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February 2017

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ORTS FIELD AND FACILITIES MANAGEMENT

Meet New STMA President

TIM VAN LOO, CSFM

ALSO INSIDE:

Fraze mowing, spring dead spot & bermudagrass

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7 TRENDS FOR 2017

By the time you read this I will have experienced STMA's Annual Conference and so I reserve the right to change my mind but as of this writing, here are 7 topics that I think will be interesting to follow through 2017:

Social media & networking. I rant and rave but there's no "peak screen" ceiling approaching any time soon—we are addicted to our devices. Most of our employers want a digital presence, so if you're not using social media now, chances you will be soon are rising fast.

Professionalism. Directly relating to my first trend is promoting, protecting and strengthening "your brand." Remember that what's posted online is out there forever so choose wisely! Seeking to enhance their personal brands, more turf managers than ever before are becoming certified and attending field days, continuing ed programs and other learning opportunities.

Fewer "Green" regulations—or not. Will federal and/or state government agencies change some rules, for example regarding pesticide use or water restrictions, reflecting the current anti-regulation mood, or is the Green movement too strong?

Research on playing surface characteristics. Our data-driven world increasingly looks for demonstrable evidence before making decisions. Currently several major universities have turf surface research facilities and those, along with many excellent turf programs at schools large and small, usually need support to continue their work. I think it's worth noting if and how specific research is being funded, both to congratulate the sponsors and for the sake of transparency. I hope the work on injury prevention and other safety concerns continues, and that sponsors investigate how they might give wisely to the industry. $upport is needed!

While we're on campus, let's check out the **turf student population**. The past few years have seen mixed results at least anecdotally; I've heard good news and bad news about the health of various programs around the country. Athletics in the USA, like taxes, aren't going away and I believe the job market will continue to be strong for turfgrass program graduates. But the fact that golf pays more, especially for younger folks, is an important issue that continues to affect job prospects.

Replacing and maintaining synthetic turf. Even assuming the large majority of synthetic turf fields installed in the past decade have performed as advertised, the oldest among them are at or nearing their end of life and need to be replaced. How facilities manage these replacements is an emerging trend; lately a few high-profile venues are even going back to natural turf though not nearly enough to name it a trend. And effective maintenance of synthetic fields, especially hardness testing, will hopefully become normal. You can't install 'em and forget 'em.

Unplugging. While we're still a minority I would guess, those among us who choose purposefully to shut off our devices in favor of real face time with family and friends is a something I'd like to see become a big trend. If even for short durations daily, not checking in on social media, emails, etc., can be a beneficial break for your sanity not to mention your health. Put it away and enjoy the peace!

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PASSION AND SERVICE

Please let me start by saying "thank you" to all who attended the Annual Conference this year. I would also like to say "thank you" to Jeff Salmond, CSFM, for his service as our president. His leadership in the boardroom was fantastic, and I for one am glad to have him with us for one more year on the Board of Directors. I would like to say "thank you" to all who signed up for committee service for 2017. Without the work of our committees the STMA would not continue to grow and succeed. During the next few weeks, committee assignments will be set, and your committee chairs will be in contact to get started with the work ahead.

As I think about our industry, I can't come up with a position or a person that doesn't "serve." We serve athletes, coaches, administrators, fans, taxpayers, other sports turf managers, and our families by providing for them. We are an industry that serves others. What a powerful statement that makes about us and what we have the privilege of doing each day. Serving others is also a great responsibility that the STMA knows and understands. Our association is loaded with people who want to help in any way they can; it's why we first came into existence and continue to exist.

I rarely meet a sports turf manager or someone who works closely with the sports turf industry who isn't passionate about their jobs.

My thoughts also quickly go to the personnel who make up our industry. I rarely meet a sports turf manager or someone who works closely with the sports turf industry who isn't passionate about their jobs. Sure, there are days that you may dread going to work, but I know that those are few and far between compared to the days that our work brings joy and fulfillment for a job well done. This passion is my favorite part of our Annual Conference—it fuels me for each new year with greater passion than before.

Service combined with passion is what makes our industry special. We have all heard the response "Living the dream!" when you ask someone "How are you?" For me, "living the dream" is an accurate statement, and I believe that it holds true for many of you. I have the privilege to serve Iowa State University in many different ways each day. That's no different than the companies, cities, districts, schools, or teams that you get to serve each day. What separates sports turf managers from the many others who work within our organizations is our passion.

As you get ready for another growing season and all the goals that you have set to accomplish this year, I encourage you to use STMA, your peers and me as resources to help you. We are all in this profession together. As you drive to work each day, remember that it's a privilege for each of us to serve our workplace. It's also a great privilege to be doing something that we are passionate about—you know—"living the dream."

MEET TIM VAN LOO, CSFM 24TH PRESIDENT OF THE SPORTS TURF MANAGERS ASSOCIATION

For the third consecutive year, STMA members elected someone raised on a farm. There must be something about growing up in an environment that requires a strong work ethic and dealing with Mother Nature that breeds leadership traits.

Tim Van Loo, CSFM, was officially installed as STMA's 24th President at last month's Annual Meeting in Orlando. Tim is Manager of Athletic Turf & Grounds for Iowa State University in Ames. *SportsTurf* emailed Tim some questions late last year:

SportsTurf: Where did you grow up and what were your interests then?

Van Loo: I grew up in a small town in Michigan, Gregory, and I graduated from Fowlerville High School in 1997. My interests were mostly basketball and golf. School was simply a way to compete in sports!

ST: What things did you learn from your parents that still stick with you?

Van Loo: I am blessed with fantastic parents; I am who I am because of them. My mom is a giver/care taker. She deeply loves people and wants to serve. I learned the value of volunteering your time to things

"Tim is very thorough and professional in everything that he does, and likes to make sure every angle to a discussion item has been fully vetted. Tim wants everyone to have looked outside the box for the full picture. These qualities will serve him well as the next President of STMA."

— Jeff Salmond, CSFM, STMA Immediate Past President

that are important to you. She continues to give time to their church and sacrifices many hours to volunteering on committees and leadership roles. My father taught me that hard work is a choice, not an ability. My father has been a farmer his whole life and he worked midnight shifts for 17 years on the weekends to help support our family. He also taught me how to manage people. He was always so patient, understanding, yet demanding when necessary. Those that worked for him always respected him. My hope is that I have used the lessons from both my parents and will continue to apply it to all that I do in my life.

Tim's family: his bride, Amber; sons Brian, Jaheim, Breon, and Steven; and daughters Emefa and Samantha.

ST: How did you decide where to go to college and what your major would be?

Van Loo: When I first graduated high school I started working for a country club golf course. The superintendent was a Michigan State graduate, so that was a huge part of my decision. Also, having grown up in Michigan, Michigan State was the agriculture school, so where else would I have gone?

ST: Now that you've been working in turf management for awhile, are there any changes you'd like to see in how the major is taught at the collegiate level?

Van Loo: I think the biggest thing that allows students to be successful is the experiences they have before they graduate and enter the turf industry. Sometimes I think the image of this business is more appealing than the actual grind it can be on some days. It's a must to work in this industry while in school to make sure you have a passion for it. Without a passion, one won't last.

After that, I think combining the school knowledge with the real world is the biggest struggle for recent graduates. The weather and schedules on athletic fields doesn't always allow you to do what is best for the field. You will have to be able to compromise some book knowledge and make it work with what you have learned from being forced to do things on a different schedule or with challenging weather. Sometimes, you have to fake it until you make it!

ST: What was your first job out of college, and what were the most memorable things you learned from that job?

Van Loo: Northwestern University was my first job out of college. I was finishing up my Master's degree from Michigan State and thought I was ready to take on the world managing athletic fields. I learned so much at Northwestern, and am still grateful for my three seasons there.

First, it's where I learned to work with coaches, staff, and co-workers. It allowed me to apply some of the things I had learned from Amy Fouty, CSFM, while working for her at [Michigan State's] Spartan Stadium. Second, it allowed me to figure out "my style" of growing grass. While in graduate school I did many different research projects while also working at Spartan Stadium. I have tried to marry the two worlds in how I manage the fields that I am responsible for.

ST: What other jobs did you have before your current position and what did you take away from them?

Van Loo: In the time after high school and before I left Michigan State I had managed to work on a golf course in some capacity for a total of 10 seasons, Spartan Stadium for three seasons, Hancock Turf Research Center [at MSU] for 7 years, and help install the Olympic soccer pitch for the 2004 Olympics in Athens, Greece. I had an unbelievable experience at Michigan State and tried to be a sponge during the ride. The research allowed me to not fear "killing grass"; if you kill it enough, you know how to bring it back. Establishing turf after you killed it allows you to not fear damaging the turf. It allows you to freely manage knowing you can always get it back!

ST: Describe relationships you've had with mentors.

Van Loo: I will only comment on a few of them, but there have been so many people that have molded me in who I am today. Dr. Trey Rogers was my major professor at Michigan State. I got to know him on a much more personal level than most students; I helped him coach his daughters basketball team, for example. Through many conversations with Dr. Rogers I learned how to think big picture. Seeing situations from 10,000 feet has helped me to step away from the immediate issue and see the big picture.

Dr. James Crum was another one of my professors at Michigan State. We had a lot of discussions about passions outside of work. The way he approached work, family, and his passions was life changing and impactful. Amy Fouty was

> "I have really enjoyed working with Tim as he has ascended through the various board positions to the office of the President. When he first joined the board, I contacted Mike Andresen, CSFM, who was actually on the Board when I was first hired. I told Mike that he really has mentored Tim well and that Tim is always so well prepared and has a calm leadership style. Mike let me know that he came that way to Iowa State, no mentoring required!
>
> I know that 1-year terms for Presidents can be challenging. However, each President lays such good groundwork for the next that it really is a seamless transition from my perspective. Jeff has done an excellent job prepping Tim, and I know Tim will be successful in leading STMA through 2017, and beyond."
>
> — Kim Heck, CAE, CEO, STMA

always a boss first, but also was always a friend when you needed one. Her approach to dealing with coaches, administrators, and co-workers while still creating world-class playing surfaces is something I have always tried to imitate.

Mike Andresen, CSFM, is not only my current supervisor, but also a man that I go to often for many things. The way he thinks through everything in life has taught me much. Many times what he says is so far from what I was thinking I am surprised and in awe of the wisdom he has to offer.

ST: What's your philosophy on hiring and training in your current position?

Van Loo: My current staff is all students. I try and find students that I think have the passion to be field managers someday. I try to also find students that aren't afraid to work.

The training aspect is something I am still figuring out. The students have such a difference in experience when they get here, I have to almost start at different points with each student. A lot of the time I let the more experienced students train the new students. My goal with all my students is that they are prepared to be a turf manager when they leave here. I try and put all of them in a position to lead before they leave. It's the only way they learn how to lead in their own way, making mistakes while they are here. Allowing mistakes to happen is important in learning how to do it right the next time. I also don't hide anything; if they have a question I try and answer it. I try and also learn from them, this might be the most difficult thing for me. Accepting new and better ways to do something that we have been doing for years a different way, sometimes the "old dog" doesn't want to change.

ST: What are your current job responsibilities and how do you approach both on-the-field issues as well as off-the-field ones?

Van Loo: My current responsibilities are Jack Trice Stadium, three and a half practice grass football fields, softball, practice soccer, track and field throws

Game day at Iowa State's Jack Trice Stadium.

areas, cross-country course, indoor and outdoor artificial fields, athletic facility landscaping, and grass parking lots. In total it's about 55 acres. We also assist with indoor and outdoor track set-up and other miscellaneous events. We also seem to be the muscle of the department, so we tend to move offices, equipment, or simply move things that others can't.

On field issues are solely on the crew and me. We have great coaches that are very understanding of what we do. We try and work with all the teams to make sure they have what they "need" with every attempt to get them what they "want"! We are in the service business; the fields aren't mine, they belong to the teams. They use the fields whenever they want, it's their call; I only say something if I am asked. As long as the field is safe it's a green light to use.

Off-field issues in our business usually are with personnel. Fortunately for me, I don't have a ton of them. Usually a face-to-face conversation is all that is needed.

ST: What qualities do you think a sports turf manager must possess today to be successful?

Van Loo: The ability to communicate clearly. Again, we are in the service business, understanding clients is a necessity, and that takes communication. They also need the ability to adapt on the fly; a plan is good, but if that falls apart you need to be able to adapt and proceed. Most importantly, stay positive about the service you provide. When the days get long and the job seems thankless, you have to keep positive and stay the course. Find the pride in a job well done, even when you're exhausted and stressed.

ST: How do you think the profession will change in the coming decade?

Van Loo: We continue to raise the bar on athletic field maintenance. Some of the facilities and fields I see are truly unbelievable. I think the move toward artificial will slow as people see the benefits of well-maintained natural grass. As well-maintained grass is the answer, there will be a greater need for sports turf managers.

ST: When and why did you join STMA?

