The Built-Up Sand-Capped Athletic Field System

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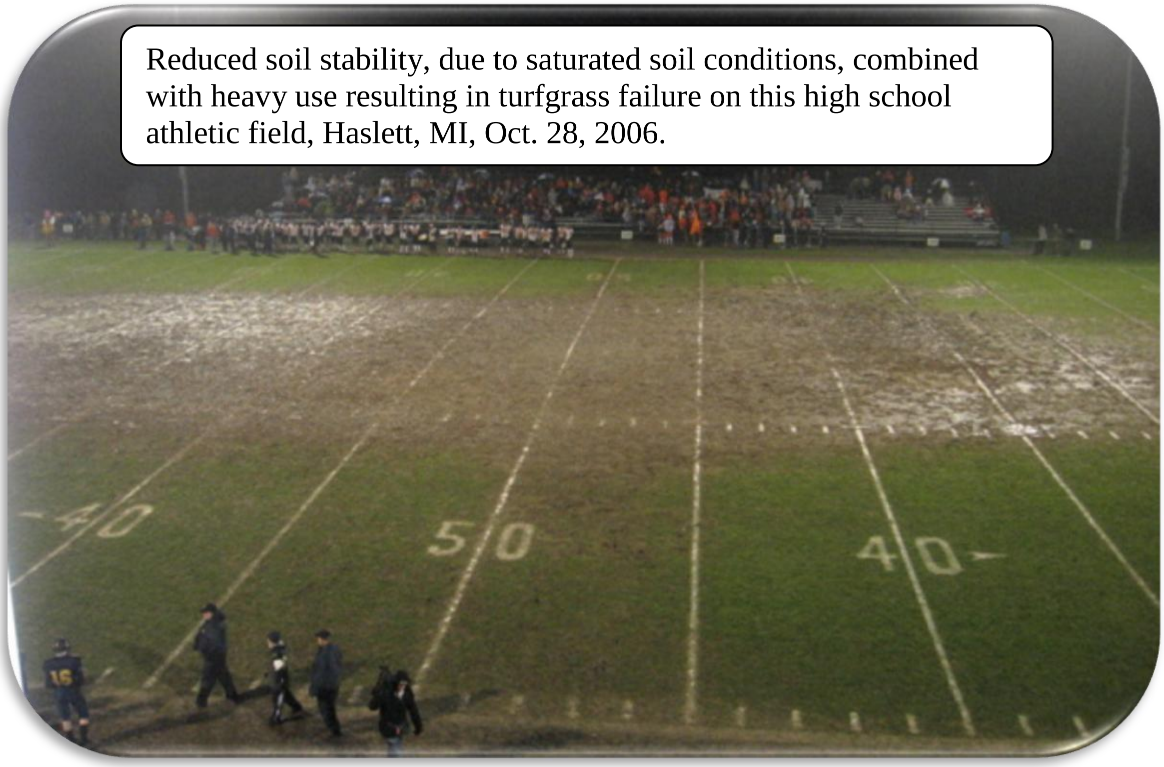
The typical high school athletic field serves as a focal point for social gatherings and adds to a sense of community pride. It is typically one of the few fields in town with lights, making it host to a variety of after school and work events including football, lacrosse, soccer, cheerleading, and band. Therefore, having an aesthetically pleasing and functional high school athletic field is often important to a variety of members in the average community.

Okemos high school soccer field, Okemos, MI, May 20, 2009, renovated using the *Built-Up Sand-Capped System* in May 2008.

The Problem

In order to have a significant number of events on a natural playing surface and provide reasonable playing conditions throughout the fall, regardless of weather conditions, the root-zone must be primarily sand-based. Unfortunately, the majority of high school athletic fields are constructed on native soil. These fields rely on surface drainage during periods of heavy rainfall, failing to provide adequate drainage of surplus water. Saturated field conditions substantially reduce soil cohesion if the native soil is high in silt and clay, adversely affecting traction and stability. Reduced stability in combination with heavy use in the typical fall athletic season results in turfgrass failure, decreased overall playability and diminished visual aesthetics.



Reduced soil stability, due to saturated soil conditions, combined with heavy use resulting in turfgrass failure on this high school athletic field, Haslett, MI, Oct. 28, 2006.

The Solutions

Current solutions to this problem include complete field conversion to a synthetic or sand-based turfgrass system.

Synthetic Field: The first, most expensive, option is the installation of a synthetic athletic field, which ranges from $600,000 – 1,000,000. The typical annual maintenance cost of a synthetic field is $5,000 – $22,000.

