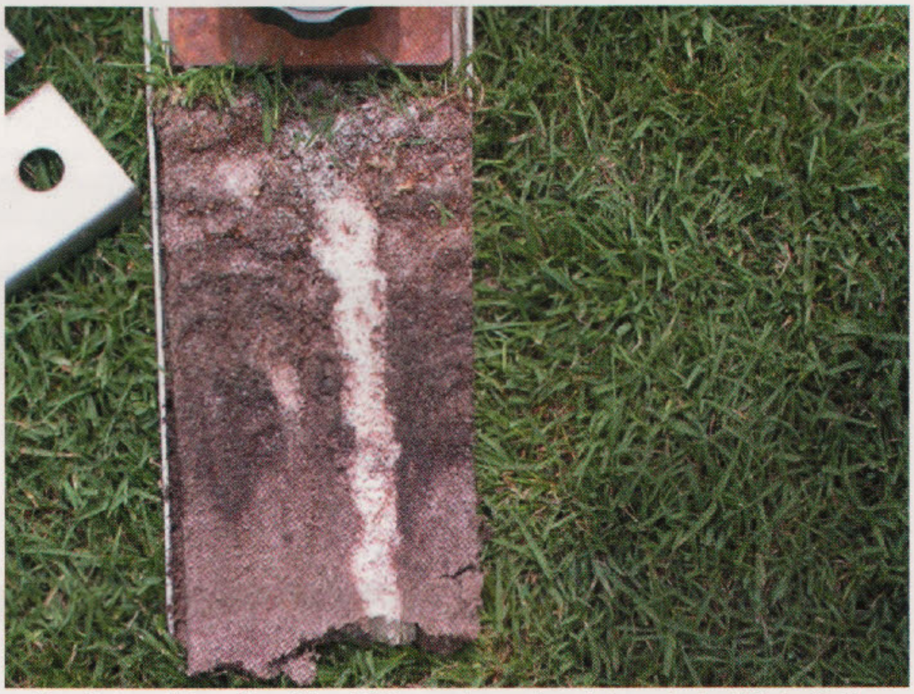
# Managing sand-based athletic fields

By John Sorochan, Ph.D.

Rootzone selection and developing sound management practices are two important components to maintaining quality athletic fields. Specifically, constructing a sand-based athletic field and properly implementing the primary cultural practices of irrigation, mowing, fertilization, and cultivation will help maintain the most consistent turfgrass playing surface.

Generally, the rootzone of an athletic field is either native soil or sand-based. Native soil rootzones high in silt plus clay provide exceptional soil strength (soil stability); however, traffic from play often causes poor drainage and soil compaction. In contrast, sand-based rootzones provide smooth and uniform playing surfaces that resist compaction and have adequate drainage. However, sand-based rootzones typically have low nutrient and water-holding capacities. In addition, sands lack cohesion that can cause stability problems.

Variables to control stability problems associated with sand-based rootzones include: particle size distribution, average particle size, particle shape, soil density, and soil amendments.



Campbell used deep tine drill and fill to create a series of channels, backfilled with the original sand blend, for water infiltration.

A well-graded rootzone in which there is a significant distribution among sand particle sizes is preferred for sand-based athletic fields. Research by Dr. Jason Henderson (Asst. Professor, University of Connecticut) as a graduate student at Michigan State University determined that a sand-based rootzone with 10% silt plus clay will provide both soil stability and adequate drainage for athletic fields. The sand content root zone near maximum density will retain macro pore space (air-filled pores) for rapid drainage, and the addition of about 10% silt plus clay will provide the soil stability and the increase in nutrient and water holding capacity. Unfortunately, the high costs and the quality of available native soil to mix with the sand rootzone can often limit blending the two.

In contrast to athletic fields, the United States Golf Association specifications for putting green construction limit the amount of silt plus clay percentages (not more than 5 and 3%, respectively) that can be used in order to provide the desired infiltration (drainage) rates. In addition, very fine sand can not be more than 5%, and the very fine sand and silt plus clay can not be over 10% of the total rootzone mix.

Because the expectations for the use of an athletic field playing surface are extremely different than that of a putting green surface, it makes sense that Dr. Henderson's research recommends slightly higher percentages of silt plus clay. The higher silt plus clay percentages reduce soil infiltration rates, but provide firmer and more stable playing surfaces.

In addition to building a sand-based athletic field properly, implementing the primary cultural practices of irrigation, mowing, fertilization, and cultivation will help maintain the most consistent turfgrass playing surface. Typically, sand-based athletic fields require more frequent irrigation compared to a native soil athletic field because of the low water holding capacity.

Turfgrass water requirements will vary depending on the time of year and weather conditions. Actively growing turfgrasses will generally require about 1 to 1 1/2 inches of water per week. The water used by a turfgrass plant is predominantly absorbed by the roots from the soil and can be supplied via natural rainfall events and supplemental irrigation.

