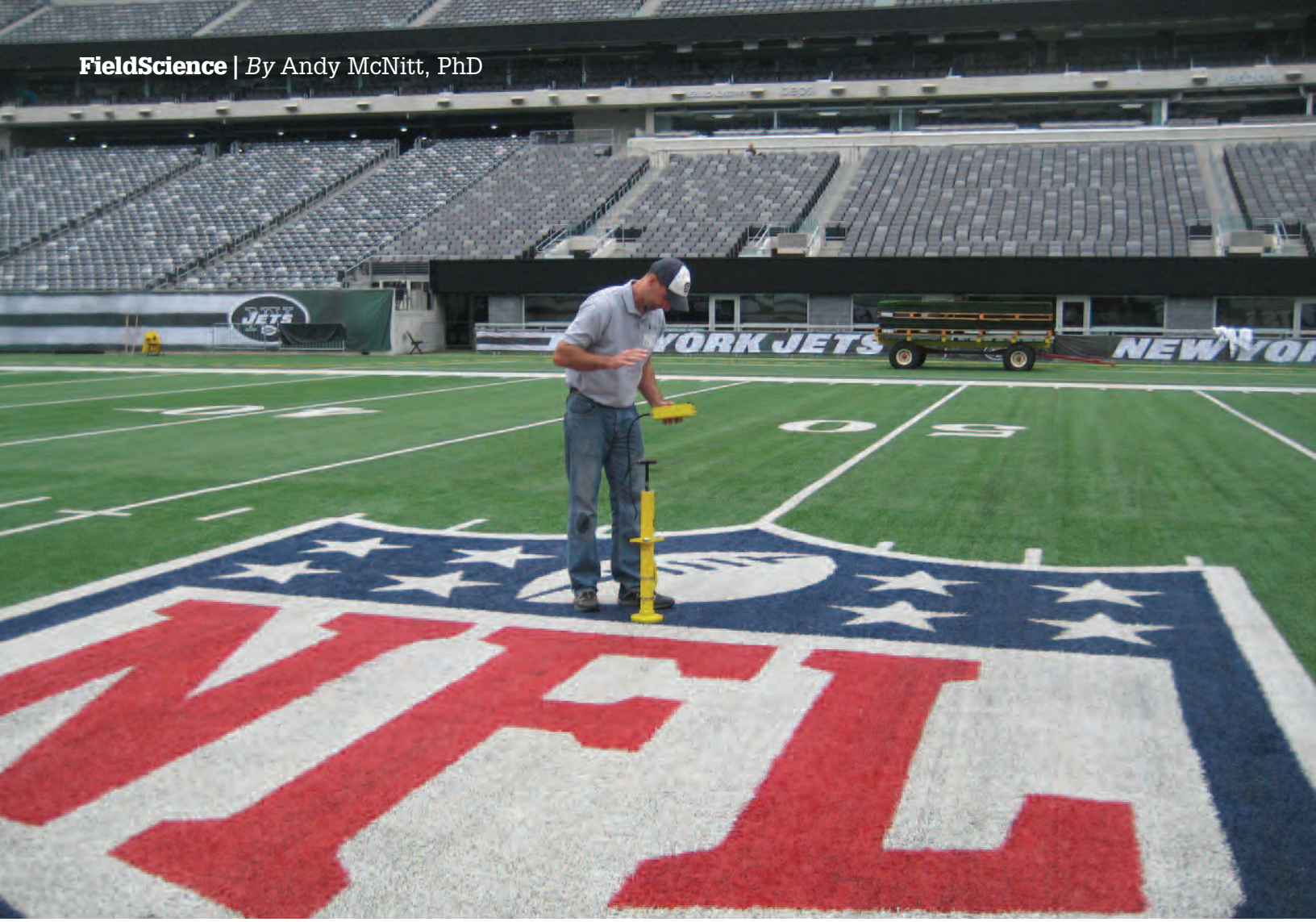


Issues and technologies used on NFL playing surfaces

I'VE HEARD IT OVER AND OVER AGAIN from those in the turf business: "If I could mow at one inch, I'd be able to have pristine looking turfgrass like in all these NFL stadiums." I politely reply that if those kinds of skills and knowledge existed anywhere, there would already be lots of smart people using them to improve these surfaces.

