

Sand Cap Build-up Systems for Michigan High School Fields

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Researchers propose a cost effective solution for failing native soil athletic fields across Michigan.

The typical Michigan 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.

The Problem

In order to have a significant number of events on a natural grass playing field and provide reasonable playing conditions throughout the fall, regardless of weather, the root zone must be primarily sand based. Unfortunately, the majority of Michigan's 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, 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.

The Solutions

Current solutions to this problem include complete field conversion to a synthetic or sand-based turfgrass system. The first, most expensive, option is the installation of a synthetic athletic field ranges from \$600,000 – 1,000,000. 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. The

FAQ # 1: I have a field that drains poorly, what are the current renovation options?

- 1) Synthetic Field – \$600,000 - 1,000,000
- 2) Conventional Sand-Based Field – \$400,000 - 600,000
- 3) Sand-Capped Field - \$150,000 - 300,000
- 4) **Sand-Cap Build-Up Field \$36,000 - 75,000 (proposed method discussed below)**

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 in 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, to maximize soil stability, and should contain approximately 90% sand. The turfgrass is then reestablished from seed. It is critical to use seed rather than sod, because sod placed over sand will create a perched water table, which will significantly inhibit soil infiltration. Installing an extensive drain system with drain lines running the length of the field spaced every 8-20' is also necessary. (New irrigation systems are usually automatic additions in these new fields, and are highly recommended because of the reduced water holding potential of the sand-based system.) This option also takes a field out of play the same amount of time. The major difference in cost between the conventional sand-based field and the sand cap is due to hauling off of the extra material during excavation as well as the total amount of material to bring the field back to grade.

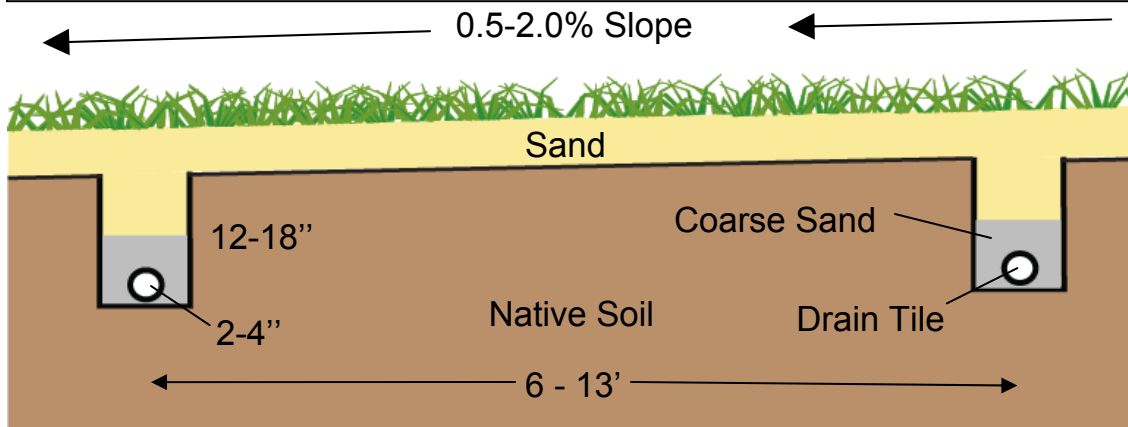
Sand-Cap Build-Up System

The fourth, least expensive, option for sand based fields is a "sand cap build-up system" (SCBUS), which can be done in four simple steps. The concept behind the SCBUS is to combine the advantages of the sand cap system (drainage and sand root zone playing surface) while providing almost uninterrupted availability. The idea is to cut drains in the existing field [running lengthwise on 6 - 13' centers depending on the surface grade and slope (see **Renovation Flow Chart: pg 7**)], put drain tile in the lines, back fill with pea stone and then sand, or a coarse sand alone (Image 1 and 2: pg 8).

Sand-Cap Build-Up System

- Step 1.** Install drain lines (6' spacing, running length wise)
- Step 2.** Repair irrigation system
- Step 3.** Renovate field (core cultivation, and over-seeding)
- Step 4.** Begin sand topdressing. (well-graded sand-based material)

Following drain tile installation, repeated sand topdressing will produce a sand-based system, capable of rapid drainage.



FAQ #2: Will this renovation process take my field out of play?

No, your field is never totally out of play. This process does not remove your existing turf, but rather amends it. However, it will require regular topdressing for more than a year to produce a sufficient system.