Van Loo: I was a student member, but really didn't get involved until I became a sports turf manager. I was fresh out of school, and needed help from my peers. Sports turf managers generally don't keep secrets, which allows us all to learn from those that have been successful. The STMA is full of people that want all fields to perform at the highest level. Being a part of STMA allows you to learn from the best, and take those practices to make your fields perform at a higher level.

> "Tim Van Loo is a sport turf professional that is a natural leader. He is a resource for support, critique and guidance for all turf managers. Tim has been instrumental with the local Iowa sports turf chapter. His commitments to hosting, speaking and organizing activities has developed the chapter into a sustainable affiliate. Tim is a humble individual that offers friendship, guidance and expertise. As the President of the STMA he will be an influential leader with 100% commitment."
>
> — Troy McQuillen, Iowa STMA Chapter President

Continued on page 49

IMPACT OF FRAZE MOWING ON SPRING DEAD SPOT IN BERMUDAGRASS

BY **BRAD FRESENBURG, PHD, LEE MILLER, PHD & DANIEL EARLYWINE**

Spring Dead Spot (SDS) is a problematic disease of bermudagrass sports turf managers have dealt with for many years. SDS is the most severe pest issue on bermudagrass in Missouri, and other regions where bermudagrass goes into dormancy. SDS is caused by a soilborne pathogen (*Ophiosphaerella*spp.) that infects roots, rhizomes and stolons as the plant goes into dormancy in the fall. During spring green-up, infected patches are dead and simply appear to remain dormant. Recovery can occur from the uninfected areas around those patches by shooting out rhizomes and stolons and oftentimes weed emergence in the affected areas occurs before complete recovery. Since the pathogen is soilborne, control is difficult, particularly in a curative situation. Current control recommendations rely almost exclusively on fungicide use. The effectiveness of these fall preventive applications can be sporadic, and recovery from an existing epidemic may be a multi-year process.

Integrating cultural practices with fungicide use may be a method to reduce disease. Observations indicated that newly established bermudagrass would not show signs of SDS until usually the third or fourth season. Additionally, high use areas, such as between the hash marks on football fields, often showed less spring dead spot severity than low traffic areas. This indicated thatch was perhaps a factor in SDS development so recommendations included thatch management by means of vertical mowing and aeration. The common practice for those who had the disease visible during spring green-up was to rake out the spots and fertilize to promote regrowth and recovery of the bermudagrass.

Several research trials have indicated hollow-tine aerification or other cultivation methods may reduce SDS severity and increase fungicide efficacy. Recently, a new intense surface cultivation method termed “fraze mowing” gained popularity as a method of thatch removal and playing surface renovation in sports fields.

The key to fungicide efficacy for SDS is to get the fungicide where it is needed. Therefore, the objective of this research is to determine the impact of fraze mowing on SDS severity, and determine how this practice can be implemented in an integrated pest management plan for this disease.

METHODS

Trial 1 was initiated on 22 July 2014 at the MU Turfgrass Research Farm on a ‘Riviera’ bermudagrass block severely infested naturally with SDS caused by O. *herpotricha*. Plots were 5 x 10 feet and arranged in a randomized complete block with four replications. Treatments were arranged in a split plot design with fraze mowing as the main plot and nitrogen source as the subplot. Before treatments were applied, an initial disease rating was conducted on 24 June 2014 to assess treatment effects. Fraze mowing was conducted on 22 July 2014 at 0.16 and 0.32 inches with a KORO Field Topmaker or not cultivated. To encourage bermudagrass regrowth, ammonium sulfate or urea was applied weekly at 0.5 lb N/1000 ft2 for 6 weeks after fraze mowing. SDS severity and green cover were evaluated every 14 days by visual estimation of percent disease area and digital image analysis, respectively. Area under the disease progress curve (AUDPC) was calculated with the trapezoidal rule. All data were subjected to analysis of variance, and where applicable, means were separated with Fisher’s Protected LSD (0.05).

These same plots were fraze mowed again on 30 June 2015 and evaluated for a second season.

Trial 2 was initiated on 30 June 2015 at the MU Turfgrass Research Farm on a block of ‘Patriot’ bermudagrass. The entire 11,000 square foot block was inoculated with a four isolate mix of *Ophiosphaerella herpotricha* on 13 September 2013. Initial disease symptoms from inoculation occurred in late May 2015. Plots were 5 x 10 feet and arranged in a randomized complete block design with four replications. Treatments were arranged in a split plot design with fraze mowing as the main plot and nitrogen source, manganese, and fungicide application as subplots. Fraze mowing was conducted on 30 June 2015 at 0.16 and 0.32 inches with a KORO Field Topmaker or not cultivated. Dissolved ammonium sulfate or calcium nitrate was applied weekly at 0.5 lb N/1000 ft2 for 6 weeks after fraze mowing. Manganese treatments were applied every other fertilizer application (3 times @ 2 week intervals) as 2 pounds manganese sulfate/A. Nitrogen and manganese treatments continued in summer 2016 with 1 pound N/1000 ft2 and

2 pounds manganese sulfate/A applied monthly. Fungicide treated plots were sprayed with Velista (a.i. penthiopyrad) at 0.7 oz/1000 ft2 immediately after fraze mowing and again on 14 October 2015. Treatments were immediately watered in with 0.2 inches of post-application irrigation. SDS severity and green cover were evaluated every 7 days by visual estimation of percent disease area and digital image analysis, respectively, in Spring 2016. Area under the disease progress curve (AUDPC) was calculated with the trapezoidal rule. All data were subjected to analysis of variance, and where applicable, means were separated with Fisher's Protected LSD (0.05).

FINDINGS

Trial 1: Fraze mowing at either 0.16 or 0.32 inches did not statistically increase or decrease SDS severity in Spring 2015 compared to the initial rating. Plots treated with ammonium sulfate had lower SDS severity than urea on two of the four rating dates, reducing disease by 12-22% from the initial 2014 rating. Over the initial season of study, fraze mowing did not increase or reduce an established SDS epidemic. Even after year two, results for this smaller initial trial were inconclusive.

Trial 2: Fraze mowing at 0.32 inches alone and in combination with other treatments decreased SDS severity compared to non-fraze plots. Fraze mowing breaks up the thatch and mat layer, allowing new growth of rhizomes and stolons to occur. This new plant tissue should be pathogen free, and if protected from new infection should lead to recovery.

The evaluation of various nitrogen sources (calcium nitrate or ammonium sulfate) in this study was aimed at manipulating soil pH, which has been observed to play a role in the reduction of SDS. When ammonium (positively charged) is absorbed by plants, hydrogen ions are released in the rhizosphere; therefore, creating a more acidic environment near the roots. When nitrates are absorbed by plants, the exchange is with hydroxyl ions; therefore, raising the pH to a more basic environment. In most research, lowering the pH with an ammonium fertilizer source has subsequently reduced SDS severity.

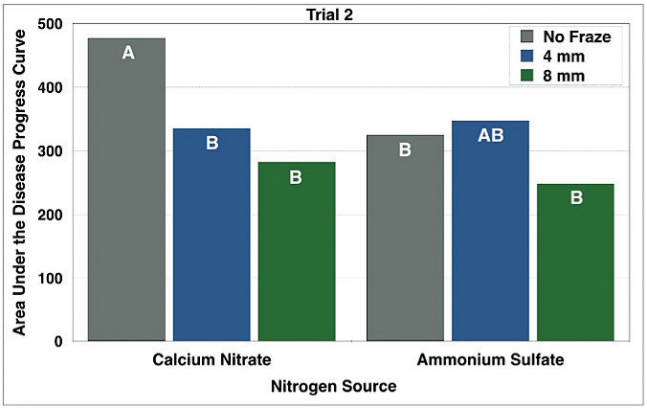

Figure 1.* Effect of fraze mowing height and nitrogen source on SDS severity.

In this trial, sprayable ammonium sulfate reduced SDS severity in the unfrazed plot compared to calcium nitrate, but no significant differences were noted among fraze mowed plots (Figure 1). In a previous trial (Cottrill et al. 2016) at the site, ammonium sulfate did not reduce SDS on plots that did not receive aerification or fraze mowing. This seems to support the theory on acidic rhizosphere conditions immobilizing SDS, and the potential need to integrate ammonium fertilization with an aerification or thatch removal practice such as fraze mowing.

Manganese is a micronutrient needed for enzymes involved in the lignification of cell walls, a defense mechanism against diseases. Previous work has shown that the take-all patch pathogen (another soilborne disease) changes the form of manganese to make it unavailable to the plant root. This manganese deficit results in the plant being susceptible to infection. In these cases, and particularly in high pH or manganese deficient soils, supplemental manganese applications have resulted in lower disease severity not just for take-all patch, but also for summer patch on Kentucky bluegrass. After the first year of applications, manganese did not have an impact on SDS severity, so perhaps this mechanism is not the same. Treatments continued into the second season and will be evaluated.

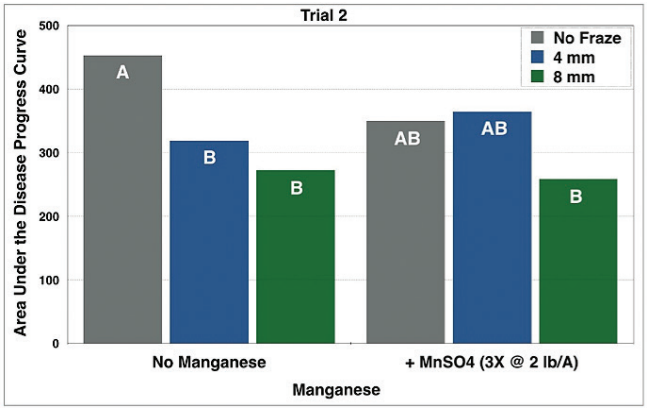

Figure 2.* Effect of fraze mowing height and manganese applications on SDS severity.

Velista fungicide is a broad spectrum SDHI (Succinate Dehydrogenase Inhibitor – FRAC Group 7) that protects against several turfgrass diseases including SDS. Velista binds with SDH inhibiting a critical respiratory pathway preventing spore germination and mycelia growth necessary for infection. Getting fungicides to the point of infection is critical when working with soil-borne diseases such as SDS. As expected, Velista fungicide applications consistently reduced SDS severity compared to the untreated control. A numerical increase in fungicide control was also observed with an increase in fraze mowing depth from 0 to 0.32 inches (Figure 3).

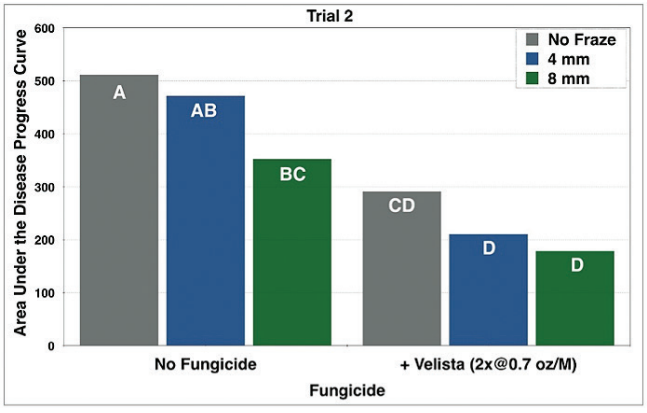

Figure 3*. Effect of fraze mowing height and fungicide application on SDS severity.

In combination treatments of nitrogen source, manganese, and fungicide, SDS was numerically reduced with an increase in the fraze mowing depth (Figure 4). While there were no significant differences, the correlating trend of less SDS with increased fraze mowing depth provides further evidence that thatch/organic matter removal and subsequent rhizome and stolon regeneration could be an important part of disease control.

Several research trials have indicated hollow-tine aerification or other cultivation methods may reduce SDS severity and increase fungicide efficacy.

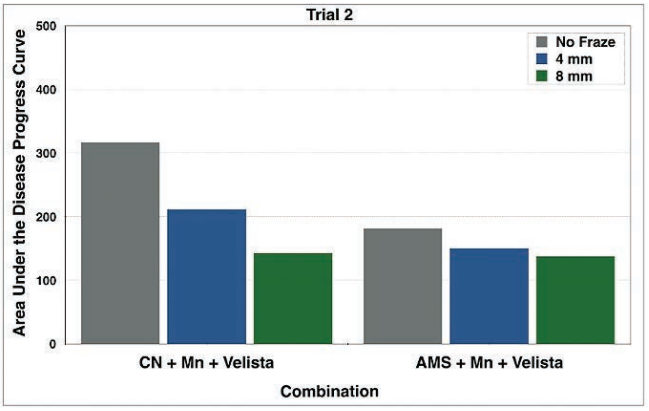

Figure 4. Effect of fraze mowing height, nitrogen source, manganese and fungicide on SDS severity. No significant differences among treatments.

While fraze mowing still provides many other benefits of thatch removal, weed seed removal, and a clean spring transition of bermudagrass athletic fields by promoting new growth, the practice may also serve as a tool to reduce spring dead spot severity. As evidenced in our first trial, fraze mowing is not a stand-alone practice for control of SDS, but instead should be looked at as a component of an overall management program. As with most research, this work has led to more questions. Can aggressive fraze mowing with a fungicide alone be all that is needed? Does it become a multi-year approach? Is fraze mowing necessary every year? Continued work at the University of Missouri and other institutions will hopefully provide an answer to these questions and more as the new practice of "fraze mowing" becomes more standard and widespread.