Sand-Based Field: The second option is a conventional sand-based field with a gravel drainage layer will cost from $400,000 - 600,000, and take your field out of play for half of the year. This involves excavating 12-16” of soil and installing drain tile, a 4” gravel layer and a 12” sand based root zone. This type of field has an annual maintenance cost of approximately $25,000.

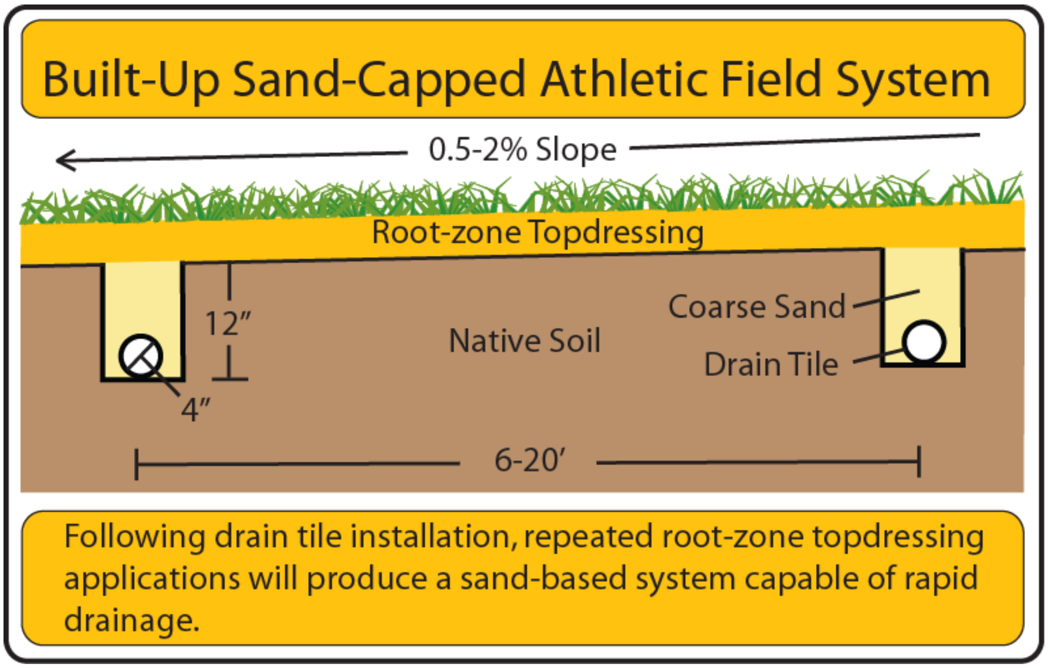
Sand-Cap Model: The third option for sand-based athletic fields is the sand-cap model, which has been employed many times in Michigan under the direction and guidance of Dr. John N. Rogers and MSU over the last 7-years, and can cost from $150,000 - 300,000. This method is less expensive because only a small layer of topsoil (2-5”) is removed from the field, and replaced with a 5-6” layer of specifically blended high sand-based root-zone material. This sand material should be well-graded; particles distributed across a range of sizes, containing approximately 90% sand – 10% silt+clay, to optimize stability and drainage. The turfgrass is then reestablished from seed, which can take up to an entire growing season to be ready for use.

Built-Up Sand-Capped System: The fourth, least expensive, option is an alternative to complete field renovation using drain tile installation and subsequent sand topdressing, providing a *"Built-up" Sand-Sapped System*. The *Built-Up Sand-Capped System* is a cost effective renovation procedure, which can be done for approximately $58,200-103,800 [price includes irrigation system installation ($15,000), 6-20' drain tile spacing ($60,000-14,400, respectively), and 2 inch sand topdressing layer ($28,800; labor and material) accumulated over time], that does not take the field out of play. Annual maintenance cost for a field such as this is approximately $8,000. Improving the playing surface with this renovation process will substantially reduce the annual maintenance budget of a typical field ($8,000 to $25,000), because annual reestablishment, whether it be by seed or sod, is no longer necessary.

