Sportsfield Drainage: Learning From Mistakes (Case 2) by Dr. Bob Sheard ♦ Tired Soil: Using Inorganic Soil Amendments to Perk up Your Root Zone by Paul Grünthal

Sportsfield Drainage: Learning from Mistakes (Case 2)

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An Ontario soccer club was successful in raising money to develop an outdoor sports facility designed to have several soccer fields. Provincial and municipal support was received contingent on the club obtaining the necessary environmental clearances and providing the city with a site development plan. A landscape architect was engaged to provide the necessary clearances and plans—plans which met with city approval. Following this initial work, few financial resources were left to develop the first field. A sketch of the soil profile and minimal directions were provided to the club by the architect.

The architect suggested removal of the surface 15 cm of topsoil, which was a clay loam, shaping the field to 2.0% grade at centre field for drainage, placing a 10 cm layer of sand over the entire field, and then replacing the topsoil (Figure 1).

During late April and early May, spring fertilization and mowing of the establishing grass were delayed due to wet conditions on the field. Any maintenance operations which were attempted resulted in severe rutting by the tractor. Later in July and August, the field became very dry and hard as no irrigation was available and the grass was in poor condition. Turf outside the field, however, remained in relatively good condition as rather timely rains were experienced throughout the area.

Coring revealed the subgrade below the sand layer was not penetrable with a hand soil probe.

What Went Wrong?

There were two major errors in design and construction. The major problem was the sand layer below the topsoil which created two zones of pore size discontinuity. The first zone was between the subgrade and the sand layer. At the interface of the subgrade and the sand there is a change from relatively large pores in the sand to very small pores in the subgrade. As often happens in sports field construction, the earth moving was done in the fall under wet conditions with large-size, earth moving machinery. This operation resulted in a compacted subgrade with further reduction in porosity through which one would expect a very low rate of water movement. Thus, winter snows and spring rains would keep the sand layer saturated for a long time in the spring. In turn, the water in the saturated sand layer would rise into the topsoil by capillary action, keeping the surface soft and resulting in the observed rutting by the tractors.

The second zone of pore size discontinuity occurred at the interface between the sand layer and the topsoil. Here the discontinuity is in the reverse direction where relatively fine pores in the topsoil overlay large pores in the sand. Initially in the spring, drying out would be delayed because a perched water table would develop in the topsoil at this interface, adding to the wetness of the surface. When the system finally dried out during midsummer, capillary flow of water from the subgrade upwards through the sand to the topsoil would be interrupted resulting in the turf having to rely only on the available water stored in the 15 cm of topsoil.

The second error in the design was the use of an excessive crown as a substitute for drainage. Although a 2.0% grade would effectively shed most of the water if the field were a bare parking lot, a dense turf, the prime prerequisite of a good soccer field, is the best system known to soil conservationists to prevent run-off. If run-off is prevented through the turf cover, the water which falls on the surface must infiltrate the soil surface and be removed by natural or artificial internal drainage systems. While a crown may be of value in a parking lot, it adds little to the drainage of a sports field.

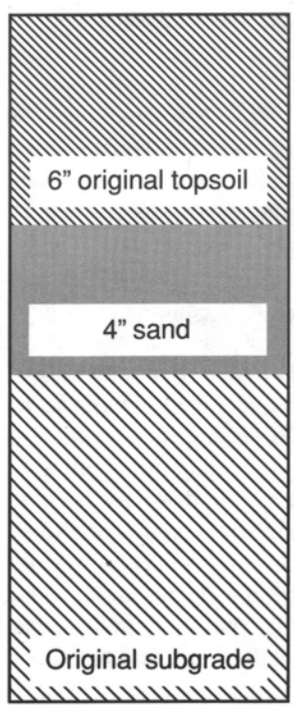

Figure 1: A schematic drawing of the soil profile of the soccer field.

The architect suggested removal of the surface 15 cm of topsoil, which was a clay loam, shaping the field to 2.0% grade at centre field for drainage, placing a 10 cm layer of sand over the entire field, and then replacing the topsoil. So, what went wrong?