*Bars with the same letter are not significantly different according to Fisher's Protected LSD test. ST

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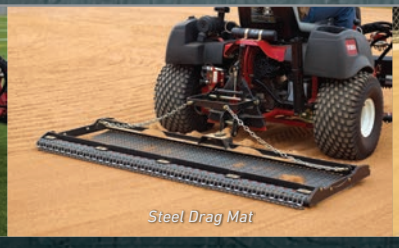
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HOW ABOUT THE MICRONUTRIENTS?

BY NICK CHRISTIANS, PHD, AND ADAM THOMS

While nitrogen (N), phosphorus (P), and potassium (K) generally get the most attention when the subject of turfgrass nutrition for sports fields is considered, there are a number of other elements that can also play important roles in a sound management program. There are 17 elements required for the growth of plants (see Table 1). Most of the plant tissue is comprised of carbon (C), hydrogen (H), and oxygen (O), but these three elements are obtained from carbon dioxide in the air and from water and are not included in a fertility program. The other 14 are generally obtained from the soil by the root system, or in some situations through the leaf, and are referred to as the mineral nutrient elements. Of these 14 elements, N, P, and K are usually needed in the largest quantities by most plants, but some of the others can also be important in unusual soil conditions, such as in the sand-based media of a sports field. An imbalance in the soil's pH can also result in deficiencies.

These 17 essential elements are divided into the macronutrients and the micronutrients. They are all essential for plant growth; the difference lies in the amounts in which they are needed. Macronutrients are used in the greatest quantities and are generally found in plant tissue in amounts of 1,000 parts per million (ppm) or more. Micronutrients are found in plants at levels of 100 ppm or less. By this definition, carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, sulfur (S), calcium (Ca), and magnesium (Mg) are macronutrients and iron (Fe), copper (Cu), zinc (Zn), manganese (Mn), boron (B), molybdenum (Mo), chlorine (Cl), and nickel (Ni) are micronutrients. In this article we would like to concentrate on the elements other than N, P, and K and how they fit into a fertility program for turf.

SOIL AND TISSUES TESTS AND SOIL PH

Turf grown on a clay-loam soil with a pH slightly below 7 will rarely show deficiencies of the micronutrients. Grass grown on low-fertility sands, or on soils with an excessively high or low pH may show deficiencies of some of these elements, however. The environment may also play a role. For instance, deficiencies may occur in very wet years, or when it is unusually hot. Therefore, the best starting point is to have both a soil and tissue test completed for each sports field. Make sure to have an independent lab run soil tests, and not one that is sponsored by your fertility supplier.

Soil tests should also report the pH of the soil, which can be an important clue in determining the availability of many of the micronutrients. Figure 2 shows the effect of pH on nutrient availability. The wider the line, the more available is the nutrient to plants, and the narrower the line, the less is available. Elements like Ca and Mg are limited in low pH ranges, while elements like Fe and manganese Mn are readily available in low pH ranges and less available in soils with pHs above 7.

CURVE OF DIMINISHING RETURNS

There is an important concept in plant nutrition that should be considered before dealing with the individual elements. That is the curve of diminishing returns (Fig. 1). The curve of diminishing returns applies to living systems in a number of important ways and is also used by economists to explain the effects of economic input and output. The concept simply stated is that where a deficiency exists, the first increments of the deficient material will produce a considerable increase, whereas each additional increment produces a diminishing response until you reach the sufficient level of that material and no further response can be expected. In agronomics, these curves are also known as "yield curves" and studies are constantly underway with a variety of crops and soil types to determine where the leveling-off point occurs. It makes no sense economically to apply more than is needed for maximum yield. In turf management, our goal

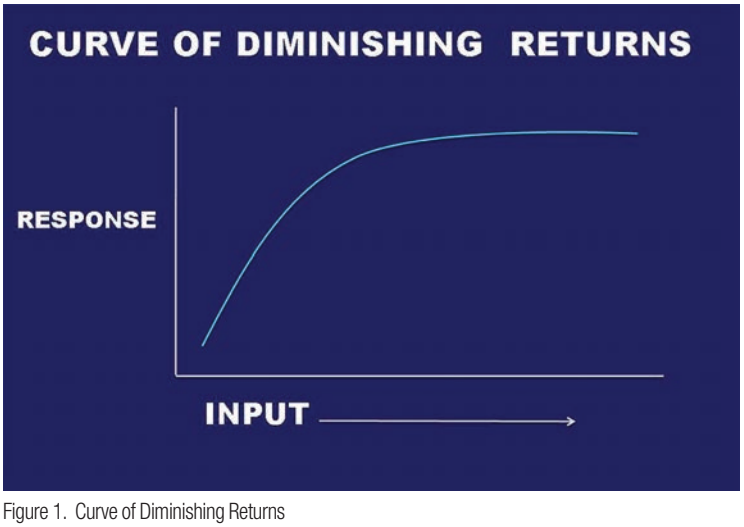


Figure 1. Curve of Diminishing Returns

is usually not yield of tissue, but aesthetics (how the area looks), but the concept still holds true. If you have enough of a particular element, more is not going to help.

Let's use calcium (Ca) as an example. If the grass is growing on a media that is very low in Ca, such as a silica-based sand, the grass will likely show a deficiency of Ca. An ounce of Ca/1,000 ft2 would likely elicit a measureable response on the plant. An additional ounce would provide some response, but not as great as the first application. As more and more is added, a point is quickly reached at the top of the curve where no additional response will occur. So, does Ca work? The answer is yes, if you have the conditions in which Ca is truly deficient. But the answer is no if you already have enough Ca.

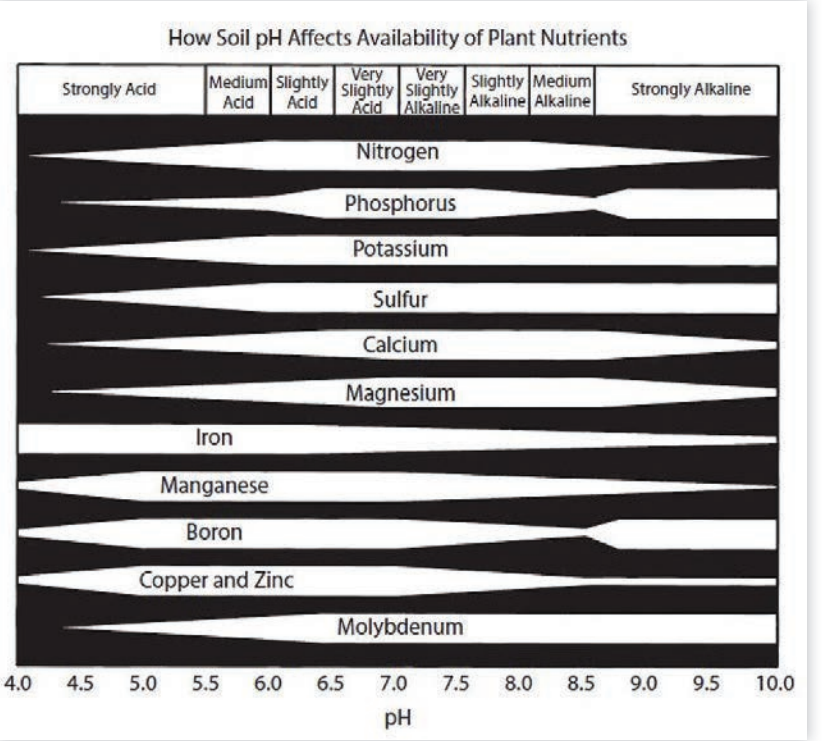


Figure 2. The effect of soil pH on nutrient availability. The wider the line, the greater the availability. (Christians et al, 2016). Picture is based on Troug, 1946.

It is also possible to apply too much of anything and cause a negative response. Boron for instance has a very narrow range from enough to too much, and excessive B can kill the plant. This is also true of some of the other nutrients to varying degrees. One of the most obvious is N. Grass deficient in N will be chlorotic and grow slowly, just enough and the plant is at peak performance, but apply too much and you can kill the grass. Other elements, such as P have a very wide range of sufficiency and negative responses occur only at extremely high levels.

This same concept holds true for your body. Does vitamin D work? Yes it does if you have a true deficiency of this vitamin. But if you already have enough, more is not going to improve your heath, and excessively high doses may be dangerous. We also mentioned economics. Economists find that if an economy is underinvested in certain areas, the application of additional capital will provide a large improvement in economic conditions, but the return on investment diminishes with each addition of capital, until the point of leveling off is reached.

Keep this concept in mind when dealing with each of the following elements. Is each of these needed in a fertility program for sports fields? Clearly the answer is yes, if they are deficient, but if there is enough, more and more will not help.

MICRONUTRIENT ELEMENTS

Iron is often the most common deficient micronutrient because it can easily become unavailable to the plant in high-pH soil. Tissue tests can reveal needed applications of Fe. Sufficient levels of Fe in plant tissue are 150 to 500 mg kg-1. Iron is a critical element in the formation of chlorophyll, and turfgrass will demonstrate a yellow or chlorotic color when Fe is lacking. Applications of Fe will make the turfgrass a darker green color within 24-48 hours. Iron and other metal elements such as Mn and Mg will often be applied as a chelated form to hold solubility in high-pH soils. Common forms of Fe used in turf are iron sulfate (FeSO4), and two commonly used chelated forms: iron diethylene triamine pentaacetic acid (DTPA) and iron ethylenediamine-N,N'-bis(2-hydroxyphenylacetic acid) (EDDHA). Chelated forms are more expensive, but should have a positive response that lasts longer than FeSO4. New research also indicates 93% of iron applied as iron glucoheptonate (a form of chelated iron) or iron sulfate were deemed insoluble to the plant within an hour when applied to soil. Applicators need to be sure to not drive across fresh Fe foliar applications to avoid tire marks on the field.

Manganese deficiency can look similar to magnesium deficiency with the leaves demonstrating a chlorotic appearance. This is due to the role manganese plays in photosynthesis, enzyme activation, and root growth. A healthy turfgrass should contain between 20 to 500 mg kg-1 of Mn on a dry weight basis. Deficiencies can happen in low- to high-pH soils. Manganese deficiency will show up in younger growth first since it is immobile in the plant. Soil applications of Mn from either the sulfate or glucoheptonate forms remained at least 30% soluble for 21 days after application; however, a rapid reduction in solubility took place to get to that 30% solubility.

Zinc deficiency is a rare problem. It typically occurs in soils with an excessively high or excessively low pH. Zinc deficiencies are generally associated with tissue levels below 15-20 mg kg-1. In various turfgrass species, the range may be as high as 20 to 55 mg kg-1. Deficiency symptoms of Zn will vary with warm- and cool-season turfgrasses.

Copper, again a very rare deficiency in turf, and tissue tests of less than 5 mg kg-1 will demonstrate visual symptoms. These symptoms include: a bluish color on new leaves and necrosis that moves to the base of the leaf.

Plants need very low amounts of Mo to function. Plant tissue should contain 0.1 to 1 mg kg-1 and soil tests should be in the range of 0.1 to 1.2 mg kg-1. Molybdenum deficiencies are very rare but may occur on turf grown in acidic, sandy soils in humid regions. One of the solutions to Mo deficiency can be to increase soil pH by liming.

Table 1. The 17 Essential Nutrient Elements Required for the Growth of Plants

Carbon (C)	Sulfur (S)	Zinc (Zn)
Hydrogen (H)	Calcium (Ca)	Boron (B)
Oxygen (O)	Magnesium (Mg)	Chlorine (Cl)
Nitrogen (N)	Iron (Fe)	Copper (Cu)
Phosphorus (P)	Manganese (Mn)	Nickel (Ni)
Potassium (K)	Molybdenum (Mo)	

If you have enough of a particular element, more is not going to help.

Boron is the least understood micronutrient, however it is known that grasses need between 5 to 10 mg kg-1 of B in the tissue. Since these levels are so low, that might explain why deficiencies are so rare. However, symptoms of B deficiencies are discoloration of the shoots and stunting of the growth point. Boron fertilization is generally avoided because the range for toxicity is not much above the range for deficiency. Sewage effluent water can be high in B and if effluent is used for irrigation, this is an element that should be monitored.

Chlorine deficiencies again are fairly rare, but when they do happen they appear as chlorosis of new leaves, witling, and in some cases necrosis. Plants should contain around 0.1 to 0.6% Cl by dry weight, and deficiencies would show up when tissue Cl concentrations are less than 200 to 400 mg kg-1. If deficiencies appear, applications of potassium chloride can correct the problem. Cl toxicity can occur when Cl becomes >1% of dry weight.

Nickel was most recently added to the list of essential elements. Its role in the plant is poorly understood, and in fact no specific Ni deficiency symptoms exist for turfgrasses. Plants normally contain Ni in a range of 1 to 10 mg kg-1 by dry weight, and repeated applications of sewage and related-industrial byproducts could be the source of Ni toxicity on turfgrass stands.

