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Contents

DECEMBER 2012 | VOLUME 28 | NUMBER 12

Field Science
8 Aeration and soil compaction in turf
12 New fertilizer laws call for enhanced efficiency

Facilities & Operations
14 Financing and constructing a new field
18 American goes solo in maintaining baseball field in Germany
20 The 1st year at BBVA Compass Stadium in Houston
30 GreenCare for Troops receives White House recognition

Irrigation & Drainage
22 NCAA champ Princeton's high-tech field hockey turf

Field of the Year
32 Patricia Wilson Field, Stetson University, DeLand, FL is College Softball winner

36 Ludwig Field, University of Maryland, College Park is College Soccer winner

Tools & Equipment
39 Latest new products in turf market

Departments
6 From the Sidelines
7 STMA President's Message
17 John Mascaro's Photo Quiz
44 STMA in Action
47 STMA Chapter Contacts
48 Marketplace
49 Advertisers' Index
50 Q&A

On the cover: L to R: Alex Steinman, Neville Kelly, Kurt Klinger, P.J. Ellis, men's soccer coach Sasho Cirovski, Casey Rezendes, Jamie Franck, and Mac Wallace, University of Maryland.


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From the Sidelines

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Five trends in sports turf

IF I NEVER HEAR "POLL NUMBERS" AGAIN IT'LL BE TOO SOON. The combination of the media's need for content and all the data being produced by surveys of too many people on too many topics overwhelms my senses and I usually ignore the results.

Here are some decidedly non-scientific results from a one-man survey* on trends in sports turf:

High expectations: Everywhere you look there are high-definition televisions and sports mean great ratings. When's the last time you dined out where there wasn't a game on TV available, at least at the bar? And lots of people have HD at home. All those viewers see top-end fields in high-definition every game. This is raising standards locally (sometimes without a corresponding appreciation for good maintenance). Many more turf managers should expect to encounter a higher bar for field appearance AND improved playability.

Government debt. Another numbers trend is toward governments looking to spend less money in a time of record government deficits, which seem to be an ever-looming threat of budget cuts in parks & rec departments. Most states are also looking at cutbacks in education spending that will affect higher ed and K-12 districts. Private resources are providing more cash for school athletic programs every year; perhaps fundraising will become part of the curriculum in turf classes.

Safety. The National Football League is very popular and therefore influential. The NFL's recent focus on keeping players safe regarding head injuries and concussions has the nation asking, "How safe is our favorite game?" No doubt that field hardness will continue to be of concern to turf managers for all sports. This new attention to concussions hopefully will lead to better standards nationwide. Measuring hardness and keeping records also might turn into more budget to keep surfaces safe as possible.

More synthetic fields. Google news feeds do not lie when it comes to what's in the news and synthetic turf fields are proof. Hundreds of communities across the US are investigating, seeking funding for, and building synthetic turf fields because they are durable and possible moneymakers through rentals and tournaments.

In addition, many fields built when the infill generation began are now 8 years old and older, and their reclamation, reuse, and/or related problems replacing them will be affecting many more communities.

Water. Preserving water and making conscientiously green decisions about water is not only common sense and good business but also a duty for turf managers. Educating yourself to save water at work could look pretty good on your review, too.

Water-saving practices and equipment will continue to improve but are turf managers doing their best?

*No robocalls were conducted in connection with this survey. ■

Correction

In our article from the October issue, "Three keys to managing high traffic, high quality athletic fields," there was an error in the ninth paragraph on page 10. The author intended to say "Soil organic matter can serve as an important source of carbon and nitrogen as it decomposes over time." We regret the error.

Eric Schroder

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President's Message

Dr. Mike Goatley

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The spirit of volunteerism

THIS MONTH I RECOGNIZE THE SPIRIT OF VOLUNTEERISM. It is on prominent display by those helping their neighbors recover from Superstorm Sandy; we see it in person at the Salvation Army kettles this time of year; and volunteerism drives STMA through service by our members on 23 committees. Those of you attending the conference in Daytona Beach will personally witness the efforts of our Conference Education, Seminar-on-Wheels, Student Challenge, and Chapter Relations committees. You will also see our volunteers in action serving as moderators for our presenters, leading our auction to raise money for SAFE, and staffing the Collegiate Challenge. Some of these volunteers will be seen, but as in the case of so many volunteers, most will be working in the background. You will find an update on the goals and activities of two of our committees, Conference Education and Environmental, in this issue of *SportsTurf*. More committee updates will appear in future issues.

As President, I have the challenge and privilege of placing our volunteers on committees. This is something that every President takes seriously because the STMA Board has the philosophy that good governance happens when we stay out of our committees' way. We regularly discuss and remind ourselves of our role as a Board when we meet, and we are committed to let the "committees do the heavy lifting." When you volunteer, we want you to understand that we recognize the time and effort required. Please do the best you can to serve, but everyone understands that sometimes there simply is not enough time in the day to do everything we would like to do. Committee sign up will be at the conference and online at www.STMA.org.