At this time it is important to correct any low spots (wet spots) in the existing slope by leveling them with topsoil; soil removed during drain line installation would be perfectly appropriate. Subsequent repair to any irrigation line damage is necessary. Then begins an aggressive sand-based topdressing program during the summer with a “specific high sand-based material” (approximately 90% well-graded sand). Sand topdressing would be coupled with your annual field renovation program (including reseeding, cultivation, etc). The goal would be to add at least 2” of topdressing as fast as possible without compromising fall time playing quality. This means that the topdressing program would begin in early June and go only through early August. Adding 1” would not be an issue to surface stability in this time frame. During this period it is also important to regularly clean and maintain irrigation heads to prevent sand from damaging the system. The topdressing stops in early August to allow settling prior to usage in the fall. **During the first year your field may not reach the level of sand necessary to prevent saturated surface conditions, particularly in low lying areas.** The drain tiles will prevent standing water from developing providing you with a system that is better than your original conditions. The next spring the topdressing process would begin again to add the rest of the material, further increasing drainage capacity. At the end you would have a well drained, stable, sand-based field at a fraction of the cost required for other renovation processes.

FAQ #3: Who can do this renovation process?

This is a job someone on staff can do, acting as the general contractor and sub-contract out the drain installation and irrigation repair. They can order the sand topdressing from a reliable source (provided below). Finally, the act of applying the topdressing can be done by in-house staff (with minimal training) or contracted out.

FAQ #4: What about the drain spacing and depth of root zone specifications? Are we a guinea pig?

The drain spacing of 6’ centers is about extensive as possible and should be more than adequate. A research project to investigate the optimum spacing was started in 2007. Investigation is exploring wider spacing in an effort to provide potentially lower costs to installation, while maintaining adequate drainage. Preliminary research has shown that when an inch of topdressing has been applied 13’ drain spacing will provide the same benefits as 6’ spacing at a lower cost of installation. The depth of root zone is actually a little easier to manipulate, simply by the nature of the method of application (topdressing rates can be increased or decreased), and therefore is even less of a concern. Preliminary findings also suggest that as little as ½ inch of cumulative topdressing sand will substantially decrease surface soil moisture, therefore improving surface stability. However, greater sand depths will not only improve drainage, but will also provide a deeper, none restrictive rooting media.

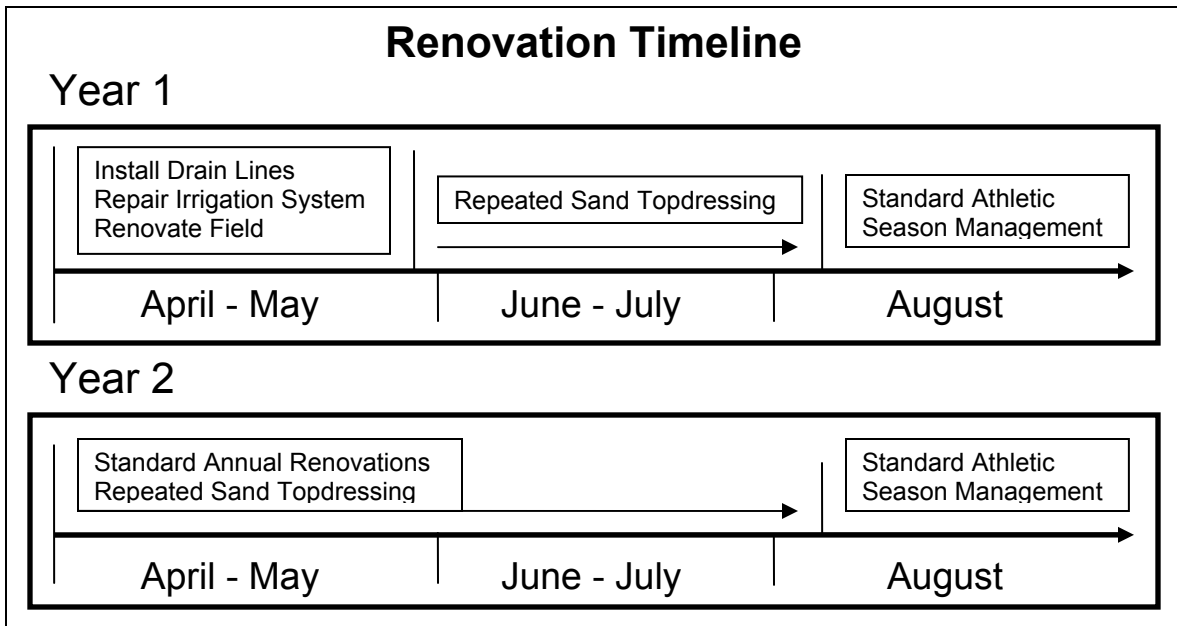
FAQ #5: Has this been done to athletic fields in Michigan?

