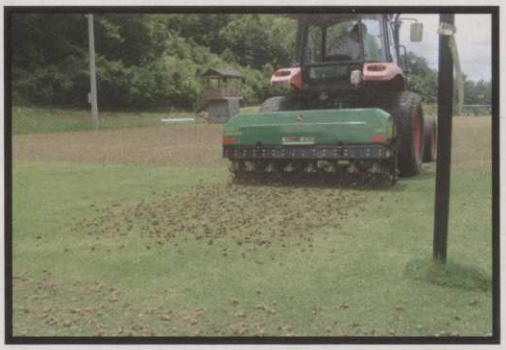
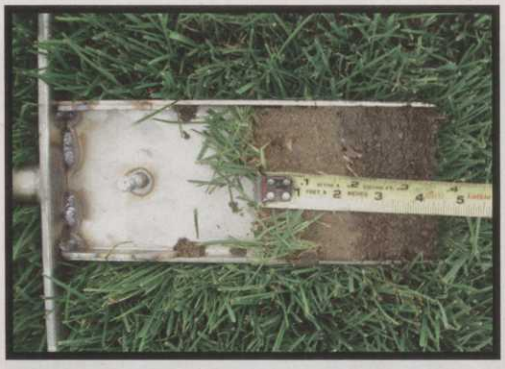
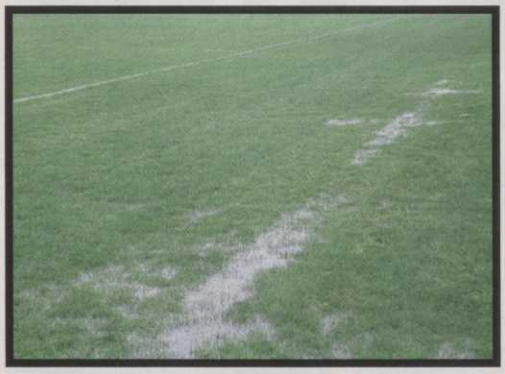


>> **CORE CULTIVATION (above)** coupled with sand topdressing **(below)** is a common practices for alleviating surface compaction and improve drainage. Photos provided by Alec Kowalewski and James Crum.



>> **Above: TWO INCHES** of sand topdressing accumulated on a native soil athletic field over two consecutive growing seasons, photo provided by Ed Everett.



>> **Above: STANDING WATER ACCUMULATES** on the sidelines of a well-managed athletic field without drain tiles despite a significant sand layer developed from frequent topdressing applications.

Selecting the proper topdressing material for your athletic field

BENEFITS OF SAND-BASED ATHLETIC FIELD SYSTEMS include a foundation that is not only resistant to compaction, but also capable of maintaining stability and rapid infiltration during periods of heavy rainfall. However, sand-based athletic fields are particularly susceptible to organic matter accumulation. Effects of excessive organic matter accumulation on sand-based turfgrass systems include decreased infiltration and hydraulic conductivity, diminished air filled porosity, which compromises gas exchange, and reduced root development and growth.

Core cultivation and vertical mowing coupled with frequent sand topdressing applications are often used to combat organic matter accumulation. Sand topdressing can also be used to improve the physical characteristics of native soil athletic fields high is silt and clay, which would otherwise provide relatively slow infiltration, have poor stability during periods of saturation and be liable to compaction. Aggressive sand topdressing (as much as 1.0-inch applied over 3.5 months), or sand-capping, can provide a cost-effective alternative to complete field renovation.

Research conducted at Michigan State University, East Lansing, MI and case study analysis have determined that intercept drain tile installation and a cumulative topdressing depth of 2.0-inhces can substantially improve native soil athletic field drainage and playability for $66,000 to 72,000 (estimates include irrigation and drain tile installation, as well as topdressing material and application). For field managers with substantial budget restrictions, topdressing alone can significantly improve playability and drainage; however, these fields will likely develop standing water along the sidelines and in low lying areas during periods of heavy rainfall.

