Taking a Closer Look at Rootzones

By Michael DePew

Do you wish you could take a really close look at your soil to see its structure in detail and how it changes over time? There's a new tool being applied to the study of sports turf rootzones that can do so: soil micromorphology.

Soil micromorphology relies primarily on two basic imaging technologies: the petrographic microscope and the electron microscope.

Petrographic microscopy utilizes specially prepared soil thin sections and a polarizing light microscope with a rotating stage. It produces microphotographs (micrographs) with a scale of resolution up to 100x.

Electron microscopy utilizes an electron beam to produce an image of the soil material. Common electron microscopes may produce images up to 200,000x.

When combined with quantitative physical and chemical evaluation, soil micromorphology becomes an especially powerful tool for analyzing rootzones. Yet, it has only recently been applied to the research and development of sports turf rootzones. At Texas A&M University, for instance, it has been used to investigate the effects of synthetic-fiber rootzone reinforcement materials. In cooperation with ProTurf Environmental and Sports Turf Services, L.C., Brigham Young University is using micromorphology to investigate sand-based rootzones and the pedological changes (changes over time) that lead to detrimental physical and chemical performance characteristics.

Readers with questions about this technology can obtain more information at the 1998 STMA conference in Orlando. A conference session will outline the uses of soil micromorphology in the study and development of sports turf rootzone technology. Readers are also invited to contact the author directly.

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Electron micrographs from about 7.5 cm depth show treated and untreated sand-based rootzone profiles. The treatment in this study was the incorporation of an interlocking-mesh synthetic-fiber system for rootzone stabilization and enhancement. The top image from the treated rootzone profile shows quartz sand grains with some thin and discontinuous clay coatings. Conversely, the untreated rootzone shown in the lower image exhibits extensive clay coatings and bridging over and between sand grains.

continued on page18

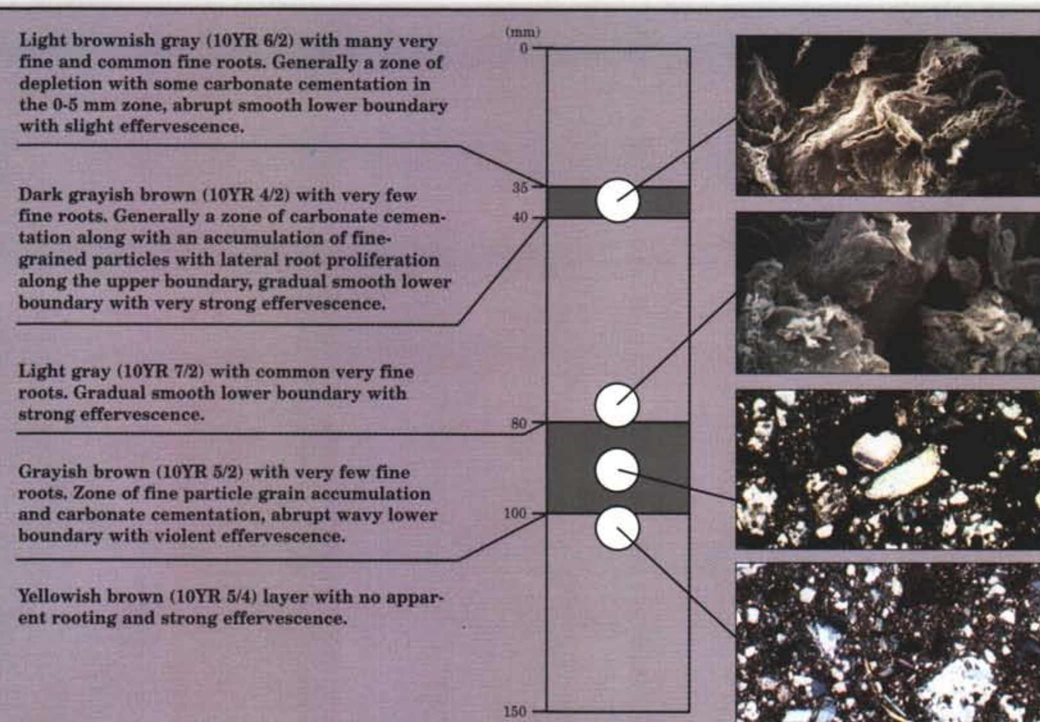

Figure 2. Micrographs imaged in cross-polarized light provide micromorphic detail to a profile diagram of a sports turf rootzone construction. Micrograph A (top) illustrates a layer of fine-grain quartz particles with carbonate cementation and remnants of amorphous iron sulphide framboids indicative of black layer occurrence. Micrographs B-D illustrate a cemented layer at 80-100 mm range. Note differences in grain sorting at the upper boundary illustrated in B and the lower boundary illustrated in D.

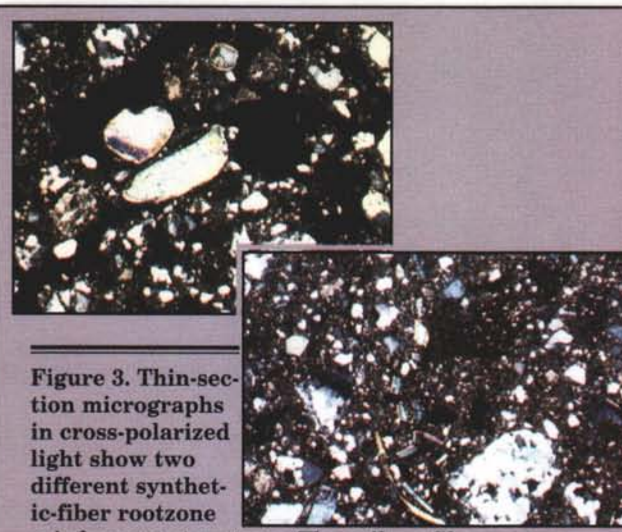

Figure 3. Thin-section micrographs in cross-polarized light show two different synthetic-fiber rootzone reinforcement systems. The soil profile was constructed with a sand/soil mixture. The top image shows interlocking mesh fibers. The continuous network of pores associated with the mesh/soil interface is apparent by the appearance of the black void space around the synthetic fibers. The lower image shows incorporation of thin fibers that are much less resilient and do not form an interlocking network in the soil profile. These smaller fibers simply "float" within the profile with no fiber/soil interface interactions apparent. The smaller fibers seem to increase the internal friction of the soil without altering the dynamics of the soil structure.