# Daytona Beach, Florida
## January 15-19, 2013

*by Debbie Savard*




# Easy Layout of a Women's Lacrosse Goal Crease

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8. Make the sector lines of the 8 meter arc. Beginning at the top of the goal circle, on the point we consider North (where the circle intersects the string line), make a straight sector line through the point that intersects East (where the circle intersects the string line) and stop at 12.25 meters and make a mark. Paint the sector lines from the circumference of circle to the 12.25 meter mark, leaving the interior of the goal circle unpainted. Repeat the procedure on the other side of the goal circle with a sector line from North through West.

9. Make the curve of the arc. From the center point of the goal circle, make a 10.6 meter radius and swing an arc connecting the 2 sector lines. (The arc is 8 meters from the circumference of the goal circle and the goal circle radius is 2.6 meter radius from the center point). Paint the arc between the sector lines. The arc from the sector lines to the goal line is not painted.

10. Make the hash marks along the 8 meter arc. Where the string intersects the 8 meter arc, mark a perpendicular line 30 centimeters (or .3 meters) intersecting the arc. On one side of the crease, from that first mark, measure 4 meters away and make another 30 centimeter mark perpendicular to the arc and repeat 2 more times, the last mark not actually on the painted arc, but on the path of the arc. Where the 8 meter arc would intersect the goal line make a 30 centimeter line perpendicular to the goal line. Paint these marks. Repeat on the other side of the crease.

11. Make another crease on the opposite side of the field.

12. Mark the scorer's/timer's table, substitution, and bench areas. The scorer's/timer's table is located midfield 4 meters back from the side line. The substitution area is 4.5 meters away from either side the midpoint of the sideline. Make two 4 meter marks, connected to and perpendicular to the sideline. The team bench area is located from the end of the substitution area to the team's restraining line and behind the level of the scorer's table extended.

13. On the opposite side of the field, mark the spectator line 4 meters away from and parallel to the sideline.

*Don Savard is a Certified Sports Field Manager (CSFM) and Certified Grounds Manager (CGM); Director, Athletic Facilities and Grounds, Salesianum School; and a member of the SFMANJ Board of Directors.*

# SOIL COMPACTION IN TURF

*Editor's Note: This article first appeared in the Winter 2012 issue of Turfgrass Times, a publication of the Alabama Turfgrass Association*

*By Dr. Beth Guertal and Dr. Dave Han*

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 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.

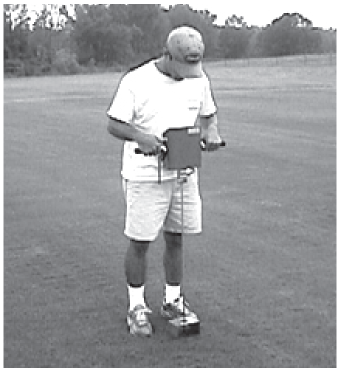
Factors affecting the effectiveness of aerification include soil wetness, tine size, depth of aerification, soil texture, aerification frequency, and equipment type. Turf aerification research is somewhat difficult to perform. Studying soil compaction requires large plots, uniform areas of compacted (and non-compacted) 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.

## 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/cm$^3$, while the bulk density of sand-based soils may range from 1.3 to 1.8 g/cm$^3$. 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/cm$^3$. 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.



*A Remik CP-20 cone penetrometer was used to measure the resistance of soil to the insertion of a probe .*

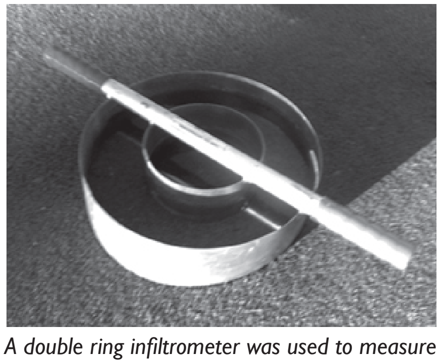
### *Soil Penetrometer Readings*

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 (~$6,000.00).

### *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



*A double ring infiltrometer was used to measure infiltration rate of water into the surface of the soil on a putting green.*

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# SOIL COMPACTION IN TURF

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 (Taylor et al., 1991).

### *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 $G_{max}$. For comparison, a tiled concrete basement floor had a $G_{max}$ reading of 1280, which was reduced to 260 when the floor was covered with a carpet pad (Rogers et al., 1988). In another study, compacted Kentucky bluegrass plots had a value of 206 $G_{max}$, while plots that were not compacted had a value of 93 (Rogers and Waddington, 1992). 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 $G_{max}$ could not be differentiated by players (Miller, 1999).