Let's review a few facts that aren't always in our frontal lobe while we watch an NFL game from the comfort of our homes on a late November Sunday.

First, it's November. It's getting seriously cold now and the light levels are extremely low. Think about the effects of "winter play" on a golf course.

Yes, most of the NFL's northern fields have an ethylene glycol heating system running under the sand rootzone. The heating systems provide some benefit by extending the growing season further into the fall and limiting frost development on areas that require painting; however, light is still limiting. The sun is low in the sky and the stadium seating is being placed as close to the playing surface as possible. This means very steep seats and significant shade. Yes, south facing endzones are sometimes built lower or more open but there are many fields where the sun never hits the field from the endzone through the 20 yard line in November.

In the fall direct sunlight is very limiting and if the heating system is used to push the turfgrass excessively, the turf becomes severely etiolated. Also, the heating system can push moisture to the soil surface. In theory, the ideal set up for an NFL football game on a sand rootzone is to have ample moisture in the rootzone but have it a little dry in the top half inch or so. When the heating system is running during cold weather, moisture in the rootzone is vapor-

▲ **Left: THE SUN** is low in the sky and the stadium seating is being placed as close to the playing surface as possible. This means very steep seats and significant shade. **Middle:** Artificial lighting systems have been developed and are being used in Lambeau Field in Green Bay. **Right:** Most stadia, save three, in the NFL are used for multiple and varied revenue generating and charity events that can find parts of the turfgrass covered for up to 7 days.

ized. It moves up through the sand and eventually encounters the cold air temperature where it condensates. This flips the moisture strata where now it is wet on the surface and dryer further down in the rootzone.

While a tremendous help, the heating systems are not a silver bullet for growing turf in cold conditions.

Light is a truly limiting factor in the fall and in some stadia throughout the season. Artificial lighting systems have been developed and are being used in Lambeau Field in Green Bay. Here at Penn State, we've been experimenting with a rollable light tarp. This system contains a series of LED lights in the wavelengths needed for optimal growth. The wavelengths can be varied to provide optimal growth conditions for particular species and in some instances for particular cultivars. We continue to work to get this system commercialized.

Besides limitations of light and heat well into the fall and winter, it's important to realize the tremendous amount of traffic/damage that occurs to these surfaces. Football fields look big when watching the game on TV. When you attend an NFL game the stadium is large and bigger than life. This subconsciously makes us multiply the size of the field. The field looks immense. Really, the majority of the game is played on a small area. Research has shown that for most games about 80% of the traffic occurs between the numbers and between the 20-yard lines. The area receiving 80% of the damage is about 15,800 square feet, or the size of about two and a half golf greens. Think about that for a moment.

Most stadia, save three, in the NFL are used for multiple and varied revenue generating and charity events. There are the NFL events, college football games, high school football games, the FOP versus the FOF charity event. Lacrosse championships, soccer tournaments and professional soccer events dot the schedule. Then in summer when the temperatures are sometimes extreme, the stadium hosts between one and three summer concert events and/or monster truck rallies where at least parts of the turfgrass may be covered for up to 7 days and other parts must accommodate large cranes, and countless passes with forklifts, trucks and other utility vehicles.

Considering the amount and kinds of events held on these surfaces, it's a testament to the field managers that they are able to provide a safe and playable surface week in and week out. Remember, there are no frost delays. Unlike baseball nobody stops playing for a little rain or even snow.

For those of you managing high school

▶ **ORGANIC MATTER** accumulation in the top couple inches of the surface can begin to act like silt and clog the macropores that conduct air and drainage water.

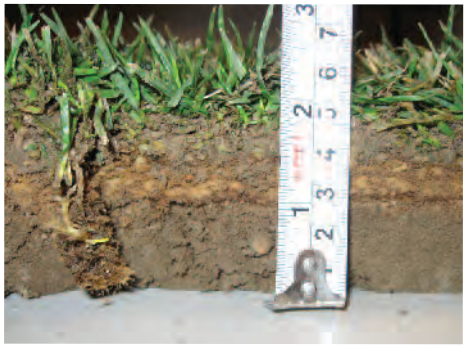
fields that host well over 100 events per year, the pure number of events may look unimpressive. You should realize that the kinds of events do differ. To give you a point of reference, when I evaluate the amount of damage caused by a Division I football game on a Saturday to an NFL game on a Sunday, it like the difference I observe on a high school field between a 7th grade game and a varsity football game. Seriously, the difference is dramatic. It's the size and speed of the players (Energy = Mass x Velocity). It's not how strong the players are, it's how fast they can move very large bodies. And when these large bodies have momentum and want to change direction, the shear forces on the turf system are tremendous.