The amount of water that needs to be applied by supplemental irrigation will depend on how much water is available in the soil and how much the turfgrass demands. For example, irrigation applications will be more frequent during sunny days with high temperatures, low humidity, and high winds then during cloudy days where humidity levels are high and temperatures are cool. Thus, any factor that contributes to the turf transpiring more (using more water) and the soil losing moisture via evaporation would warrant increased irrigation scheduling. Therefore, it would not be accurate to suggest irrigation once, twice, or three times per week because weather patterns change frequently. Instead, irrigation requirements should be monitored daily for turf watering needs.

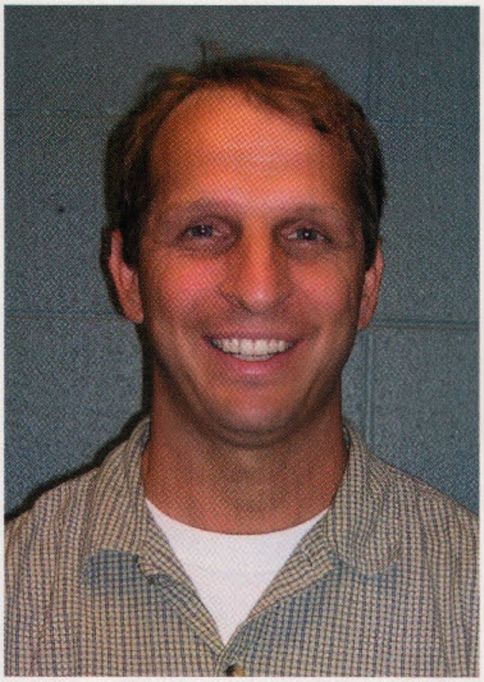
Soil nutrient tests should be conducted regularly and subsequent fertilizer applications should be done for any nutrient deficiencies that occur. Nitrogen fertility for sand-based rootzones should be more light (low N) and frequent if using water-soluble nitrogen fertilizers because of the low nutrient holding capacity. Using slow release nitrogen fertilizers such as polycoated urea can reduce application frequencies and allow for increased nitrogen rates.

Mowing should be done regularly enough to not exceed the one-third rule. This rule states that no more than one third of the leaf material should be removed at any mowing. Optimal mowing heights for cool-season athletic fields (Kentucky bluegrass and perennial ryegrass) are between 1 and 2 1/2 inches and 3/4 to 1 and 1/4 inches for warm-season athletic fields (bermudagrass and zoysiagrass). In addition, regular mower maintenance including reel or blade sharpening will assure that the highest quality of cut.

**TYPICALLY, SAND-BASED ATHLETIC FIELDS REQUIRE MORE FREQUENT IRRIGATION COMPARED TO NATIVE SOIL ATHLETIC FIELDS BECAUSE OF THE LOW WATER HOLDING CAPACITY.**

Turfgrass vigor increases with the proper implementation of irrigation, fertility, and mowing practices; therefore, as turfgrass vigor increases, irrigation, fertility, and mowing requirements also increase. Sand-based athletic fields typically do not become compacted; however, layering problems as a result of organic matter accumulation often occurs over time. Regular cultivation practices of aerification and topdressing are required to dilute organic matter accumulation and potential layering problems that buildup.

Whether it is Kentucky bluegrass or bermudagrass, organic matter accumulates as a result of decomposing roots, rhizomes and/or stolons, and clippings contribute to an increase in organic matter at or near the rootzone surface that can over time impede infiltration rates. This problem is especially pronounced on overseeded bermudagrass



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athletic fields in the transition zone and southern climates where turfgrass growth from both cool and warm-season turf occurs 10 to 12 months of the year.

For example, Shields Watkins Field at Neyland Stadium in Knoxville was constructed with a sand-based rootzone that had 0.5% organic matter by weight. Over a 10-year period, even with regular core aerification and sand topdressing, a 4-6% organic matter layer by weight formed in the top 5 inches of the 12-inch rootzone.

For Bob Campbell, University of Tennessee Athletic Field Manager and past president of STMA, the increase in organic matter was not high enough to significantly cause drainage problems, but infiltration rates decreased from the original rates. Because Shield Watkins Field is an overseeded athletic field, organic matter accumulation for the two turf species being used accumulates for 10 months of the year. Compounding the problem is the fact that core aerification was only be done during the early summer and regular sand topdressing amounts and frequencies are limited due to the fall football season.

Since the organic matter accumulation occurred over a 5-inch depth, conventional core aerification can not penetrate deep enough to break up the layering profile, but coupled with sand topdressing the percent organic matter accumulation is diluted. In order to address the layering issue, Campbell used deep tine drill and fill to create a series of channels, backfilled with the original sand blend, for water infiltration. The increase in organic matter was not necessarily a major problem, but was an issue that needed to be dealt with in regards to water infiltration. Conversely, the increase in organic matter by weight over time has helped increase the nutrient holding and water hold capacities of the rootzone.

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