### *The 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 need 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 three 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

## Dr. Henry W. Indyk

### Graduate Fellowship in Turfgrass Science

*As many of you know, the turfgrass industry lost a dear friend and colleague in September 2005. We will all miss Henry very much and would like to insure that his legacy lives on. The Indyk family would like to establish a memorial fellowship to support graduate students interested in applied turfgrass science. This fellowship is being created to help assure that tomorrow's graduate students have the financial resources to get an advanced degree in turfgrass science at Rutgers University. To fund a full graduate assistantship each year in Henry's name, we will need to raise a total of $400,000. Your generous support at this time will bring us closer to reaching this goal.*

*To make a tax-deductible contribution today, please send a check payable to the Rutgers University Foundation, 7 College Avenue, New Brunswick, NJ 08901. Be sure to indicate "Indyk Fellowship, Turfgrass" in the memo portion of your check. If you desire, you may provide a donation in the form of a pledge payable over several years.*

*For information on other ways to support this fellowship, please contact*
*Dr. Bruce B. Clarke, Director – Rutgers Center for Turfgrass Science*
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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 examined 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 (eight inches deep) reduced soil resistance when either solid or hollow tines (5/8 inch diameter) were used. The standard tine aerifier (four inches deep) often produced a significant reduction in resistance when hollow tines (5/8 inch diameter) were used.

The deep tine aerifier reduced soil resistance from 3.5 to 7.6 inches, but did not reduce compaction in the top 3.5 inches. The standard tine unit did reduce resistance significantly in the top three 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 three years in a row were assessed. At a depth of 2.3 to 5 inches, there was significantly more resistance compared to non-aerified plots. This indicates that a layer of compacted 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 (~ 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.

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*Dr. Dave Han is Associate Professor of Agronomy & Soils, Auburn University, Auburn, AL.*

# More from theNew Jersey Green Expo: Turf and Landscape Conference 2012

## December 4-6, 2012
## Atlantic City, NJ

*by Debbie Savard*


Continued from front cover

# Somerset County Park Commission Wins 2012 SFMANJ FIELD OF THE YEAR

*SFMANJ member Glenn Liebehenz is Grounds Manager at Northern Burlington County Regional High School, site of the 2013 SFMANJ Spring Field Day.*

The North Burlington County Regional School District should be proud of Don and Bernard, their efforts and more importantly, their results. In a time when all we hear about are budget issues and we don't have enough manpower, Don and Bernard have been able to improve 27 fields.

Due to their efforts, Northern Burlington County Regional School District has been chosen as the site for the SFMANJ Spring Field Day. The all day program will include a trade show, equipment demonstrations, baseball field laser grading, infield skin surface amending, pitcher's mound and home plate re-construction, demonstration of cultural practices such as aeration, topdressing and overseeding, educational talks from Brad Park and Craig Tolley, plus DEP credits.

The SFMANJ congratulates Don and Bernard for being runner-up for 2012 SFMANJ Field of the Year.

Dave Kascinsky from the Somerset County Park Commission was the Field of the Year winner in 2010 for the Torpey Athletic Complex Baseball Field and co-runner up for the Softball Field in 2011. It was not a surprise to anyone who knows Dave that he re-submitted the Softball Field for 2012 Field of the Year. Dave has transformed both the softball field and baseball field into very playable surfaces that are perhaps two of the best public ball fields in New Jersey. Both fields have natural turf, with the baseball field having a grass and skin infield and the softball field being all skin. Dave credits his years working with Ray Cipperly and Dan Purner at TD Bank Ballpark, home of the Somerset Patriots with giving him the skills and confidence to become a superior sports turf manager. When asked, Dave still helps at TD Bank Ballpark.

In addition to both ball fields, which have lights, Dave is also responsible for a lighted all-purpose synthetic field. From late April until late October, Dave estimates 25-30 ball games are played 7 days a week, on his two fields.

Like many experienced groundskeepers, Dave performs much of the infield grooming by hand. His pre and post- game routine, learned at TD Bank Ballpark, includes making sure all displaced infield mix is swept from the grass to prevent lip build up. Dave will then make sure the pitcher's mound and home plate area are leveled with moistened clay and compacted. If no games are scheduled during the day, Dave keeps tarps these areas to retain the moisture in the clay.

This past season, Dave amended the existing infield skin surface and had irrigation installed on the softball field.

The existing infield skin surface material was high in sand and silt content. Dave wanted to create a surface similar to that of TD Bank Ballpark. The goal was to drop the overall sand content by 8-10% and raise the clay content so the silt to clay ration was less than 1. The result was a material that resisted migrating into the grass lips and had the ability to absorb more water without eroding.

The new irrigation system allowed Dave to manage moisture within the new skin surface and surrounding turf.

The SFMANJ congratulates Dave Kascinsky and The Somerset County Park Commission for winning the 2012 Field of the Year award.

*SFMANJ member Bernard Luongo is Lead Grounds Manager at Northern Burlington Regional High School, site of the 2013 SFMANJ Spring Field Day.*

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*The well-maintained Girls Softball Field at Northern Burlington County Regional High School, site of the 2013 SFMANJ Spring Field Day*

The SFMANJ Field of the Year program recognizes the efforts of member sports turf managers throughout New Jersey. Applications for the 2013 Field of the Year are due by the end of October 2013 and are awarded at the NJ Green Expo in Atlantic City, NJ in early December. In addition to a plaque, the winner will receive a complimentary registration to all education sessions, the two day trade show, dinner and one nights lodging at Trump Taj Mahal.

If you have any further questions regarding the program please feel free to contact the SFMANJ office.

*Scott Bills is Certified Sports Field Manager (CSFM); Sports Field Consultant; and SFMANJ Secretary and Public Relations Committee Chairman*

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