On these higher-end sand-based systems, grinding out of the turf through abrasion is a secondary damage of the turf behind divoting. So the management philosophy of an NFL field manager and a high school field manager are different.

A high school turf manager caring for a native soil field receiving many, many events per week is trying to limit, and more importantly trying to constantly recover from wear due to abrasion and soil compaction. Thus, the turfgrass needs ample nitrogen to help it recover and should have a higher cutting height to help reduce the effects of abrasion. Aeration is done to reduce soil compaction.

On these higher-end NFL and college fields that have lower numbers of events, perhaps only two per week, but where the events are at a much higher intensity, maintenance practices vary. Research on Kentucky bluegrass grown on sand indicates that within reason a lower mowing height results in less damage due to divots. In the past, Beaver Stadium at Penn State was mowed as low as 7/8" and typically exhibited a low amount of divoting. A common mowing height for Kentucky bluegrass in the NFL is 1.25 inches although some are mowed at a lower height year round.

▼ **ALL BUT A HANDFUL** of natural grass NFL stadia resod at least 1.5 times per year and as many as four times per year, bermudagrass fields included.



During summer months, before the beginning of the football season, some nitrogen and water is withheld in order to "harden off" the bluegrass. Stressing the plants somewhat has proven to reduce divots compared to having succulent plants heading into the season. When the weather cools, additional nitrogen is applied in order to stimulate growth. Also, significant spring nitrogen applications are suggested during any cultivation or renovation procedures. Cultivation followed by core harvesting on sand rootzones is done to reduce organic matter buildup in the rootzone.

Organic matter accumulation in the top couple inches of the surface can begin to act like silt and clog the macropores that conduct air and drainage water.

Tom Serensits, manager of Penn State's Sports Surface Research Center, has done significant work using Primo on these sand-based fields. His research showed that if Primo is applied all growing season stopping sometime in early August, that a field can experience as much as a 20% reduction in divoting into November. You can watch a video of Tom's work by going to ssrc.psu.edu and selecting 'SportsTurfScoop' in the left hand menu.

Using all of these techniques often isn't enough to allow the turf manager to maintain a consistent turf stand. Thus all but a handful of natural grass NFL stadia resod at least 1.5 times per year and as many as four times per year, bermudagrass fields included. We have been working with sod companies to improve the quality of their sod for these in-season resod jobs. This has truly become a science. The team is on the road next week, so it is decided that the old sod will be stripped, new sod will be harvested and laid, and a game will be played on it 10 days later. Many of the techniques suggested above are employed in the sod field, before harvesting, to reduce the divot potential of newly laid sod.

Kentucky bluegrass cultivar selection is also a factor. Personally, I believe that Kentucky blue breeding is moving away from what sports fields need. I believe that the cultivars we used 20 years ago were more divot resistant than the cultivars today. We are looking for aggressive rhizome producers and typically those cultivars are poor seed producers and have been abandoned by growers in Oregon due to the low yields per acre during seed production. While today's cultivars are more attractive and more disease resistant, they are also more prone to divoting. We have begun to play with some old cultivars to determine their divot resistance and see if selections can be made in order to breed grasses specifically for these high-end sand-based fields.

Evan Mascitte, an MS candidate working in our project, has decided to seriously investigate the preharvest conditioning of sod to be used for in-season resodding. We'll be reporting on that work in another issue.

And remember: some of the best, in any business, are so good they make their jobs look easy, when in reality they are hard-working professionals performing well. ■

Dr. McNitt has been with The Pennsylvania State University for 30 years. Presently he is Director of Penn State's Center for Sports Surface Research (ssrc.psu.edu) where he conducts research relating to athletic field surface characterization and golf green construction and maintenance. Dr. McNitt is also the Program Coordinator for the 4-year turfgrass science major and the Basic & Advanced Certificate as well as the Associate, Bachelors, and Masters of Professional Studies Programs offered through Penn State's World Campus Online Learning. In 2010 he was inducted into Penn State University's College of Agricultural Sciences Academy of Teaching Excellence.