A few other elements have also been considered for the list of essential elements for all plants, but have not been added to date. Silicon is often not classified as an essential mineral nutrient for turfgrasses, but turfgrass tissue concentrations typically contain 1% of their dry weight as Si. No current Si recommendations exist for any specific turfgrass species at this time, and currently deficiency symptoms don't exist for Si.

Cobalt (Co) is another one of the elements that is not on the accepted list of essential elements, but plays an important role in some higher plants. It is found in plants in small amounts, it helps with metabolism, and has demonstrated a role in nitrogen fixation in legumes. It can be found in coastal mountain soils of California in high levels, which can make for difficult growing conditions for turfgrasses in these soils. Specific ranges of Co are not known for turfgrasses deficiency or toxicity.

Sodium is not considered essential for plant growth, but is easily taken up by the plant and present in many soils. Soils with a pH above 8.2 can have Na on Cation exchange sites, which will lower the soils ability to hold and exchange other elements. Excessive Na will also cause the soil to loose structure. Halophytes, or salt-loving plants, remove Na from the soil and thrive with Na present, in many cases, Na is harmful to most turfgrass species. Seashore paspalum is the one major turfgrass exceptions.

Tissue tests and soil tests are two of the best ways to see if micronutrient fertilization applications are needed, and these tests will give you an idea of where you stand on overall fertility. Since micronutrients play important roles in healthy turfgrass, they need to be considered in the development of a sound management program. But don't forget the concept of the "curve of diminishing returns." If you have enough, more is not going to help. In fact it can become toxic. ST

Nick Christians, PhD, is a professor in the department of horticulture at Iowa State. Adam Thoms is assistant professor and Extension turfgrass specialist at Iowa State. *References for this article are available on www.sportsturfonline.com. For more information on micronutrients, see the latest edition of "Fundamentals of Turfgrass Management 5th ed." (Christians, Patton, and Law, 2016).*

John Mascaro's Photo Quiz

Answer on page 35

John Mascaro is President of Turf-Tec International

Can you identify this sports turf problem?

PROBLEM: Thin and uneven turf

TURFGRASS AREA: Baseball outfield

LOCATION: Bloomington, Illinois

GRASS VARIETY: Kentucky bluegrass blend

BACKGROUND ILLUSTRATION COURTESY OF ISTOCKPHOTO.COM

IRRIGATION WATER TESTING AND INTERPRETATION

BY DR. JUSTIN QUETONE MOSS & CHRISSIE A. SEGARS

Whether it's your first day on the job or your 20th year as a sports turf manager, it's important to know where your irrigation water comes from. Common irrigation sources for sports turf managers include, but are not limited to: surface water, groundwater, municipal water, and recycled/effluent water. Now that you know your water source, what in the world is in it and what does it mean? Irrigation water management is an important component of a successful sports turf management program. Whatever your water source, it is important to test your irrigation water so you can successfully manage your field in the best way possible. This article seeks to educate sports turf managers on how to properly take a water sample and what to do once you get your irrigation report back from the lab.

COLLECTING THE SAMPLE

Obtaining a proper sample is the first step in receiving an accurate irrigation report. Below are general guidelines for collecting a sample. You should always check with the lab where you are submitting your sample for their specific guidelines. The steps below are taken from the soil, water and forage lab at Oklahoma State University.

1. Obtain a clean, opaque 4oz water bottle from a local extension office.
2. Take the sample directly from the irrigation source you want to test (irrigation head).
3. Fill the bottle halfway, rinse the bottle entirely then pour it out. Repeat three times.
4. Collect the sample.
5. Label bottles immediately.
6. Fill the bottle as full as possible with the lid tight and submit to county extension office or lab.

INTERPRETING THE REPORT

When you first receive your irrigation report, it can be overwhelming. Where do you start? What should you be looking for? Below, we will look at several parameters that will give you a great start for interpreting your water results. All parameters are important, but these are the best place to begin.

pH is the measurement of dissolved hydronium ions in solution. Irrigation water can be classified as alkaline or acidic based on the pH value. The pH values can range from 0 to 14; 7.0 is neutral, below 7.0 is acidic, and above 7.0 is alkaline. A desirable range of pH for most turfgrasses is 6.0 to 7.0 but most irrigation water will range from 6.5 to 8.4. The suggested range is also dependent upon your soil type. A pH outside of this range may not be a direct problem itself, but may show a need for evaluation of other chemical components in the irrigation water.

Bicarbonate & Carbonate are common components of irrigation water that can have a direct effect on turfgrass health. If bicarbonates are >120 ppm and carbonates are > 15 ppm and sodium is >100 mg/L, then there is potential to create sodic soil conditions. This is bad for soils and for turfgrass performance. High concentrations of bicarbonates and carbonates with high calcium and magnesium can lead to deposits of calcium or lime. Irrigation water with a high pH (>8.0) often contains higher bicarbonates.

Residual Sodium Carbonate (RSC) allows us to find the sodium hazard of our irrigation water. To get this parameter bicarbonate, carbonate, calcium, and magnesium are calculated based on an equation and expressed to give us the sodium hazard. An easy way to think about this parameter is calcium and magnesium act as a "blocker" of sodium accumulation. If the RSC becomes too high, the calcium and magnesium are removed and unable to stop the accumulation of sodium. The range for RSC can be seen in Table 1.

RESIDUAL SODIUM CARBONATE	SODIUM HAZARD
<0 (A NEGATIVE NUMBER)	No hazard.
0-1.25	Low Hazard
1.25-2.50	Medium Hazard
>2.50	High Hazard. Sodium accumulation.

Table 1: Classification of irrigation water based on RSC in meq/L (Adapted from Moss et al., 2016).

Electrical Conductivity & Total Dissolved Solids. Saline soil conditions are one of the more common issues when dealing with marginal to poor irrigation water quality. Electrical conductivity is a measure of the degree that a water conducts electricity across 1 cm of water. Electrical conductivity is measured by passing an electrical current through the water sample and recording the resistance. Electrical conductivity is used to estimate total dissolved solids by multiplying by 0.64 based on the units given below in Table 2. Total dissolved solids or total soluble salts (TSS) are often reported as "total salts" on an irrigation

Whatever your water source, it is important to test your irrigation water so you can successfully manage your field in the best way possible

water report. Both methods of reporting are useful. Total salts is a more direct approach while EC is indirect. Remember, 1ppm=1mg/L.

TOTAL SALTS	EC	CLASSIFICATION	MANAGEMENT
<320	<500	Excellent	None
320-960	500-1500	Good	Little concern, especially with periodic rainfall
960-1920	1500-3000	Fair	Leach salts from soil as needed
1920-3200	3000-5000	Poor	Routinely leach; monitor soils
3200-3840	5000-6000	Very Poor	Requires special attention; consult water specialist
>3840	>6000	Unacceptable	Do not use

Table 2: Classification of irrigation water based on total salts (mg/L or ppm) and EC (µS/cm or µmhos/cm) (Adapted from Moss et al., 2016).

The Sodium Adsorption Ratio is generally used to determine the ratio of sodium to calcium and magnesium in soils, which determines sodium status and permeability hazard. Although, this is a soil parameter, it can be used to classify irrigation water (Table 3) and is typically reported on irrigation reports.

SAR	CLASSIFICATION	MANAGEMENT
<1	Excellent	None
1-2	Good	Little concern; add pelletized gypsum periodically
2-4	Fair	Aerify soil, sand topdress, apply pelletized gypsum, monitor soils
4-8	Poor	Aerify soil, sand topdress, apply pelletized gypsum, monitor soils closely, leach regularly
8-15	Very Poor	Requires special attention, consult water specialist
>15	Unacceptable	Do not use

Table 3: Classification of irrigation water based on SAR (Adapted from Moss et al., 2016).

TOTAL SALTS

Together, total salts and SAR are used to help predict water infiltration rates. Infiltration refers to the soil's ability to allow water through; also referred to as soil permeability. Infiltration rates can be improved by high total salts, but high salts may also reduce turfgrass health. Therefore, irrigation water with high salts can benefit and damage turfgrass simultaneously (Fig. 1). Extremely pure water can lead to reduced infiltration, even at low SAR. High total salts can help with infiltration at medium to high SAR (15-20); high calcium and magnesium can counterbalance effects of high sodium.

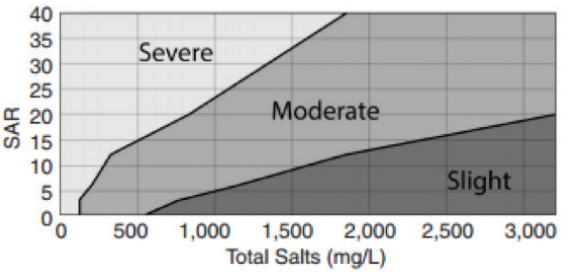
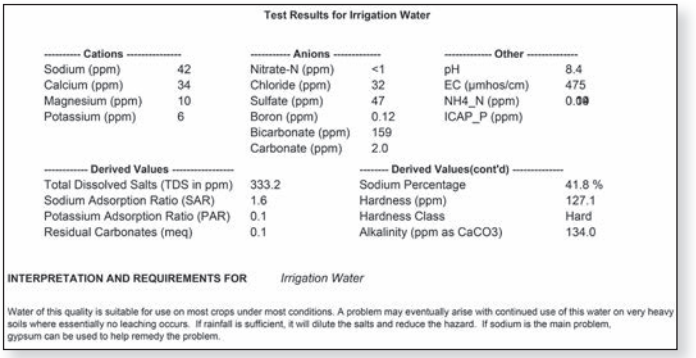


Figure 1: Total salts and SAR are used together to predict the effect of irrigation water on infiltration hazard (Adapted from Harivandi, 1999).

EXAMPLE IRRIGATION WATER REPORTS

Let's look at two example reports. Both reports will come from the Oklahoma State soil, water, and forage lab. These irrigation reports are broken down into categories that make it easy to see and know what to look for. These reports also include a paragraph that gives recommendations based on the reported values. This will not be the case for all labs, but is becoming more common.



Test Results for Irrigation Water

Cations		Anions		Other	
Sodium (ppm)	42	Nitrate-N (ppm)	<1	pH	8.4
Calcium (ppm)	34	Chloride (ppm)	32	EC (µmhos/cm)	475
Magnesium (ppm)	10	Sulfate (ppm)	47	NH4_N (ppm)	0.09
Potassium (ppm)	6	Boron (ppm)	0.12	ICAP_P (ppm)	
		Bicarbonate (ppm)	159		
		Carbonate (ppm)	2.0		

Derived Values		Derived Values(cont'd)	
Total Dissolved Salts (TDS in ppm)	333.2	Sodium Percentage	41.8 %
Sodium Adsorption Ratio (SAR)	1.6	Hardness (ppm)	127.1
Potassium Adsorption Ratio (PAR)	0.1	Hardness Class	Hard
Residual Carbonates (meq)	0.1	Alkalinity (ppm as CaCO3)	134.0

INTERPRETATION AND REQUIREMENTS FOR *Irrigation Water*

Water of this quality is suitable for use on most crops under most conditions. A problem may eventually arise with continued use of this water on very heavy soils where essentially no leaching occurs. If rainfall is sufficient, it will dilute the salts and reduce the hazard. If sodium is the main problem, gypsum can be used to help remedy the problem.

Example 1- Suitable Irrigation Water

The pH of this water is in the upper part of our desired range. However, a pH of 8.4 will still allow for successful turfgrass growth without further remediation. A pH above 8.0 can cause higher bicarbonates, but in this case, since sodium is not an issue it should be suitable for turfgrass growth.

The bicarbonate of this irrigation water is slightly above the threshold of 150 ppm. However, levels of carbonates and RSC are well within the low hazard category. The pH of the water

could be the cause of the slightly higher bicarbonate level. Irrigation water with these reported values should have no concern for sodium accumulation.

The EC for this irrigation water falls into the "Excellent" range. This range suggests no management concern. Remember, EC is an indirect measurement of salt accumulation but can still be useful for management considerations.

The total salts reported value of 336.7 ppm falls into the "Good" range for irrigation water. This water should have little management concern especially with rainfall and leaching ability. The SAR of 1.5 also falls into the "Good" range. This value is of little management concern, however, if sodium should become a problem, gypsum can be used to help remedy the concern.

Now that we have looked at these two parameters separately, let's look at how they will affect infiltration rates together. According to Figure 1 above, when used together, these parameters fall into the "Moderate" category for infiltration. If this water is being used on a heavy soil system where leaching is unable to occur, a problem could arise in the future. However, with regular rainfall and leaching occurring, no problem should be found.

Overall, this irrigation water should be suitable for turfgrass growth without many problems, especially if it is on a sand based system.