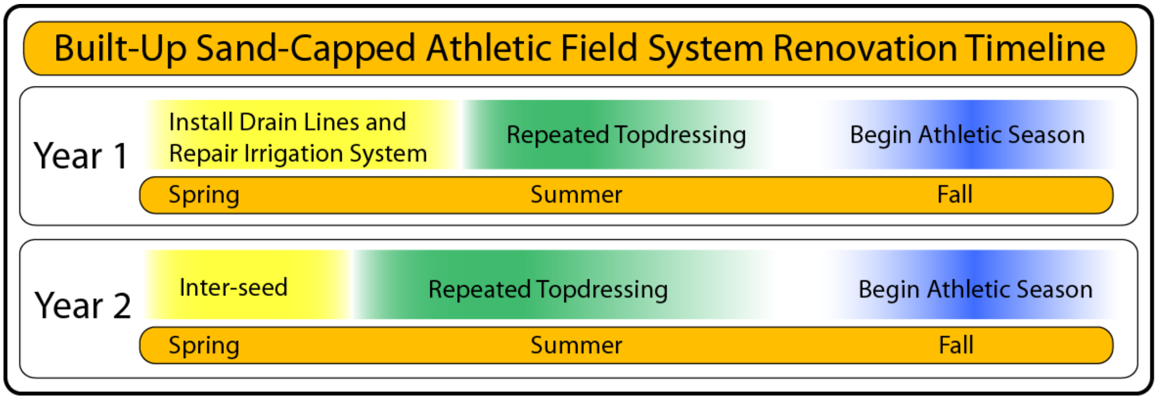
Left: Cutting drain lines and installing drain tiles, Intramural Field, Michigan State University, East Lansing, Michigan, July 200.
Right: Sand topdressing being applied at Haslett High School, Haslett, Michigan.

The 2010 Michigan Sports Turf Managers Association Field of the Year, Okemos, MI, Sep. 11, 2009, renovated using the *Built-up Sand-Capped System* in May 2008.

The concept behind the *Built-Up Sand-Capped System* is to combine the advantages of the sand cap system (drain tiles and a sand-based root-zone) while providing almost uninterrupted availability. The idea is to cut drains in the existing field running lengthwise on 6-20' centers depending on the surface grade and slop, put drain tile in the lines, back fill with pea stone and then sand, or a coarse sand alone. After the drain lines have been backfilled to field level with sand they will need to be fertilized, with a controlled release product, seeded and mulched, with a product like HydroMulch, PennMulch or straw, to ensure repaid turfgrass establishment. At this time it is important to correct any low (wet) spots in the existing slope by leveling them with topsoil; soil removed during drain line installation would be appropriate for this task. Subsequent repair to any irrigation line damage is necessary. Following this begins an aggressive topdressing program during the summer using the well-graded 90% sand – 10% silt+clay root-zone material descried earlier.



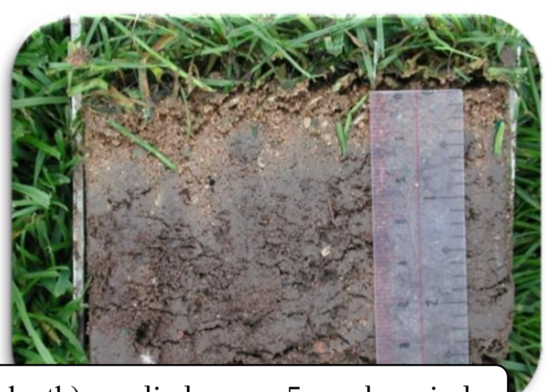
Root-zone topdressing would be coupled with annual field maintenance, including inter-seeding, fertilization, cultivation, and etc. The goal would be to add at least 2" of root-zone as fast as possible without compromising fall time playing quality. Therefore, if renovations were done in the spring on a field in the Midwest the topdressing program would begin in early June and go only through early August, with each inch of well-graded root-zone material costing about $14,400 ($6,000 labor and $8,400 materials). The topdressing stops in early August to allow the recently applied topdressing to settling prior to fall use. During the first year the root-zone may not reach a depth necessary to prevent saturated surface conditions, particularly in low lying areas, but the drain tiles will prevent standing water from developing, providing a system that is better than original conditions. In the following spring the topdressing process would begin again to add the rest of the material, further increasing the systems drainage capacity. The end result is a well drained, stable, sand-based field at a fraction of the cost required for other renovation processes.



