preparing the model, the sandy loam soil was carefully mixed, tamped into place, and thoroughly soaked by sprinkling. After drainage from the model had ceased, small amounts of fertilizer and lime were spread by hand evenly over the surface, and grass was sown on August 12. Subsequent additions to soil moisture were from natural rainfall, which infiltrated readily. Measurements of soil moisture by the nuclear method indicated that the growing grass was subjected to moisture stress which varied with position on the slope despite fairly frequent rainfall. At no time did the average moisture stress as reflected by moisture contents at 9 inches depth exceed the one-third atmosphere percentage. A gradient in plant growth and density, quite obvious to the eye, developed during the period August 12 to October 19. Under the conditions of the experiment, it is most unlikely that the downward migration of nutrients caused this response.

Several workers have reported evidence that small increase in soil moisture stress within and above the field capacity range can cause appreciable reduction in plant growth. McKell, Perrier, and Stebbins[1/] have recently reviewed experimental work on this subject and at the same time showed that orchard grass (*Dactylis glomerata*) reduced growth rapidly and progressively as soil moisture stress increased from zero to about 3 atmospheres. The present study suggests that small, recurring moisture-tension gradients on natural slopes, undetected by most

---

1/ McKell, C. M., E. R. Perrier, and G. L. Stebbins. Responses of two subspecies of orchard grass (*Dactylis glomerata* subsp. *lusitanica* and *judaica*) to increasing soil moisture stress. Ecology 41: 772-778. 1960.