Test Results for Irrigation Water

---------- Cations ----------		---------- Anions ----------		---------- Other ----------	
Sodium (ppm)	164	Nitrate-N (ppm)	<1	pH	8.3
Calcium (ppm)	53	Chloride (ppm)	40	EC (µmhos/cm)	1042
Magnesium (ppm)	15	Sulfate (ppm)	160		
Potassium (ppm)	1	Boron (ppm)	1.69		
		Bicarbonate (ppm)	429		
		Carbonate (ppm)	2.2		

---------- Derived Values ----------		-------- Derived Values(cont'd) ----------	
Total Dissolved Salts (TDS in ppm)	865.2	Sodium Percentage	64.5 %
Sodium Adsorption Ratio (SAR)	5.1	Hardness (ppm)	196.7
Potassium Adsorption Ratio (PAR)	0.0	Hardness Class	Very Hard
Residual Carbonates (meq)	3.2	Alkalinity (ppm as CaCO3)	355.6

This water is generally of sufficiently low quality that its use is considerably restricted. It may be used safely only on very well-drained, permeable soils and on salt-tolerant crops. It requires careful irrigation practices including applications of excess irrigation water to keep the soil leached of salt when rainfall is insufficient to provide leaching.

Good soil management practices must be used to maintain good physical structure in the soil and to maintain a high level of fertility. Use of this water on medium textured soils may result in problems if care is not exercised. This water is not recommended for heavy textured soils.

If this water is used extensively, it is recommended that a soil sample be obtained every few years from the irrigated fields to determine the extent to which sodium or salts may be accumulating and the need for special management practices.

Residual carbonates are present in excess amounts lowering water quality to unsuitable.

Water with too high residual carbonates may contain effective sodium in excess of that indicated by the sodium percentage of the water. The calcium and magnesium may precipitate out as lime, thus increasing the percentage of sodium. Boron toxicity may occur in poorly drained soils

Example 2- Potentially Unsuitable Irrigation Water

The pH of this water is in the upper part of our desired range. However, a pH of 8.3 will allow for successful turfgrass growth without further remediation. A pH above 8.0 can cause higher bicarbonates. However, in this case, sodium is an issue but is likely not due to pH.

The bicarbonate level of this irrigation water is well above the recommended threshold of 150 ppm. The carbonate level is below the recommended threshold of 15 ppm. However, when the bicarbonates, carbonates, calcium, and magnesium are used to calculate the RSC, it presents an issue. The RSC is calculated as 3.2 meq, which falls into the "High Hazard" category for sodium accumulation. The higher concentrations of bicarbonates and carbonates have removed a lot of the calcium and magnesium that allows for high sodium accumulation.

The EC for this irrigation water falls into the "Good" range. This range suggests little management concern, especially if rainfall and leaching can occur. Remember, EC is an indirect measurement of salt accumulation but can still be useful for management considerations.

The total salts reported value of 865.2 ppm falls into the "Good" range for irrigation water. This water should have little management concern especially with rainfall and leaching ability. The SAR of 5.1 also falls into the "Poor" range. This is cause for concern. Management recommendations are aerification of the soil followed by sand topdressing, pelletized gypsum, continued soil monitoring, and leaching when possible.

Now that we have looked at these two parameters separately, let's look at how they will affect infiltration rates together. According to Figure 1 above, when used together, these parameters fall into the "Moderate" category for infiltration. Infiltration rates should not be a problem on well-drained soils. Soil management cultural practices should allow infiltration when using medium textured soils.

Overall, this irrigation water is of low quality. The use of this water must be monitored closely and is really only recommended for more salt tolerant turfgrasses on very well drained permeable soils and medium textured soils with careful monitoring. This water is not recommended on heavy soils.

Summary of Discussed Irrigation Parameters

WATER PARAMETER	UNITS	DESIRED RANGE	USUAL RANGE
PH	1-14	6.5 - 8.4	6.0 - 8.5
BICARBONATE (HCO3)	ppm or mg/L	<150	<610
CARBONATE (CO3)	ppm or mg/L	<15	<3
RESIDUAL SODIUM			
CARBONATE (RSC)	meq/L	<1.25	-----
ELECTRICAL CONDUCTIVITY (EC)	µS/cm or		
	µmhos/cm	200-1200	<3000
TOTAL SALTS (TSS OR TDS)	ppm or mg/L	256-832	<2000
SAR	Unitless	<6	<15

Table 4: Summary of Irrigation Water Quality Parameters, (adapted from Duncan et al., 2009)

UNIT ABBREVIATION	COMMENTS
ppm	Parts per million
mg/L	Milligrams per liter
µmhos/cm	Micromhos per centimeter
mmhos/cm	Millimhos per centimeter
µS/cm	Microsiemens per centimeter
dS/M	Decisiemens per meter

Table 5: Commonly used units of measure in irrigation water quality testing.

Continued on page 25

RESURRECTING A FIELD AT THE K-12 LEVEL

BY **PETER AUTH**

After the recession in 2008, Santa Clara Unified School District (SCUSD) had to reallocate many of its resources away from athletic fields, common areas and playgrounds. Though in better economic times, SCUSD's resources continue to be strained as they work to meet the demands of a growing population and unprecedented levels of new housing and traffic in the area. An article dated February 16, 2016 by a CBS news affiliate said that "the economic growth in Silicon Valley's technology sector has swelled to such unprecedented levels that housing, transit and highways are 'bursting at the seams' in an effort to accommodate the sudden surge in prosperity."

While "bursting at the seams," this area has seen a depletion of accessible green space uses for physical education and after school activities. SCUSD is in the heart of Northern California's Silicon Valley, located at the south end of the San Francisco Bay known as the South Bay Area. The State and Santa Clara County have been plagued by drought conditions for more than 5 years, receiving an average 330 sunny days per year with no rain, making natural turf playing surfaces almost a thing of the past. Water conservation efforts have been in full swing throughout the state. California has a new saying: "Brown is the new green." Burrowing coastal prairie animals take to their new living quarters quite well, only adding to concerning field conditions. New construction development, lack of rain and preservation of water has led to poor playing surfaces and gopher and rodent infested fields, forcing the school district to use resources in a multitude of ways.

I came to the South Bay Area from Central New York a little more than 2 years ago. Despite the differences in climate and growth patterns, I quickly became acclimated to the area's growth patterns, drought tolerant plants, and effective watering practices. I also realized that students and coaches were being forced to share available green spaces, often leading to miscommunication and lack of room due to scheduling problems, practices and forfeiture of games. The lack of functional and effective playing fields continued with no resolution for the kids to be able to play competitive and recreational sports activities on their home fields.

Many of the fields that I inherited were riddled with active gopher holes, hard soil, bare spots, no growth, weeds and a lack of any real fertile soil. With the soccer season starting in the fall of 2016, I was approached by the SCUSD facilities manager to see if they could turn over a football field at Peterson Middle School where students had been affected, with no place to play. The school's principal said the existing field had not been used in 9 years due to active gopher holes, uneven surfaces and the proneness to ankle injuries. The field had been shut down after numerous complaints from parents and physical education teachers concerned with the risks to students. Physical education teachers had been forced to use blacktop and parking area surfaces for all activities and classes. The principal said that mounds of dirt had been brought in over the years to fill the holes but nothing was ever sustainable. In previous years, the Peterson Middle School soccer team scrambled to find open green space to play and practice, even sharing a local park field across the street. However, earlier this year, they were asked to discontinue use of the park field due to a new private school being built there.

The cost of housing and population has not only skyrocketed in this area, the cost of losing valuable green space has as well. The Silicon Valley's high tech companies attract talent

SANTA CLARA USD

Santa Clara Unified School District serves over 15,300 TK-12 students, in addition to students in Preschool through Adult School. Neighborhoods in the Cities of Santa Clara, Sunnyvale, San Jose, and Cupertino comprise the District's 56 square-mile area. Santa Clara Unified prides itself on having teachers, classified employees and administrators who are dedicated, experienced professionals who care about each student's well-being and academic preparation.

from around the world giving way to very culturally diverse communities. Within these communities the desire to maintain their culture includes the recreational activities they enjoy. For example, cricket, a sport popular in India, dominates the Indian-American culture in the area. This results in needing additional, shared green space. SCUSD collaborates with recreational groups and offers its fields to these community-based leagues as a way to share in the diversity of the area.

I was pressed and impressed of the thought of resurrecting the old football field at Peterson Middle School. The collaborations began with a walkthrough of the space with his grounds team to assess what they were up against and to firm up a drop-dead date of project completion. With the support of administrators, teachers, parents and students, the only "buy-in" left was the confidence to make it happen. The project began on September 26, 2016.

Our team gave ourselves a 6-week turnaround time, knowing that the students' first games were to start the first week in November. An audit of the space included a detailed assessment of the field's overall condition and health. The gopher holes alone consisted of multiple active sites with three to four holes every 3 feet while encompassing many bare spots with no turf growth, irrigation concerns and an abundance of overactive weeds. Going into the fall and winter seasons, they had recently experienced some rainfall at the beginning of October. Mother Nature was on their side, providing reasonable relief in attempting to establish new turf for the area, which is typically late spring to early fall. The space was benefitting nicely from occasional rain. At the same time, assessment of irrigation resulted in an adjustment in order to get head-to-head contact. The next step following irrigation repairs was to get the field moistened and softened enough to aerate. Additionally, a contractor was hired and his traps were placed throughout various field locations to rid of the active gophers.

We began the aeration process, aerating in every direction—north to south and east to west—with two 30-inch stand-on aerators. I like these because they do a super job pulling cores on the field. While the field was being aerated, the facilities maintenance team came in and painted the field goals and put together new soccer goals for the kids to use for their very first game.

Their goal was to make this field as much like professional stadium turf as they could possibly do. In the following days, they brought in 25 tons of the product Planters Mix. This mix consisted of organic compost, screened topsoil and a mixture of additives that would stimulate a healthy green turf. They also brought in 25 tons of screened topsoil and laid that down the following day. Before topdressing the material onto the field, we started the seeding and fertilization process. Because of the time constraints, we weren't able to drag the cores and, in addition, we were having technical problems with the topdresser's not discharging the product in evenly. We decided to use an annual ryegrass seed incorporated with a perennial turf seed mixture to assist in getting the green fast. We laid this material down with a broadcast spreader along with starter fertilizer and then started the topdressing procedure. This took about 10 days from start to finish, taking into consideration other school district projects going on at the time.

SCUSD consists of 27 schools from grades Pre-K to 12 in addition to an adult education campus and administrative and other buildings, each with their own athletic, landscaping, turf, and irrigation demands. If it were not for the support of the administration with buy-in from the beginning, scheduling a team of individuals to commit to this alone would have been a nightmare over the 6 weeks. The administration, grounds team, facilities manager, principal and other staff were all very cooperative to help anyway necessary to see this project come to fruition. This included working hard to keep the public and pedestrians off the field and from using it as a dog park.

Once all the products were in place and on the field, the irrigation was adjusted to water every zone for 10 minutes three times a day for a total of six zones. We started to see some germination in about 7 days, because we had used the annual

ryegrass. And, about 7 days after that, we were doing our first mow on the field at a height of 3 inches. The target completion date of November 7 was fast approaching and confidence was high. The gopher contractor continued to trap and, by the time he had trapped and pulled his last gopher, he counted a total of 80. The field was rolled one last time and was all set to go. The last step was to paint the lines, place the goals and bring the kids out for a look.

On November 7, I contacted the school principal to share that the field was ready for students. I felt like our team had accomplished something enormous and had given these students and young athletes a place they could call their home field and something that they could identify with just as I did when I was their age. Stepping back from the whole process, I know that it takes a village to raise a child and that is something we did. I also know that there were probably some things that could have been done differently, such as not using as much annual seed or trying to level the field out a little bit better but, from the day that team had walked on that grass to what it is today, I was super proud to be part of an organization that has said from the beginning in one way or another, "These kids need an open green field to play on and we are going to do everything we can to make that happen."

The principal said, "The boys soccer team and physical education classes couldn't wait to get out there! They were super excited to play on grass, something they haven't done since they've been enrolled at our school." ST

Peter Auth is Facilities Grounds Supervisor for the Santa Clara Unified School District. He has a Bachelor of Science in Environmental Studies degree from the State University of New York, College of Environmental Science & Forestry in Syracuse, as well as an Associate's Degree in Applied Science in Ornamental Horticulture-Landscape Development, State University of New York, College at Cobleskill. Peter's wife, Amanda, co-wrote this article.

Continued from page 22

As a sports turf manager, irrigation water quality is very important to understand. As we have learned, interpretation of water quality parameters, while complex, can be done if we follow written guidelines. While management of irrigation water can be done using general written guidelines, some instances may require more in depth analysis. Many factors contribute to proper management as well as problems that may arise. Factors such as climate, soil type, and turfgrass cultivar/use must be taken into consideration when problems or management remedies are concerned. ST

Dr. Justin Quetone Moss, is associate professor and Chrissie A. Segars is a PhD Candidate, Oklahoma State University.