Yes, currently two high schools (Okemos and Grand Blanc) began this process in 2007, but this process has been going on with native soil golf course putting greens for the last 30 years. For this reason, the feasibility is not a question. It makes sense and it has been done in other areas of turf for many years. One big plus is the specific sand based root zone which will be topdressed on the fields. This specific sand has been providing exceptional performance on Michigan fields for the last 10 years. The advantage of this process is that in the end you have transformed your poorly drained native soil field to a stable, well-drained sand-capped field.

The SCBUS will not only reduce the annual repair costs required for a native soil field, but also reduce the initial cost of field renovation. To install the drainage and backfill a field with 6' centers (would approximately have thirty 400' x 4" drain lines @ \$4-5/linear foot) would cost \$48,000-60,000 installed, while a field with 13' centers \$22,400-28,000. Then topdressing would begin on the field during the summer with each inch of material costing about \$9,000 (labor and materials). The sand is added on a weekly basis and the existing grass grows up through the sand profile. This option is considerably less expensive than the first three options. It will likely take more than one year to get 2" of material built up, but you also have the option of adding more than 2" if the situation calls for it in the future.

Research

The SCBUS is a natural extension and combination of two currently proven applications. First, the use of repeated sand topdressing in order to develop a sand-based profile has proven to be successful in the golf course industry for over 30 years. Second, sand-based athletic fields are widely used in Michigan and proven to provide a superior playing surface in comparison to native soil fields.



Sand-Cap Build-Up System

Step 1. Install drain lines – Renovation Services & Drainage Specialist

Step 2. Repair irrigation system – Renovation Services & Turf Suppliers, etc.

Step 3. Renovate field – Renovation Services, Turf Supplies, etc. & Turf Equipment Suppliers

Step 4. Begin sand topdressing – Sand Topdressing Sources

Research on this renovation process is currently be conducted by Alexander R. Kowalewski, PhD student, to provide a scientific justification for the procedure. Funding will be sought through sources within the state to carry out his specific research project. If you choose to move forward with a project of this nature please contact John N. Rogers, III or Alexander R. Kowalewski for progress monitoring through updates and possible visitations.

Preliminary Research Findings

Preliminary findings from research conducted in 2007 show that as much as $\frac{1}{3}$ " of topdressing can be applied in a single application and 1" of topdressing applied over a one month will increase surface stability (Image 3: pg 8). A drain tile spacing of 13', which will substantially reduce installation costs, is adequate to provide sufficient drainage and stability when 1" of sand topdressing has been applied. 2008 results suggest that if 2" of sand topdressing has been accumulated and an adequate surface slope is available ($\geq 1\%$) drain tiles spacing can be increased to distances greater than 20', to prevent standing water from accumulating along sidelines and other low lying areas.

Resources

There are several excellent sources in the area to service your athletic field needs. They are provided below. When you call these companies, they will direct you to a specific sales person in your area. These resource contacts are of particular importance because they are familiar with the specifications and recommendations stated in this document and/or are in regular contact with Dr. John N. Rogers, III.

Contacts

Dr. John N. Rogers III
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Researchers and resources mentioned in this document are in no way, shape or form liable for personal injury, misinterpretation of information and recommendations, or detrimental field conditions resulting from deviation from the above described renovation processes and procedures.

Renovation Services		
Davey Tree: Sports Turf Auburn Hills, MI 248-475-9155	Sports Turf Specialists 281 Taft St. Zeeland, MI 616-866-7395	Turf Services, Inc 17205 148 th St. Spring Lake, Mi 616-842-4975

Country Club Turf 4137 W. Michigan Ave. Jackson, MI 49202 517-750-7513	Contractors Landscape 3681 Frost Road Webberville, Mi 48892 517-775-8787 eeeverett@core.com
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Turf Supplies, etc.		
Rhino Seed and Turf Brighton, MI 800-482-3130	Turfgrass, Inc P.O. Box 667 S. Lyon, MI 48178 248-4371427 1-800-521-8873 Fax: 248-0437-5610	Verdicon, Inc Dave Polen, Sales Rep 586-839-8930

Turf Equipment Suppliers		
Toro Equipment Spartan Distributors Auburn Hills, MI 800-822-2216	John Deere Equipment Weingartz 39050 Grand River Farmington Hills 888-4-JD-TURF	Jacobsen Equipment W. F. Miller 25125 Trans X Novi, MI 800-555-8189

Sand Topdressing Sources	
Osborn Industries 5850 Pardee Taylor, MI 48180 313-292-4140	J.W. Surge Industries Muskegon, MI 231-740-0682
Drainage Specialist	
Water Management 1596 S. College Rd. Mason, MI 48854 517-628-8001	Chattaway Excavating, Inc. 899 S. Onondaga Rd. Mason, MI 48854 517-628-2828

Renovation Flow Chart

The following flow chart is designed for making renovation decisions prior to the initiation of the renovation process based on a variety of possible existing field conditions.