CEO Kim Heck led a great professional development exercise at our Fall Board meeting that placed the Board members in groups of "the early bird gets the worm" or "the second mouse gets the cheese." We all agreed there were times when we needed to be in each group, and I think our Board (and our committees) have nice blends of both groups of personalities. As part of our exercise, we each got a short but highly informative book called *Who Moved My Cheese* by Dr. Spencer Johnson. It would make a nice holiday gift for one's self-help library. The characters are mice and little people who live in a maze looking for their cheese. They have highly variable strategies in how they look for their cheese, but it is the little people (Hem and Haw) that struggle the most because they resist change. One comment made by Haw caught my attention: "What would I do if I weren't afraid?" I can think of lots of times that I probably should have answered that question; maybe you can, too. I told this to a friend, and he sent me a one-liner from comedian Stephen Wright: "Well, what happens if you are scared to death twice?" Hmm…

I wish everyone a safe and happy holiday season and all the best for 2013! ■

Mike Goatley

Aeration and soil compaction in turf

The effects of traffic and compaction in turf are usually easy to see—thin turf, worn paths, areas of bare ground that do not respond to applications of fertilizer or water. Turfgrass growing in compacted areas has shallow rooting, causing greater susceptibility to drought and other stress. The soils in compacted areas have low air porosity and reduced infiltration. Such compaction is most likely to occur in fine-textured soils (those with a higher clay content), but over time all soils are susceptible to compaction.

Turf managers know that one key to correcting soil compaction in turf is aeration, also known as aerification. Aerification is performed using a wide range of equipment which drills, slices, spikes, punches or water-injects the turf and its underlying soil to various depths. Sometimes the equipment removes a plug of turf, and sometimes it only cuts a slit or punches a hole. With some equipment there is the additional benefit of a small amount of thatch control, as the slicing or core removal also removes some thatch. Regardless of the exact piece of equipment used, almost every turf manager has a piece of aerification equipment in their shed.

Factors affecting the effectiveness of aerification include soil wetness, tine size, depth of aerification, soil texture, aerification frequency, and equipment type. Turf aerification research is somewhat difficult to do. Studying soil compaction requires large plots, uniform areas of compacted (and noncompacted) turf, and possibly many different pieces of equipment. Additionally, collecting the data required to show treatment differences requires intensive sampling and a lot of labor. Typical data collected from compaction studies may include soil bulk density, soil penetrometer resistance, surface hardness, water infiltration, shoot density, and root length or weight. The objectives of this article is to provide explanations of the type of data collected in turf compaction experiments, and to discuss some past and current turfgrass compaction research.

RESEARCH

Our previous work at Auburn University found that aerification was less likely to have an effect in noncompacted soils as compared compacted. We looked at the effects of using a deep, hollow tine aerifier (8 inch deep, 3/4 inch diameter) at two locations: a heavily trafficked and compacted marching band practice field, and a lightly trafficked field at the Auburn University Turfgrass Research Unit.