Traditional Irrigation Water Quality References

SOURCE	AUTHOR	TITLE
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PENN STATE UNIVERSITY	Peter Landschoot	Irrigation Water Quality Guidelines for TurfSites
OKLAHOMA STATE UNIVERSITY	Justin Quetone Moss et al.,	Turf Irrigation Water Quality: A Concise Guide
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Table 6: Irrigation Water Quality Guideline References

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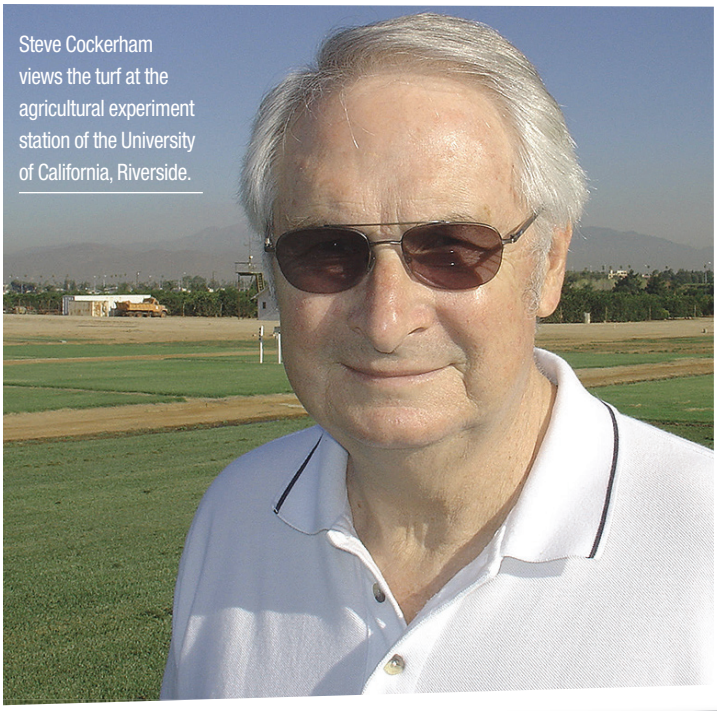

PHOTO COURTESY OF UNIVERSITY OF CALIFORNIA, RIVERSIDE

Steve Cockerham views the turf at the agricultural experiment station of the University of California, Riverside.

STEVE COCKERHAM: BUILDING ON EXPERIENCE TO CRAFT THE FUTURE

BY **SUZ TRUSTY**

PHOTO COURTESY OF TPI ARCHIVES

Steve Cockerham in 1974 displays the netted sod in one of the first production fields.

Editor's note: *This article originally appeared in an issue of Turfgrass Producers International's* Turf News. *It's a profile of Steve Cockerham, Superintendent of the Department of Agricultural Operations, University of California in Riverside. Our thanks to TPI for allowing us to reprint it here.*

Stephen T. Cockerham served as American Sod Producers Association President from 1981 to 1982. He was owner of Rancho Verde Turf Farms in Perris, CA, at that time. But his involvement with sod producers began much earlier. It was 1969 when Tobias Grether, owner of rapidly growing Cal-Turf in Camarillo, CA, hired Steve to put together a research department for the company that would focus on new techniques and new cultural practices in sod production.

Grether was a force in the industry; one of the five ASPA members that would later be honored for their "vision and unselfish dedication" in helping to organize the association. "Toby was a true visionary, eager to explore possibilities, and a mechanical genius," says Cockerham. "Nearly six years working with Toby was fascinating—and the whole Cal-Turf experience was an incredible opportunity for me."

Steve Cockerham brought his own unique vision, expertise and genius to sod production and the turfgrass industry. His start in turf included a segment as Dr. James B Beard's "student labor" while Beard was working on his Ph.D. at Purdue. After Purdue, Cockerham worked in cooperative extension in Pennsylvania.

He had moved on to a position in research and development for Ortho, in Fresno, CA, when Grether connected with him. Following Cal-Turf, Cockerham worked as a consultant, owned the sod farm, and then switched back to consulting. In 1983, he was hired by the University of California, Riverside. They were seeking someone who knew research and knew production to serve as superintendent for the Department of Agricultural Operations research station. That proved to be another industry-impacting match.

All these segments of Steve Cockerham's career build together, expanding horizons along the way.

CAL-TURF AND THE SOD INDUSTRY

His Cal-Turf experience started with a road trip as he and his wife, Barbara, and their two-year-old son, left California in a company car, pulling a travel trailer, on a mission to hit the turfgrass research stations across the U.S. that had anything to do with turf. "We spent about nine weeks, meeting the "Who's Who" of researchers and many of their students, who later became researchers," Cockerham says. "The trip allowed me to build a nation-wide network of scientists who shared their expertise. And, by the time we returned, I had a pretty good grasp on how to start a company experiment station."

One of his first research projects tackled the issue of excessive turfgrass clippings. An article he wrote in 1969, "The Cal-Turf Method of Clipping Utilization," gives an overview of how he and Grether collaborated to turn the negative of excessive clippings into an asset—a component in poultry food.

Cockerham says, "If I could figure out what a process needed to accomplish, Toby could design a machine to do it. The results were unique harvesting equipment and an onsite clippings dehydration facility."

As Grether began to expand Cal-Turf, Cockerham, whose role was now agronomist, was in the middle of the process. "We set up two sod farms from scratch, one in Irvine and one in Northern California," Cockerham says. "Toby shared his goals for each site and I learned enough to develop the procedures, design the irrigation systems and determine the equipment needed to make that happen later for my own operation."

NETTING AND SOD

A piece of mail, delivered to Cal-Turf by mistake, sparked the idea of combining netting and sod. It was an ad for DuPont Vexar netting promoting its use under mattress ticking to keep bed springs from puncturing the mattress. Cockerham knew most turfgrasses could be lifted and transplanted successfully before they were mature enough to be handled as sod. He says, "I wanted to find out if turf grown through netting could be harvested earlier. I shared my idea with Toby and he encouraged me to research it. I contacted DuPont and they sent material for the initial research. We harvested that first trial in four months. Toby, the manufacturing genius, built a machine to install the netting, cover it and seed—all in one operation."

In 1975, Grether sold Cal-Turf to American Garden Products in an offer too good to refuse. The new ownership and Cockerham were not a good fit, and he left the company. He started consulting, but soon saw there was room for another sod company in the market. He needed some backers to help finance it. "I walked into a bank and told them what I wanted to do. They asked to see the pro forma profit and loss statement. And I said, 'Pro what?' So I had to learn the basics of business finance." The result was Rancho Verde Turf Farms.

ASPA LEADERSHIP ROLES

Cockerham had been involved with ASPA for several years before becoming a member so he knew most of the sod producers and researchers that were active in the association. John Hope of Manderley Turf Farms, who would be elected ASPA President for 1979-1980, had encouraged Cockerham to serve on the board. Though Cockerham defines his role as "the guy in the corner saying, 'Hey, wait a minute guys,'" ASPA's records report his leadership initiatives.

Cockerham served as program chair of ASPA's 1981 Midwinter Conference and would be elected president for 1981-1982 that July. The sod industry was facing multiple challenges: water use issues, an energy shortage, a recession and the resulting depressed markets, a lack of agreement on sod quality, pricing all over the board—and the debate over natural grass versus "that other stuff" was heating up.

While Cockerham had gotten Rancho Verde Turf Farms "off the ground and operating pretty well," the double whammy of the 1980 credit crunch and fuel shortages hit start-up businesses especially hard. "I couldn't get enough fuel to run my trucks," he says. "I had a letter of credit with the bank by then, but the interest rate was around 36 percent."

Ben Warren, co-founder of Warren's Turf Nursery in Palos Park, IL, was a key leader in the formation of ASPA, and its first president. He had sold the company, which then decided to expand into southern California. Cockerham says, "Warren's bought my farm, making it a branch of Warren's Turf Nursery. I assisted the team during the transition, and then went back to consulting."

WATER ISSUES HIT INDUSTRY

In the early 1980s, Aurora, CO, outlawed the use of turf in lawns because of a water issue. "That was the first time we had that big a hit to the sod industry," says Cockerham. "We, as sod producers and ASPA, realized water issues were not going away."

With California's persistent water problem, Cockerham had been researching turfgrass water use and, as researchers know, you always have to qualify, quantify and document scientific information. He says, "I met with Dr. Victor Gibeault, professor at UCR and long-time friend, to coordinate and co-chair what became"Turfgrass Water Conservation" symposium. It featured research experts from education and industry who addressed water conservation as it relates to turfgrass selection, production and maintenance. The University of California had agreed to publish the proceedings, if we developed it." Cockerham encouraged ASPA to sponsor the symposium. It was offered as a pre-conference event in conjunction with the 1983 Midwinter Conference in San Antonio, TX. Gibeault provided a summary of the symposium in a Conference session. The first edition of Turfgrass Water Conservation, co-edited by Cockerham and Gibeault, was published in 1985.

UNIVERSITY OF CALIFORNIA, RIVERSIDE

In 1983, Cockerham became Superintendent of Agricultural Operations for the agricultural experiment station of the University of California, Riverside. His background made him uniquely qualified for the position.

Cockerham says, "It was a fully administrative appointment, with the superintendent responsible to the Dean and the academic senate. That meant I'd need to have a publication history to get promoted. Vic Gibeault was already working in turf there, so we collaborated to put together a significant research program and the facility to operate it. We'd establish a second facility a few years later."

The 1984 Olympics drew him into the sports turf industry. "I worked with sod growers at both the Coliseum and the Rose Bowl to prepare the fields for the events held there."

When the World Cup came to California in 1994, Cockerham worked with Dr. Jim Watson, turfgrass expert with the Toro Company, on preparing all nine venues for soccer. They were at the Stanford University field in Palo Alto, when Cockerham experienced what he terms, "my biggest scare." We were putting down the turf when I realized it was netted sod. I was the guy that invented it and knew I was going to have to explain the concept to someone. I was overwhelmed by self-doubt at that moment. As it turned out, the netting was deep enough that the players' cleats didn't cut into it—and when they wore down the grass, the netting tore instead of catching their cleats. It was a wow moment. I'd had visions of one of those million dollar players ending his career."

Typical of Cockerham, when he gets involved in an industry, he becomes a force in it. He served as president of the Sports Turf Managers Association (STMA) in 1989. He was the recipient of the prestigious Dr. William H. Daniel Award, which honors educators/researchers for their service to the industry, in 1991 and 1998. And he was the recipient of the 2005 President's Award for Leadership.

The books he developed during his tenure with UCR made an equally impressive impact. Aiming to open doors, Cockerham wrote Turfgrass Sod Production, a basic guide and reference manual, which was published in 1988. He says, "It was written for new employees of established companies; turfgrass students; and those going into the business. Many in the sod industry liked it and some contributed to it. But those guarding their 'trade secrets' were not happy with me."

In the early 1980s, Aurora, CO, outlawed the use of turf in lawns because of a water issue. "That was the first time we had that big a hit to the sod industry," says Cockerham.

His next book, Establishing and Maintaining the Natural Turf Athletic Field, "a practical guide to sports turf culture," was published in 2004.

When Gibeault retired in 2007, Cockerham organized a second water symposium to honor his work. The second edition of "Turfgrass Water Conservation," published in 2011, was a byproduct of this symposium. Cockerham co-edited the second edition with Bernd Leinauer, a turfgrass specialist at New Mexico State University. "We added a 'Practicum' chapter of practical information, gleaned from each technical chapter, especially for practitioners, administrators in planning and operations, politicians, public agencies, educators, and students."

DIRECTOR EMERITUS

Cockerham retired in 2010 as director emeritus of UCR agricultural operations and, of course, he is still "working on some things." He's researching a range of cultural practices on a few paspalum cultivars to assess their performance in the Riverside, CA, climate. He has rekindled the unfinished De Anza zoysia project. De Anza, and its sister zoysia, Victoria, were patented and released from the UCR turfgrass breeding and research program through his collaboration with Gibeault. "De Anza was the first turfgrass used in what was then named Bank One Ballpark, home of Major League Baseball's Arizona Diamondbacks. Its attributes are so strong, it deserves a closer look. I'm also working on an irrigation sensor study funded by a water conservation grant from Toro."