SELECTING THE PROPER TOPDRESSING SAND

The amount of topdressing material necessary to develop a 2.0-inch sand layer over a standard high school football

Table 1

	Topdressing Material Recommendations for Athletic Field Use[w]	Alternative recommendations and specifications	
		USGA (2004) root-zone[w]	ASTM (2004) root-zone[w]
	Sieve fraction sand particle diameter (% retained)		
Fine Gravel (>2.0 mm)	<5%	<3.0	< 20.0
Very Coarse Sand (1.0-2.0 mm)	5-15%	≤ 10.0	< 20.0
Coarse Sand (0.5-1.0 mm)	20-30%	≥ 60.0[x]	25 to 50
Medium Sand (0.25-0.5 mm)	30-45%		> 25.0
Fine Sand (0.1-0.25 mm)	10-18%	≤ 20.0	< 10.0
Very Fine Sand (0.05-0.1 mm)	2-5%	≤ 5.0[y]	< 5.0
Silt (0.002-0.05 mm)	2-5%	≤ 5.0[y]	< 5.0
Clay (<0.002 mm)	2-5%	≤ 3.0[y]	< 3.0
Cost of material meeting these recommendations[z]	$30 per 1,000 lbs	$20-25 per 1,000 lbs	

field equates to roughly 600 tons, costing $12,000 to $36,000 depending on material specifications and availability. Field managers should be aware that not all topdressing material will provide the results they are looking for, i.e. improved infiltration rates and surface stability. For instance, topdressing sand containing excessive amounts of course particles, and poorly graded sand, which may be as cheap as $10 per 1,000 lbs, will compromise stability. Sands containing more than 10% silt (0.002 to 0.05 mm) and clay (<0.002), on the other hand, will compromise drainage (Table 1).

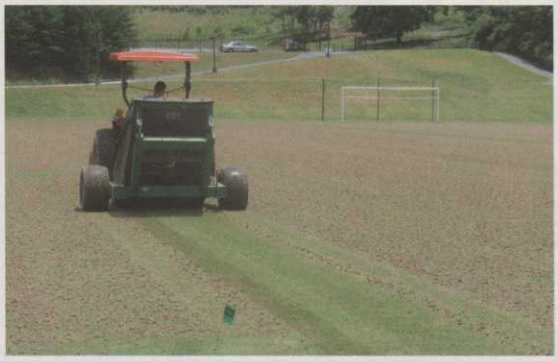
When shopping for topdressing material have a physical analysis done before selection, look for well-graded sand, with <5.0% fine gravel (>2.0 mm) and ≤ 10% silt+clay. The "Topdressing Material Recommendations for Athletic Field Use" (Table 1) suggest 2-5% very fine sand (0.05-0.1 mm), 2-5% silt and 2-5% clay. Material meeting these recommendations will increase the stability of the sand, without compromising infiltration rates. Materials meeting these standards will likely be a specialized soil blend for athletic field use and cost around $30 per 1,000 lbs. Field managers may also opt to use topdressing that conforms to USGA (2004) rootzone recommendations, which are designed to maximize drainage.

Sands conforming to USGA recommendations may have little to no fine material (<10% very fine sand, silt and clay combined), which may reduce surface stability in comparison to materials conforming to "Topdressing Material Recommendations for Athletic Field Use." However, field managers in locations that receive heavy rainfall may be willing to compromise some stability for maximum drainage. Topdressing material conforming to USGA recommendations will likely be readily available and cheaper ($20-25 per 1,000 lbs) than the specialized athletic field soil blend previously discussed.

