

### Effect of Rootzone Material and Depth on Moisture Retention In USGA Type Putting Greens

B.R. Leinauer, P.E. Rieke, T.A. Nikolai, D.E. Karcher, J.R. Crum, and R.N. Calhoun  
Department of Crop and Soil Sciences

Many new putting greens are constructed according to USGA specifications that call for a sandy rootzone mix over a pea gravel layer (or over an intermediate sand layer). This holds water above the interface between the rootzone mix and the pea gravel (often the perched water table) plus it provides desirable aeration, resistance to compaction, water retention, and drainage in the top mix. However, there are two distinct phenomena that limit turfgrass vigor, especially when constructed with an undulating design. These phenomena, "Localized Dry Spot" (LDS) and "Black Layer", can both directly be related to moisture extremes in the soil: dry, and very likely water repellent conditions on the elevated areas; and wet and soggy conditions in the low areas of the green.

Specifications for the rootzone mix of USGA putting greens require that the sand mixture be placed at a uniform depth of 12" across the entire surface of the green. In a green constructed in this manner it is likely that there will be lateral flow toward the lower part of the green that occurs above the interface between the top mix and the underlying coarser material. Lateral flow occurs in sloping soil profiles when gravitational forces acting on the water become greater than the capillary forces in the soil, but not great enough to cause immediate downward drainage from the top mix. This lateral flow causes lower water contents in high areas of the putting green resulting in dry soil conditions and susceptibility to LDS. The water flows to the lower parts of the green and may cause higher water contents closer to the surface in the same green. This is the location where Black Layer most frequently occurs.

A study funded by the M.T.F. and supported by several companies in the turf industry in Michigan was initiated in summer 1997 to study the effects of different rootzone materials (sand, sand/peat, and sand/soil) and depths on water flow and soil moisture content in a sloped USGA putting green. Altering the rootzone depth, decreasing it in high areas and increasing it in low areas, will increase the water content near the soil surface in high areas and decrease the water content of the rootzone mix in low areas. This should subsequently relieve areas of elevation extremes from moisture stress and decrease the possibility of LDS or Black Layer occurrence.

The 120' x 80' sized research green was built in spring 1998, with a 3% slope facing South and a 7% slope facing North. The green is divided into twelve 8' x 80' plots. Six of the 12 plots are built with an uniform rootzone depth of 12" over the entire area, and the remaining six have a depth of 16" in the low areas and 8" in the high areas. There are three root zones: 100% sand; 80% sand:20% peat; 80% sand; 20% soil with 2 replications of each. The green was seeded to L-93 creeping bentgrass.

Research is currently under way to evaluate the effects of the 1) root zone materials, 2) depth of top mix, and 3) slope on soil moisture content at various depths, water movement in the green, and turf quality in a USGA putting green. The results will provide a better understanding of water flow and drainage in these greens, and will help gain insight into their irrigation needs. Initial observations indicate the bentgrass has grown in most rapidly on the sand:peat mix while the sand green has been slowest.

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