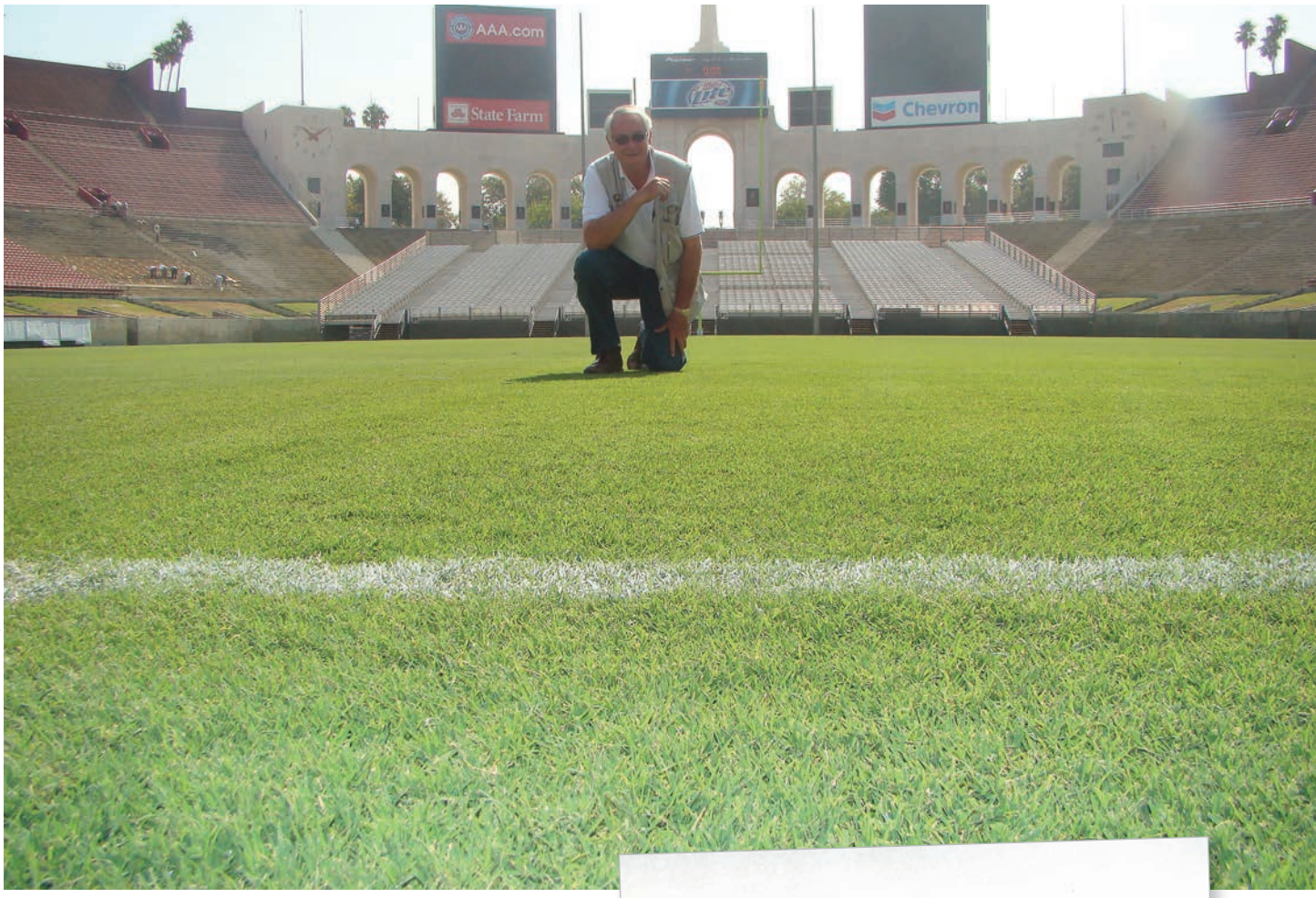

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PHOTO COURTESY OF TPI ARCHIVES

ABOVE: Steve Cockerham checks the field at the Los Angeles Coliseum.
AT RIGHT: Cockerham stands with pallets of sod for the home of TV's Johnny Carson.

As always, Cockerham is forward thinking. "Water will be key everywhere, as it long has been in the Southwest," he says. "During the severe drought about 15 years ago, I helped as Vic led a group of sod producers and other sod industry representatives to present scientific evidence to the governor and legislature to counteract those bashing turfgrass. This time, no one took a leadership role. It would be a great if TPI would step up to leadership in water politics—local, regional, national and international—but it must be coordinated so the message is consistent. Whatever the association can do, through research and/or education, to spread the positive message must be a top priority. Manufacturers are coming alongside that need, but they could use some help and recognition for their contribution. Sod growers have never been reluctant to state their thoughts. We just need to channel our efforts in the right direction to make a difference in public and legislative opinion and action." ST

Suz Trusty is co-editor of Turf News.

MY DISASTER AND HOW I OVERCAME IT

Editor's note: *We asked some readers to share their stories of when a turf-related disaster strikes and how they handled it:*

Rick Perruzzi, CSFM

South Portland, ME Parks and Rec

In 2007 our Recreation department was approached about hosting part of the US Youth Soccer Region 1 Soccer Championships in June of 2008. This tournament is still the largest to date we have hosted on our facility, which has six soccer fields, five softball and two baseball fields. After discussing the impacts internally, we decided to go ahead and host games during this 3-day event, which had teams from as far south as Virginia traveling to the Portland, ME area.

Wanting to put our best efforts into this event, we made it our mission to make all 6 fields have the same conditions in terms of ball roll and aesthetics. Going into spring we were able to shut all the fields down to get them prepared for the 12-hour abuse they were going to take for 3 days. The fields were mowed at 1 ¼ inches starting in mid-May once the weather got nice, did some sod work where needed, topdressed all six fields and had an aggressive fertility program to ensure its strength and recovery time.

Two weeks before the tournament we started to line the fields so we could begin the traditional soccer pattern as seen in the professional ranks. The biggest component that helped us was that the weather had been awesome, if anything a little dry, but with our irrigation system we could control moisture levels. I remember the Tuesday or Wednesday before the tournament I started to realize that we actually pulled this off and created the best fields possible for a tournament of this size, especially where we had never hosted anything like this before. When the tournament directors showed up they were extremely happy and impressed with what we were able to produce for a product, six fields all looking and playing the same.

The start of the tournament on Friday morning went off without a hitch and continued into the afternoon. Around 2 pm I started looking towards the west, as I normally do because as turf managers we are also meteorologists, and noticed what I thought looked like potential thunderheads. I went into my office and brought up the radar and noticed some small storms forming about 50 miles away, as they traditionally seem to gain some strength off a lake about 30 miles away.

I contacted the tournament director to keep him up to speed but explained to him because we sit on a peninsula on the Gulf of Maine most the of the storms seem to split and follow the river to our north and a river to our south, both within 15 miles. This may seem strange but it happens to us more than people may think. As the time approached 3:30 pm I noticed the track of the cell was still heading directly for us and not wavering. At 4 pm the situation was getting real, as I met with the tournament staff discussing contingency plans, as this storm was reported to have strong gusty winds, torrential downpours and hail. Not typical for a Maine thunderstorm in June, at least on the coast. Lastly, the last round of games started at 4 pm. By 4:30 it was evident that this was going to hit us and started clearing the fields and made it mandatory to get people to their cars because we did not have the space to house hundreds of people. All I remember thinking was, please do not let us get to much rain to flood the fields out, which has happened to us in the past.

I recall looking out the window as the storm approached and looking at the tree line about ¼ mile away and seeing a wall, yes a wall, of water coming right at us. It rained for approximately 45 minutes and deposited almost 4 inches of rain, needless to say the fields were flooded and of course the tournament directors are looking at me on how to fix the conditions. As my crew and I jumped into action my first thought was to try to get the water off the fields by using our 8 horsepower pump with 2-inch fire hose attached to it. We were able to remove the standing water on two fields in about 4 hours then solid tine aerate the playing surface to increase surface area.

By the way it was dark and we do not have lights on our fields. We then moved to the area with the other four fields and started moving (pushing) and pumping water off of those. We finished at 1 am. I sent the crew home and had them report at 5:00 am to assess the situation.

At 6 am the tournament director showed up and went over the situation and we agreed that five of the six were playable, which meant we needed to line another field for 8 am to all the games started on time. By Sunday the original 6th field was reopened and they were able to finish the tournament on time, which made the tournament staff extremely happy.

That is by far the proudest I have ever been of a crew as everyone worked together to make this happen during the best and worst conditions. We did not receive one complaint as the fields played a little soft but footing was not sacrificed. The worst parts of the fields were actually where the line officials were running up and down the sidelines. In the end, no matter how well you are prepared for the worst, it is how you respond and work together to overcome adversity.

Murray Cook, left, with Fidel Castro's son, Antonio

Murray Cook
The Brickman Group

We rebuilt the infield in Cuba in March 2016, ahead of the exhibition game between the Tampa Bay Rays and the Cuban national team. It was in pretty rough condition and needed to be replaced. As the event approached we were informed there would be some special guests attending the game. It would mark the first time a sitting President had visited Cuba since Calvin Coolidge. President Obama and family sat in the front row with Cuban president Raul Castro.

We were told the local sod would be cut in large slabs but unfortunately it arrived in 6-inch square pieces. We had 3 weeks to turn this infield into a safe playable field using wheel barrels, shovels etc. We had daily meetings leading up to the event with Cuba's vice president Miguel Diaz-Canel and Fidel Castro's son, Antonio, as they wanted the field to look the best it could be for this historical event. A backup plan was in place to fly big roll sod into the country from Carolina green on US cargo planes but the grass began to grow in the final 2 weeks so we stuck with the local sod. Somehow our team of turf gurus, Chad Olsen, Cindy Unger and our Cuban turf friends, were able to establish the young turf for the game using local materials. It was short of a miracle.

Scott Stevens, CSFM
Elon University, Elon, NC

Let me start by saying that everyone makes mistakes and in every situation there is an opportunity for learning and growth. Being located in the Piedmont region of North Carolina, we do not receive many snowstorms (usually one or two a year at most) and they typically end up mostly being ice events. When we do get snow, the snow often melts the following day.

Toward the end of last January, we had one of those rare winter storms blow through our area. All told, we had about 2 inches of snowfall (which to northern states or mountainous areas may seem insignificant, but in our area this is considered a lot). As it usually does, the snow began to melt the next day and refroze overnight on our fields. Our spring sports teams begin practice in January and start playing games in mid-February.

Before this particular storm, the softball team decided to cover their infield to protect the dirt. When they went out to practice the day after the storm they found a sheet of icy snow covering their tarp. Given that it was early in the season and their practices had been going strong, they were anxious not to let a little foul weather slow them down. So, they decided to remove the snow from the tarp themselves using steel rakes and shovels. They began by using the shovels to chip the frozen melted snow and using the rakes to pull it into piles, which they then removed from the field. The operation was quite the undertaking. They were successful in clearing the ice/snow from the field and even posted their hard work on social media for all their followers to see how committed they were to preparing for the upcoming season. Unfortunately, unbeknownst to the dedicated team, the shovels and rakes they had used to remove the ice had punctured close to 5,000 holes in the tarp.

In the end, the team learned valuable lessons about infield tarp care and post-weather event practice. Had they waited just one additional day after the storm last January, they would have saved their tarp and their trouble because the weather turned sunny and mid-50s and melted all the snow and ice (as is typical for NC that time of year). Instead, they owned up to the mistake and spent a great deal of time patching their damaged tarp to the best of their abilities. The result still vaguely resembled a large slice of Swiss cheese, needless to say the sports turf team ended up using a lot more calcined clay every time it rained throughout the season to maintain the field's playability. This fall the softball team purchased a new tarp for the upcoming season and will be communicating directly with the sports turf team before and after any major weather events.

Eric Harshman
Berea College, Lexington, KY

When I worked at the University of Kentucky, before a late February softball tournament, I aerated the infield skin to help aid in thawing out the playing surface. This was done to speed the process of drawing out moisture. I then added a pallet of sure dry to get the field playable, before tilling, grading and rolling. ST

SAFE FIELDS FOR ALL

that's the root of our mission

7 MILLION

SPORTS AND RECREATION–RELATED INJURIES OCCUR IN THE U.S. EACH YEAR

62% of injuries happen during practice

50% IN KIDS UNDER THE AGE OF 15

AS AN STMA MEMBER, SAFE IS YOUR CHARITABLE FOUNDATION. We work to enrich communities by championing safe, sustainable fields for all athletes – providing research, educational programs and scholarships to help meet the industry's need for more qualified sports turf managers.

SO FAR, WE'VE GIVEN OVER

$225,000

in scholarships & travel reimbursement to 120+ students

96% of SAFE scholarship recipient graduates work full time in sports turf management

TOGETHER, WE CAN DO SO MUCH MORE.