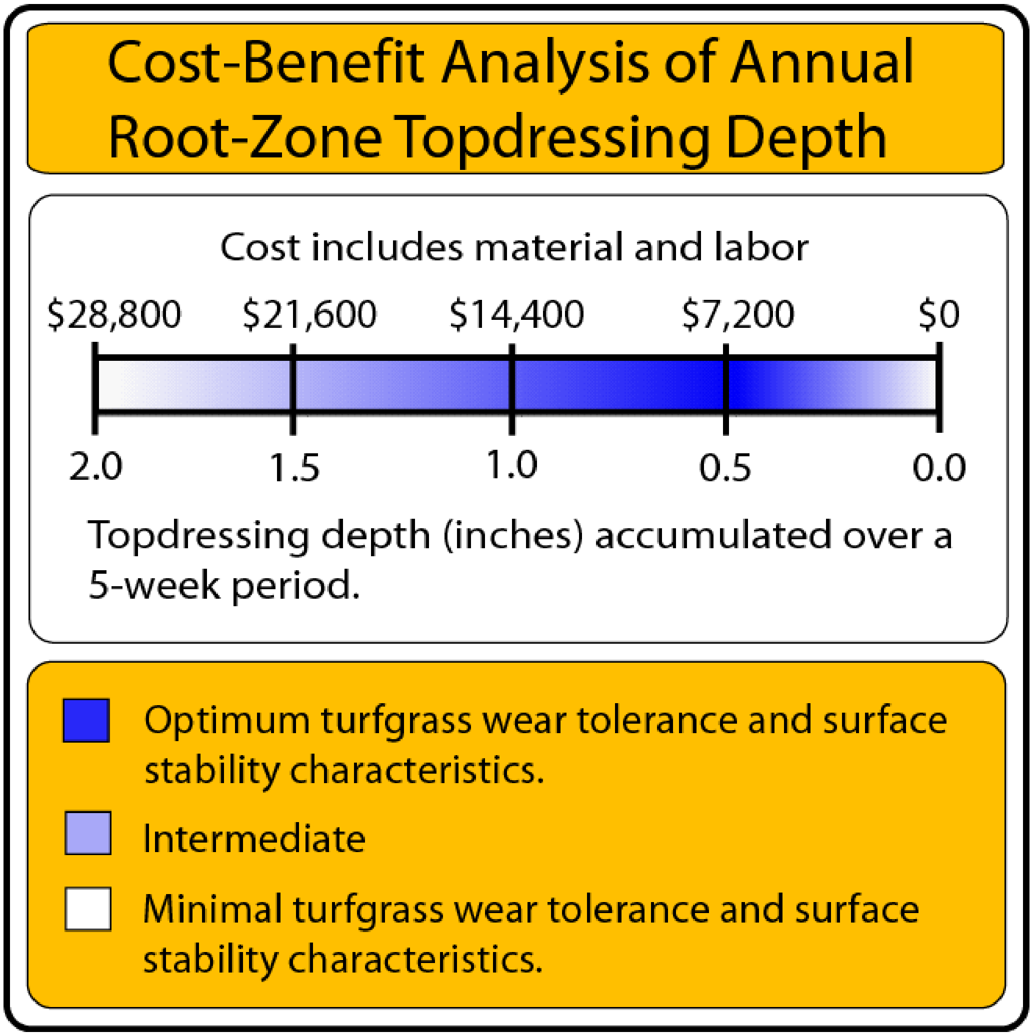
The Research

In 2007, two research projects were designed and initiated at the Hancock Turfgrass Research Center, East Lansing, MI, to address the feasibility of the *Built-Up Sand-Capped* renovation process. Well-graded 90% sand – 10% silt+clay topdressing material, developed by a team of turfgrass scientist at MSU in the later 90's for athletic field construction, was utilized for the following research projects.