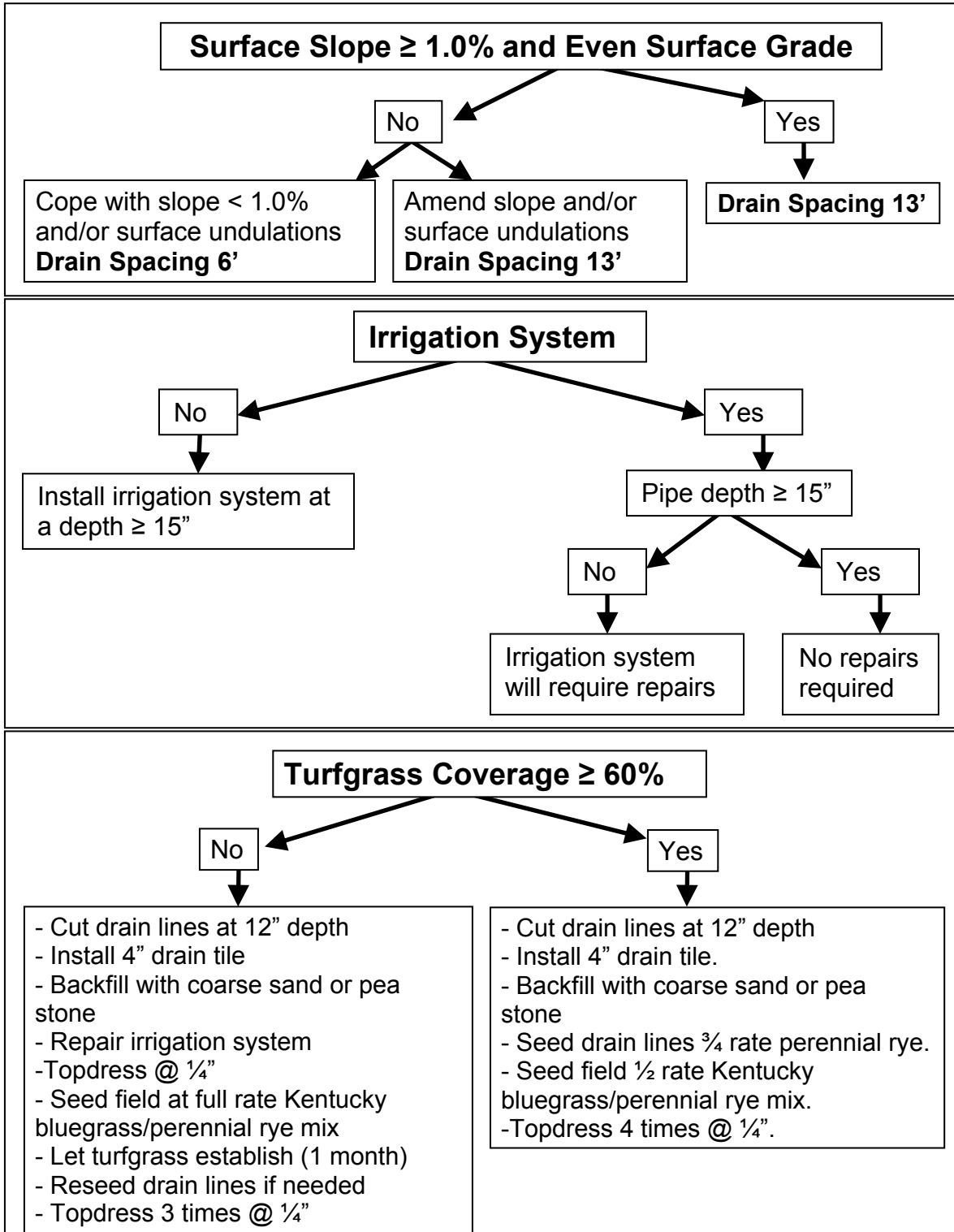


Image 1: Cutting drain lines, installing drain tiles, and backfilling lines with a sand-based root zone material, Grand Blanc High School, Grand Blanc, Mich., Water Management Inc., May 2007.



Image 2: Grand Blanc High School athletic field after the drain line installation process, Grand Blanc, Mich., Water Management Inc., May 2007.



Image 3: Four sand-based topdressing applications applied to a newly established turfgrass stand over a one month period at ¼ inch per application, providing a 1 inch of sand-based root zone material, research plots at the Hancock Turfgrass Research Center, East Lansing Mich., August 2007.

