Apply as rapidly as soil will absorb the water.

Ohio State College Experiments show during 3 summer months 1½ times normal rainfall ample amount. At Amherst that means 18.16 in. or a 75 ft. diameter range sprinkler throwing 15 g.p.m. on 4,000 sq. ft. must operate a total of 50 hours during the season. This amount is probably excessive for New England.

VI. Late spring and early fall watering sometimes needed.

VII. Incorrect watering has cumulative bad influences which may not become prominent for three or more years.

Kentucky bluegrass becomes very thin from excessive watering.

VIII. Conclusion: Artificial watering of fine turf grasses is very beneficial if correctly done; otherwise, it may be very harmful.

More water requires more fertilizer and more frequent clipping, resulting in costs that are constant and seldom considered when planning a water system.

CHANGING THE SOIL STRUCTURE

By HOWARD B. SPRAGUE

Desirable soil structure is highly essential on turfed areas, from the standpoint of drainage and aeration, and of water-holding capacity. Soils naturally differ greatly in soil structure and subsequent treatments are responsible for further changes. Three vital factors affecting soil structure are the texture, lime content, and humus supply.

The natural differences in soil structure may be indicated by the water-holding capacity of 12 soils of three geographic provinces in New Jersey. These soils ranged from a capacity of 594 gal. of available water for a sandy soil to a depth of 6 2/3 in. over a surface of 1,000 sq. ft., to 1787 gal. for a silt loam soil. Not only did these soils differ in capacity to store water, but they also differed greatly in their ability to permit ready entrance of rainfall. Thus, Merrimac sandy loam allowed water to enter 7 times as rapidly as Wethersfield gravelly loam, under equal conditions. Obviously, the Wethersfield soil is a very inefficient soil, even though it has equal water holding capacity, as a

result of its failure to absorb rainfall readily.

The structure of soils may be considerably changed by treatment. In general, continuous cultivation has greatly exhausted the humus supply of our soils, and caused a breakdown in their granular structure. In many cases, lime has also been lost extensively and this has still further deflocculated the soil. Grass will gradually restore soil structure, to the depth of root penetration, provided the proper treatment is given. Improper management may be responsible for still further deterioration in structure even though the area is continuously in sod.

In a series of tests conducted at New Jersey on the same soil type, the continuous use of acid-forming fertilizers without the use of lime has had the following effect: (1) increased soil acidity and broken down soil granules, (2) caused a tremendous accumulation of roots, producing a sod-bound condition, (3) greatly reduced the capacity of the soil to permit entrance of water, and (4) seriously injured the turf in spite of continued watering.

By contrast, the use of a properly balanced fertilizer together with lime has produced a sod that is durable, strongly drought resistant, and capable of sturdy growth in both cool and warm weather.

Discing or spiking is a great aid in renovating soils with poor structure. It speeds up the penetration of lime applications and hastens the entrance of water. Without such treatment lime may lie stranded on the matted surface layer of grass crowns for a considerable period (several months or years) before actually reaching the soil and exerting a beneficial effect. Lime applied in late summer or early fall will be more effective than spring applications, since autumn rainfall is more likely to be favorable for washing the lime into the soil. Lime is slow in its action and at least 1 or 2 years will be required to exert a significant effect, when applied as a topdressing on established sod.

Organic matter additions are effective in changing soil structure only when incorporated in the soil itself. Topdressings of organic matter on established sod will not penetrate the soil to improve its structure or water-holding capacity. When incorporated with soil, organic matter is extremely effective in improving the structure of all classes of soil.