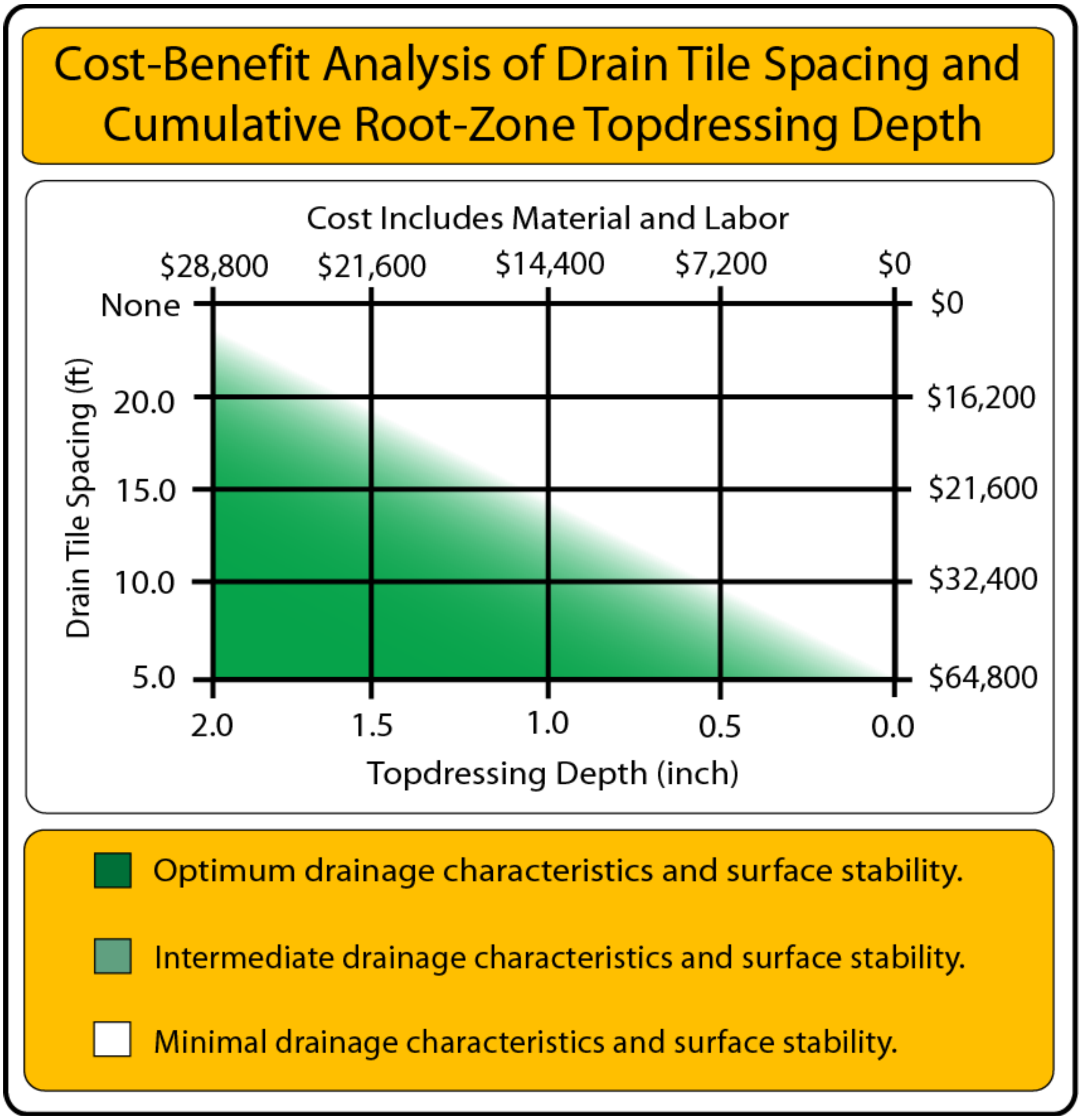
Experiment 1: The objective of the first experiment was to evaluate the effects of cumulative sand topdressing rates and summer traffic on the fall wear tolerance and surface stability of a cool-season turfgrass stand. Finding from this body of work determined that ½" of topdressing applied over a 5-week period, and restricting summer traffic on a newly established turfgrass stand, will provide the greatest surface stability (shear strength) in the subsequent fall. Topdressing depths regardless of rate improved turfgrass wear tolerance (ground cover and shoot density), but aggressive rates, greater than 1 ½", diminished surface stability. Therefore, ½" applied over a 5-week period is suggested to provide the optimum wear tolerance and surface stability. If annual topdressing depths greater than ½" are desired, it is recommended that field managers spread out applications over a period of time greater than 5-weeks to avoid compromising surface stability. For instance, if 1" is the desired annual topdressing depth, this depth of sand should be applied over a 10-week period.



Sand topdressing, four applications (½" depth), applied over a 5-week period, Hancock Turfgrass Research Center, East Lansing, Michigan, July 27, 2008.



Experiment 2: The objective of the second experiment was to establish intercept drain tile spacing, in combination with sand topdressing, necessary to improve drainage, turfgrass wear tolerance and surface stability on a sandy loam soil. Preliminary findings from this research suggest that as little as ½" of sand can used to improve athletic field playability by substantially decreasing the surface moisture content. Findings from this research also determined that a drain tile spacing of 13', which will substantially reduce installation costs ($22,400-28,000; material and labor), is adequate to provide sufficient drainage and stability when 1" of topdressing [$14,400; material (300 tons of sand spread across 72,000 ft^2) and labor] has been applied. However, 2008 results suggest that if 2" of topdressing ($28,800) has been accumulated and an adequate surface slope is available (≥1%) drain tile spacing can be increased to distances greater than 20'. Drain tile installation at 20' spacing would cost approximately $14,400-18,000. It is important to note that drain tiles are necessary to prevent standing water from accumulating along sidelines and other low lying areas and therefore should not be completely excluded from the renovation process. Conservative recommendations based on this research suggest a drain tile spacing of 13', and a 2" sand topdressing layer accumulated over a two year period for a total of $66,200-71,800 (cost includes a $15,000 irrigation system).



For more information regarding the *Built-Up Sand-Capped* renovation process and specifications contact the following…

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