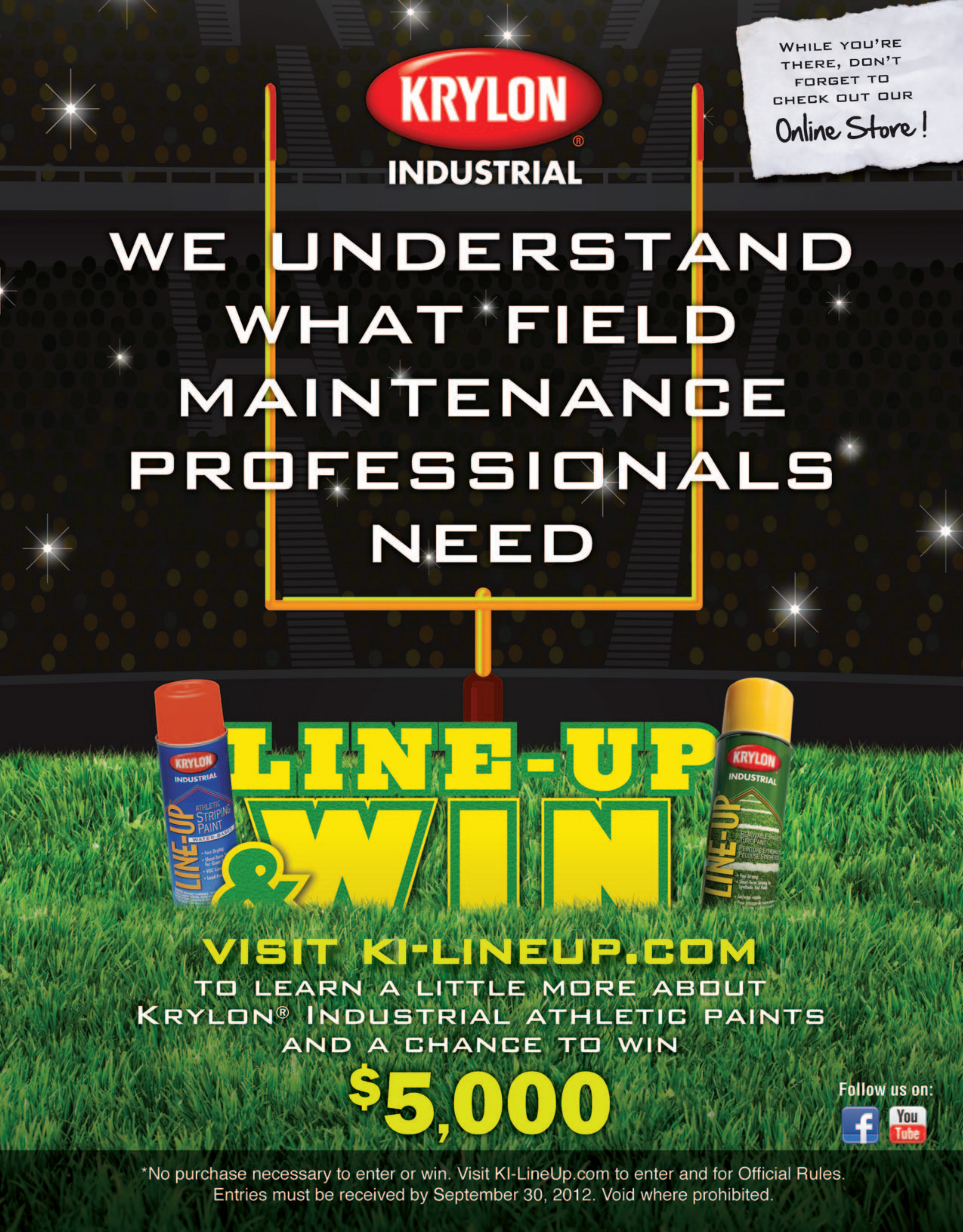
At the heavily trafficked site, every additional core aerification in a given year decreased soil resistance. This was not the case at the lightly compacted site. Only one aerification was needed in a given year to produce a significant reduction in soil resistance. At the heavily trafficked site, the effects of deep-tine aerification usually lasted about 3 weeks. This supports the conclusions of previous workers that frequent aerification might be needed on compacted sites.

However we did not evaluate the effects of different equipment (e.g., tine depth, solid vs. hollow tine) on compaction in trafficked turf. We also wondered if continuous aerification would allow a compacted layer of soil to form at the bottom of the tine working depth. These “aerification pans” can form over time from the effect of tines pressing down on the soil below the level where they actually penetrate and remove soil.

This research looked used three different pieces of equipment (a pull-behind aerifier, a GA-60 standard tine aerifier and a Soil Reliever deep tine aerifier) using both solid and hollow tines. Plots were aerified four times per year and traffic was artificially applied with a heavy roller to induce compaction. Compaction was evaluated by measuring soil resistance to a soil penetrometer at depths down to 12 inches.

The equipment used has a large effect on the amount of compaction relief and where it occurs. The deep tine aerifier (8 inches deep) reduced soil resistance when either solid or hollow tines (5/8-inch diameter) were used. The standard tine aerifier (4 inches deep) often produced a significant reduction in resistance when hollow tines (5/8-inch diameter) were used.

The effect of the different sizes of aerification equipment on the relief of com-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paction as measured by soil resistance was studied. The deep tine aerifier reduced soil resistance from 3.5 inches down to 7.6 inches, but did not reduce compaction in the top 3 ½ inches. The standard tine unit did reduce resistance significantly in the top 3 inches, but had no effect deeper in the soil.

The long-term effects of continued aerification with a standard tine unit fitted with solid tines (5/8-inch diameter) for 3 years in a row, at a depth of 2.3-5 inches, showed that there was significantly more resistance than in unaerified plots. This indicates that a layer of compacter soil (known as a "pan" or "aerification pan") had developed near the bottom of the tine stroke. This illustrates the need for periodic deep tine aerification to avoid this problem. The pan of compacted soil was less severe when hollow tines were used, but still could build up over time.

When the surface hardness of the turf was measured using a Clegg hammer, all forms of aerification produced a softer surface at least for one week after treatment. The standard tine aerifier with hollow tines tended to produce the softest surface.