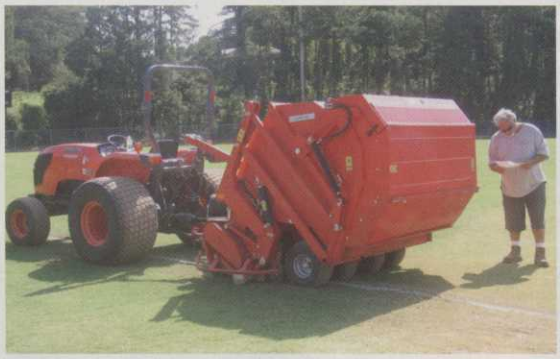
PREVENTING SOIL CONTAMINATION

After an adequate sand layer (2 inches) has been accumulated over time, light topdressing (0.25-inches annually) and annual cultivation should be used to prevent the accumulation of organic matter on the playing surface. If hollow or side-eject tines are used for cultivation purposes, special care must be taken to remove soil cores or prevent tines from penetrating to depths greater than the sand topdressing. If native soil is excavated by the hollow tines and deposited on top of the sand layer they must be removed to prevent the drainage system from being compromised by the poorly draining subsoil. A simple alternative to prevent this problem from occurring would be verticutting, which would allow field managers to address organic matter accumulation without disrupting the soil profile. For best results the selected cultivation method should be coupled with sand topdressing, pairing these cultural practices will ensure that the voids created by cultivation are filled with sand, allowing the system to maintain rapid infiltration rates in the long run.

It is important to note that field managers and topdressing suppliers should work together regularly testing material to ensure that topdressing specification remain consistent over time. If a field



>> **Above: IF CORE CULTIVATION DEPTH** penetrates the topdressing layer, or sand-cap **(top photo)**, these cores should be removed to prevent drainage from being compromised by the native soil that is brought to the surface.



>> **Above: WHEN CULTIVATING** a built-up sand-capped field with a sand depth of 2-inches or less, verticutting is an easy alternative to core cultivation that will not disrupt the soil profile.

manager is forced to switch to an alternative topdressing material it is essential to select a material with the same or lower proportions of fine material; fine sand (0.1 to 0.25 mm), very fine sand, silt and clay. Placing material containing a greater amount of fines over your existing sand will result in poor space discontinuity, which will decrease surface infiltration rates and produce a perched water table affect.

COST-EFFECTIVE CRUMB RUBBER USE

Crumb rubber, while being substantially more expensive than sand topdressing ($1,000 per 1,000 kg) has been shown to significantly improve turfgrass wear tolerance in extremely high foot traffic areas, when sand topdressing may no longer be affective. Due to the cost restraints associated with this material application is often restricted to localized high traffic areas, such as sidelines and soccer goal mouths. Current recommendations suggest small-particle size crumb rubber (0.05 to 2.0 mm) applied at a 0.25-inch depth (223 kg per 1,000 ft2) per application until a cumulative depth of 0.75 to 1.0-inch is achieved.

RECOMMENDATIONS

When using sand topdressing to develop a built-up sand-capped athletic field system field managers should strive to apply a 1 inch depth of sand topdressing over a 3.5 month period, with a cumulative depth of 2 inches, which is attainable in as little as two growing seasons. After this depth is achieved apply 0.25-inches of sand topdressing annually, coupled with core cultivation and/or vertical mowing to mitigate organic matter accumulation. When selecting a topdressing material field managers looking to improve stability and drainage should select materials that adhere to "Topdressing Material Recommendations for Athletic Field Use" (Table 1). While field managers looking to maximize drainage should select sand that conform to USGA recommendations for a method of putting green construction (USGA, 2004). ■

>> **THIS PHOTO** illustrates the perched water table affect that can result from applying a topdressing material with a greater amount of fine particles; fine sand, very fine sand, silt and clay, over sand with a greater proportion of coarse material.

>> **CRUMB RUBBER** is an excellent topdressing material for high traffic areas were sand topdressing may no longer affective; however, it is cost prohibitive ($1,000 per 1,000 lbs) in comparison to sand topdressing ($20-30 per 1,000 lbs, depending on specifications and availability).

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