

Development of zoysiagrasses for turf purposes.

Development of Merion (B-27), a superior bluegrass.

Development of a national decentralized cooperative program of research and

education in turf management.

Research projects now being sponsored by the Green Section are designed to answer many of the knotty problems facing us today. Results will be published regularly in the USGA JOURNAL.

## COMPACTION, DRAINAGE AND AERATION

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The summer of 1949 was one of the most difficult seasons that many greenkeepers have experienced for the maintaining of turf. While the reason for the difficulty was most often considered to be weather conditions, observations made over a large part of the country indicate that compaction has been the major factor contributing to the loss of turf on greens. Many skilled greenkeepers are able to keep turf on their greens year after year in spite of poor soil conditions, but when a year like 1949 comes along, even the most highly skilled superintendent is hard put to keep his greens in good condition when any controllable factor is less than optimum.

Since 1945, one of the pet themes of the USGA Green Section has been *improved drainage and aeration*. Scarcely a turf conference has been held since 1945 which did not have on its program at least one paper pointing out the importance of good physical soil conditions together with good drainage and good aeration. The subject has been emphasized repeatedly here and in other magazines.

During 1947 and 1948 the Green Section effected a cooperative agreement with Saratoga Laboratories for the sole purpose of studying the physical soil factors associated with good putting greens and poor putting greens. The findings were reported in the USGA JOURNAL in June and July, 1949.

Inasmuch as many clubs have not taken steps to improve the physical soil conditions on their greens, perhaps it would be well to reiterate some of the principles involved.

Compaction of soil near the surface results from traffic of players on the green and from the operation of main-

tenance machinery. Some compaction of this kind is likely to occur regardless of the type of soil mixture used in building the green. This relatively thin layer of compacted soil can be broken up by regular spiking. Spiking may be accomplished by the use of hand-operated, hollow-tined forks or by the use of power-operated machines designed for the purpose.

A more serious type of compaction is that which occurs throughout the soil from which the putting green is built. This condition is built into a green by the use of a too-heavy soil mixture. This type of compaction can be corrected only by rebuilding the putting green and using a soil mixture which contains sufficient sand to preclude the possibility of compaction.

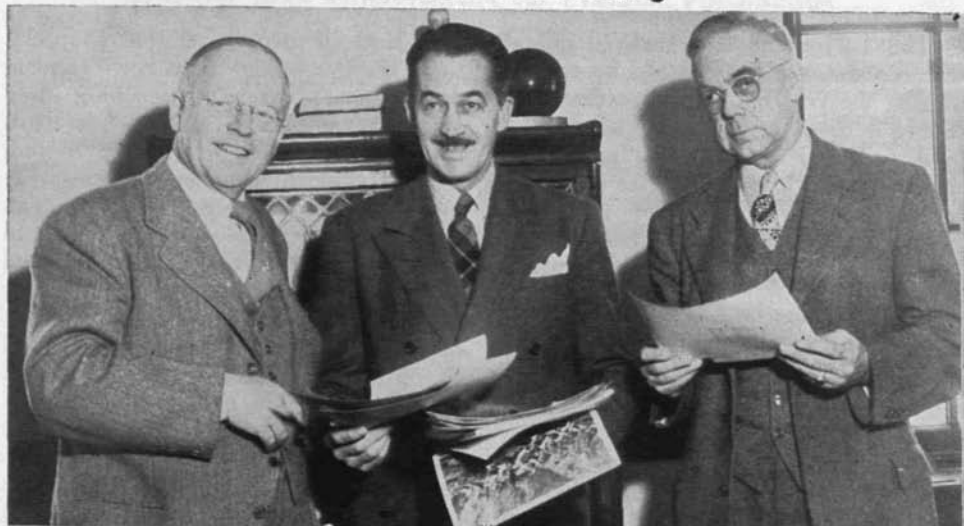
Compaction is detrimental to a putting green because of several reasons. First, a hard green is unacceptable from the players' standpoint. The greenkeeper is likely to over-water the green in an effort to soften it so it will hold a golf shot. Secondly, compaction interferes with the movement of moisture and air in the soil. Drainage is retarded and grass becomes unhealthy.

Another factor which contributes to poor drainage is layering in the soil. Any soil fraction used alone in topdressing a putting green will produce a layer. Such a layer will retard water movement by capillary action whether the layer be clay, sand or organic material.

Putting greens which are built on heavy soils require drain tile, a thick gravel blanket or both in order that gravitational water may be removed rapidly from the soil.

The above-mentioned drainage factors all pertain to internal drainage. Surface

## At Canadian Turf Meeting



*Ontario Agricultural College*

Turf scientists from the United States addressed the Royal Canadian Golf Association's Turf School at the Ontario Agricultural College. Three were, from left to right, O. J. Noer, Agronomist, Milwaukee Sewerage Commission, Milwaukee, Wis., Dr. Fred V. Grau, Director, USGA Green Section, and Dr. L. H. Dickinson, Agrostologist, University of Massachusetts, Amherst, Mass.

drainage is also highly important. Surface water should be removed from a putting green in at least two directions.

The effects of poor drainage necessarily are combined with the effects of poor aeration. Soil is composed of solid particles and pore spaces. The pore spaces are filled with air and water. In a normal soil in which plants thrive, the soil particles are surrounded by a thin film of capillary water and the remainder of the pore space is filled with air. In a compacted, poorly drained soil, water fills the entire pore space and air is excluded. Thus good drainage and good aeration go together. They cannot be separated.

It is well known that turf growing in a poorly drained soil develops a shallow root system. An equally important factor, though perhaps not so well recognized, is that the plant requires oxygen for the uptake of mineral nutrients from the soil. When air is excluded the plant suffers from malnutrition even though the soil may contain sufficient quantities of these essential elements for good growth.

It is therefore evident that compacted, poorly drained, poorly aerated soil produces weak, shallow-rooted plants. Turf thins out, unfavorable weather produces scald and diseases are extremely difficult to control. Turf in such a weakened condition is easy prey for any pest.

In the preceding paragraphs no mention has been made of water management. Water management can be the salvation or the downfall of a greenkeeping superintendent. Many are so highly skilled in this phase of greenkeeping that they are able to grow good turf even under adverse conditions. However, it is generally recognized that greens which are constructed and maintained with proper regard to drainage can suffer a great deal more abuse from faulty watering than can a green which is poorly drained.

It is hoped that clubs which suffered last year from unusual weather conditions will take steps to remedy faulty conditions and that they will be better prepared for the next period of unfavorable weather.