CONCLUSIONS

• Compaction of turfgrass soils lowers the percent macropores in the soil; a decrease in macropores limits soil aeration, which hurts root growth.

• Core aerification, especially solid tine, may not help eliminate thatch.

• Effects of aerification in heavily trafficked soils may be short-lived (about 1 month).

• Diagnostic techniques for detecting compacted soils, such as infiltration measurements or soil penetrometer readings, are widely variable, even across supposedly uniform surfaces such as a putting green.

• Compacted "pans" develop over time at the bottom of the tine's penetration into the soil, especially when using solid tine equipment.

• Deep tine equipment is more effective at reducing soil compaction at depths below 2.5 inches. ■

Beth Guertal is a professor of agronomy & soils at Auburn University; Dave Han is an associate professor of agronomy & soils at Auburn University.

Things we measure in turfgrass compaction experiments

SOIL BULK DENSITY

Bulk density is defined as the mass of a unit volume of dry soil. To collect a bulk density reading a sample of known depth and diameter (typically 6 inches deep and 3 inches in diameter) is removed from the soil. The soil sample is dried and weighed and the bulk density is expressed as the mass per volume (grams per cubic centimeter). As the soil is compacted the bulk density increases, because more soil particles are forced into a smaller volume and soil pore space is reduced. Sandy soils typically have a higher bulk density than soils high in clay or loam, because sandy soils have few of the very small pores associated with fine-textured soils that have clay and organic matter. Additionally, sandy soils that contain sand in a range of sizes (as is a typically sand-based putting green) are already tightly packed, as smaller sand grains fit in between larger.

Typical bulk densities for clay and silt loam soils may range from 1.0 to 1.5 g/cm3, while the bulk density of sand-based soils may range from 1.3 to 1.8 g/cm3. At the upper end of these ranges the bulk density is great enough that root penetration may be inhibited. As comparison, the USGA recommendation for bulk density of putting green rootzone mix is 1.2 to 1.6 g/cm2. It's important to note that bulk density is highly variable from location to location. One sample will usually not be an indicator of the bulk density of an entire field or turf area.

SOIL PENETROMETER READINGS

A soil penetrometer is a device used to measure the compaction of the soil. What is actually measured is the resistance, or amount of pressure needed to push a tipped rod through the soil. The rod tip is equipped with a load-sensing cell, and the soil strength is recorded as the tip is pushed down through the soil. Soil penetrometers used for research are very sensitive, and require some practice to use correctly to obtain accurate measurements. They are also very expensive, about $6,000.

HYDRAULIC CONDUCTIVITY

Hydraulic conductivity is the ease with which soil transmits water. In turfgrass what we often measure is the saturated hydraulic conductivity, which occurs when all soil pores are filled with water.

Saturated hydraulic conductivity is typically measured using a double ring infiltrometer, which consists of two metal rings (one around 12 inches in diameter and the other around 18 inches), with the smaller placed inside the larger. Water is added to both rings until a height of water is maintained for a period of time, which indicates that the underlying soil has become saturated. The drop in the height of water inside the smaller ring during a given period of time is used to calculate the saturated hydraulic conductivity, which is reported in units such as inches per hour.

Small-diameter (6 inches) infiltrometers can be purchased from many turf supply catalogs. The intended use of these units is to provide turf managers the ability to measure infiltration rates of their turf soils quickly and directly in the field. Because research has shown that double-ring infiltrometers with an inside ring diameter of at least 12 inches produce the most accurate measurements of water infiltration, the accuracy of 6 inch diameter rings is a concern. A 1991 research study by D.H. Taylor compared single and double-ring infiltrometers with inner-ring diameters of 6, 8 and 12 inches on a variety of turf areas, from golf greens to football fields. They found that infiltration rates varied widely within each sampled turf area, even when the largest diameter rings were used. The conclusion from their work was that infiltration rates measured with ponded water should be used only as a rough estimate, and results should be used with caution.

CLEGG IMPACT READINGS

Typically used to measure the hardness of a turf surface, the Clegg hammer calculates the hardness of a surface based on its reaction to a weight dropped on the surface from a consistent height.

A diagnostic tool for discovering differences in surface hardness due to aerification treatments, work has also started on calibrating Clegg hammer readings to field hardness or softness. For example, a survey of 24 high school athletic fields had Clegg values that ranged from 33 to 167 Gmax. For comparison, a tiled concrete basement floor had a Gmax reading of 1280, which was reduced to 260 when the floor was covered with a carpet pad. In another study, compacted Kentucky bluegrass plots had a value of 206 Gmax, while plots that were not compacted had a value of 93. A survey of college and professional soccer players compared their perceptions of soccer fields that had been used to collect Clegg data. Typically, fields with a hardness reading between 90 and 120 Gmax could not be differentiated by players.