OUR GOAL: $1 MILLION OVER THE NEXT 5 YEARS FOR NEW PROGRAMS AND RESEARCH

80% of the 2,600 STMA members from 33 chapters around the country have never donated

We rely on individual donations for **60%** of our total funding

PLEASE DONATE TODAY

SAFE

The Foundation for Safer Athletic Fields for Everyone

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Sources: Centers for Disease Control and Prevention (www.cdc.gov) & The American Academy of Orthopaedic Surgeons (www.aaos.org)

John Mascaro's Photo Quiz

Answers from page 19

John Mascaro is President of Turf-Tec International

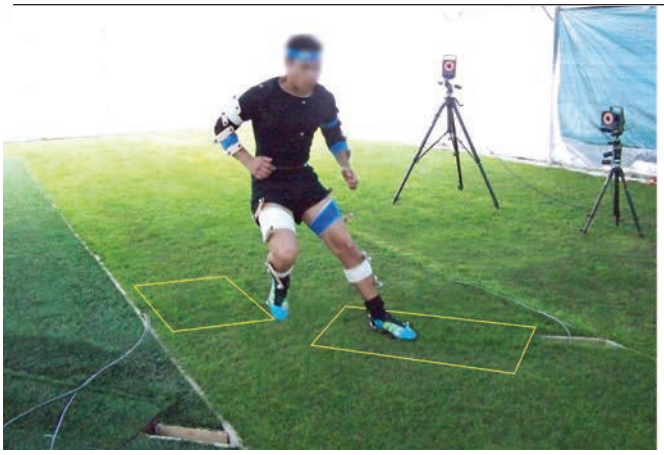
Thin and uneven turf is caused by a disease that almost every sports turf manager that has youth baseball has to deal with; I call it "Cleateos-Boredomeos." This disease is caused by a bored 8-year-old baseball player discovering cleats on the bottom of his shoes for the first time. The head groundskeeper noticed that anyone under age seven hasn't really figured out their cleats can dig holes, but by age eight, they realize it can happen. Plus, since it is the first year of "kid pitch," there is not a lot of outfield activity and the kids get bored. Interestingly, these spots used to be enormous and at one point, the crew resodded an area about 6 x 4 feet in all three outfield positions. Since then, they implemented a turf management program to diligently fill in the holes right away. Since that point, they have noticed a lot less digging than before. It seems to the head groundskeeper, "if there is a hole already there, they will start to dig and the next kid finds it his duty to expand on that hole." Since they mow every other day, when they see a hole they use a hexagon shaped turf plugger to immediately fix it, add a little water and the job is done. In addition, they remind coaches at every pre-season coach meeting and have several signs up in the dugouts that say, "Grass grows by the inch, but is killed by the foot." They also send a friendly reminder to the coaches who played the previous night if damage has occurred and ask them to pay attention to their outfielders.

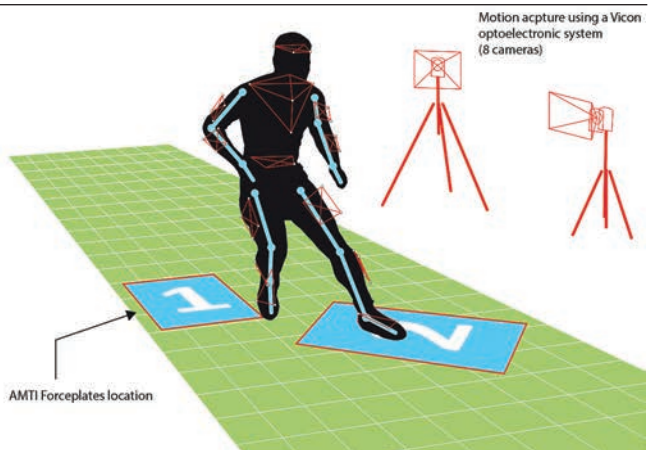
PHOTO SUBMITTED BY ANDY OMMEN, HEAD GROUNDSKEEPER AT MCLEAN COUNTY PONY BASEBALL IN BLOOMINGTON, IL.

If you would like to submit a photograph for John Mascaro's Photo Quiz please send it to John Mascaro, 1471 Capital Circle NW, Ste # 13, Tallahassee, FL 32303 call (850) 580-4026 or email to john@turf-tec.com. If your photograph is selected, you will receive full credit. All photos submitted will become property of SportsTurf *magazine and the Sports Turf Managers Association.*

BACKGROUND ILLUSTRATION COURTESY OF ISTOCKPHOTO.COM

The inverse dynamic procedure





INFLUENCE OF PLAYING SURFACE ON ACL INJURIES FOR NON-CONTACT SPORTS

BY **DR. PHILIPPE ROUCH, XAVIER DREVELLE, & PATRICIA THOREUX**

Editor's note: *This article was written by Frenchman Philippe Rouch so please forgive us if the English translation isn't perfect!*

Injuries can be carrier killers for players. A serious traumatic injury could end untimely the player season. Moreover, it takes a while for the player to come back to its top physical and psychological level. Some of them never manage to do it.

These injuries are also financial burden on club. With the increase of player's values, club cannot afford them to be badly injured, which can decrease their value and indisposed them for several games. That is the reason why player's safety is becoming one of the most important aspects of the football clubs' policy.

PLAYING SURFACE & INJURY RISK

It has been reported that 64% of the players who experienced an injury believed that was caused by the pitch. Up to 91% of them think that the type of playing surface can increase this risk. Elite players perceive the injury risk to be higher on artificial turf (AT) compared to natural grass (NG) particularly when ligament damages are considered.

The influence of the playing surfaces on the injury rate has been highly studied mostly through retrospective epidemiological studies. Despite the evolution of artificial turf system and the development of the 3rd and 4th generation technology, their impact on injury risk is still debating. This may be partly due to the variety of natural grass type they have been compared, to the geographic location of the pitch and the sport concerns.

Evolution of natural grass playing surface has also been accelerated in recent year mainly with the emergence of reinforced natural turf (so-called hybrid) technologies. These latter have been engineered to reinforce natural rootzone and provide resistance, stability and durability independent of environmental conditions. These reinforced natural turf pitches have been introduced into many top-level stadia and the difficulty lies in the fact that all these technologies differ to each other in the engineering process leading to drastic mechanical property differences on pitch.

Given the variety of the different playing surfaces including natural grass, artificial turf and reinforced natural turf, it is essential to characterize their mechanical properties and impact on player welfare. Even if some existing FIFA-standard tests define some safety limits, the range for impact hardness and shear resistance are not related to biomechanical or injury data yet. Then, the ability of the standards to define surface safety is limited, moreover if reinforce natural turf are taking into account.

Nevertheless, a clear consensus recognized that poor surface quality might predispose to more non-contact injury independently to the type of surface. Surface hardness and irregularity are the two main factors identified by players as cause of related-pitch-injury occurrence. The mechanical characteristics of sports surfaces related to athlete-surface interaction could be divided into (i) vertical behavior during impact and (ii) horizontal behavior (traction force) relating to the grip of shoes on the surface. Ideal surface allows players to move efficiently trough the stride, and should therefore present a combination of firmness (to give amount of support), cushioning (to damp the shock at impact), grip (to provide traction during push-off and turns) and rebound (to return energy from the soil during the push-up).

Even if no clear link has been showed between artificial turf and injury raise, players still complains. Therefore, some

football championships such as Ligue 1 in France agreed to ban artificial turf on pitch in 2017.

ACL INJURY RISK FACTOR

Acute traumatic ligament sprains injury at the ankle and the knee is frequently cited as a significant risk to athletes in sports that involve sudden stops and direction changes such as American football, soccer or rugby. It represents a high proportion (up to 20%) of the total of the reported lower limb injuries. In particular, the very mediatized rupture of the anterior cruciate ligament (ACL) is known to be very incapacitating with at least a 4-months period away from the pitch. Even if the return to play rate after ACL reconstruction was very high, only two-thirds of the players competed at the highest-level 3 years later.

ACL injury is usually multifactorial combining player's intrinsic and extrinsic factors, but it is interesting to highlight that for 85% of them it resulted from non-contact or indirect contact mechanism. In this case, 3 predominant playing situations have been identified leading to such trauma: (i) pressing following by re-gaining balance, (ii) re-gaining balance after kicking and (iii) landing after heading. These situations involve knee excessive valgus combined with internal rotation with the foot further away from the center of mass of the player. In addition, anterior cruciate ligament (ACL) injury is frequently cited as a significant risk to athletes on artificial turf mainly because of the changes in shoe-surface interaction.

Thus, it could be interesting to compare the mechanical loading of knee joint during game situations performed on different surfaces with the assumption that higher knee inter-segmental load in valgus and internal rotation would lead to a higher risk of ACL injury.

A study was design to compare the impact of three different surfaces and their potential role in the ACL injury risk.

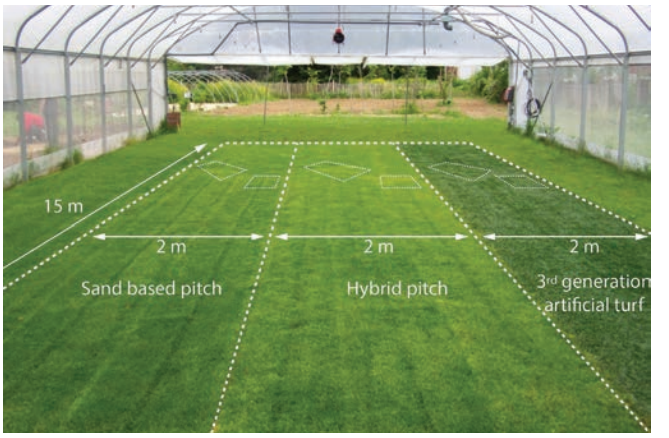
There is a paucity of on-field study assessing the impact of the soil on ground reaction forces under players' loading due to the difficulty of outdoor experimental design. To the other hand there is a huge need to go further to understand the underlying causes of injury on the different surfaces in the real-world context.

So the first step was to adapt the experimental technique to the field environment. An experimental protocol was specially designed to analyze the influence of playing surface on force distributions during the landing phase of 3 movements, i.e. running, side-step cutting and jumping. To achieve this aim, motion analysis and ground reaction force of college rugby players were recorded during the same movement over the different surfaces.

A greenhouse (Figure 1) with three different surfaces was built in order to control surface environment and moisture. Surface was divided in 3 (15 x 2 meters long) tracks made in accordance with ISO standards (NF P90-112 & NF P90-113).

A natural grass track (NG) was composed of sand-based rootzone (Cargo-Green AG, Bassel, Switzerland), a third generation artificial turf track (AT) and a natural reinforced grass

(Figure 1) The greenhouse with three different surfaces



track (HY). The HY is composed of artificial rootzone of sand, cork and synthetic fibers in which natural lawn grows (AirFibr technology, Natural Grass, Paris, France). All tracks have been maintained following the same program.

Then, players' ankle and knee joint strains related to the degree of impact absorption of the different surfaces were estimated by inverse dynamics taking into account body inertial parameters.

FINDINGS

Our results showed that speed and cadence of running were similar among tracks contrary to the stress applied by the surface on players' joints. Indeed, knee joint loads were higher (+6 to 21%) on AT compared to natural ones, as well as ankle joint loads (up to 16-26%). Furthermore, valgus and internal rotation of knee joint during sidestep cutting were significantly higher on AT compared with the natural counterparts (+43% and 36% respectively). Since the ACL injury is mainly involved in combination of high levels of knee valgus and internal rotation strains, natural grass surfaces and especially the natural reinforced grass (HY, AirFibr technology) appeared to be safer for players.

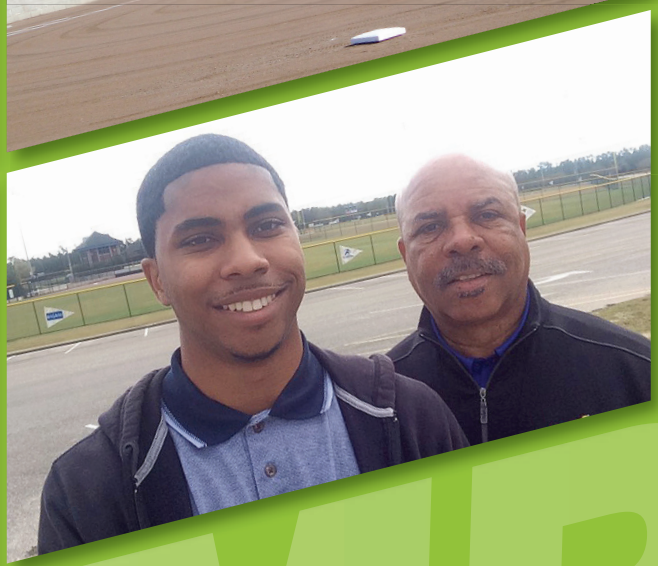
The main finding of this study is that playing surface has a significant effect on external knee moments during running, sidestep cutting and drop landing. As understanding the injury mechanisms is a key factor in injury prevention research, further investigations should focus on the development of detailed models of playing surface's mechanical behavior.

To an injury point of view, it is obvious that a lot of attention should be paid to the choice of playing surface technology and it maintenance across the season. As the important aspect of sport surfaces is to improve player's athletic performance and safety, it is fundamental that club's technical, medical staff and groundsman communicate with each other to tackle the player's injuries issue. ST

Dr. Philippe Rouch is Professeur des Universités, Directeur de l'Institut de Biomécanique Humaine Georges Charpak; Xavier Drevelle is with Service de Chirurgie Orthopédique – Hôpital Avicenne – Université PXIII; and Patricia Thoreux works for both institutions, all in Paris, France.

CHAMPS FIELD

Gulfport SportsPlex, Gulfport, MS



The Field of the Year Awards program is made possible by the support of sponsors Barenbrug USA, Carolina Green Corp., Ewing, Hunter Industries, and World Class Athletic Services.

Category of Submission: Schools/Parks Softball

Sports Turf Manager: Ken Edwards, CSFM (Ken recently retired and was replaced by his son, Keair; we hear from both in the interview on following pages)

Ken's experience: My career in sports turf management started in the US Army. When not training for combat I was assigned duties as the Base Recreation Specialist responsible for scheduling and maintaining ball fields and golf courses. After military retirement I took a job as a recreation specialist at Gulfport Navy Base and continued to maintain sports fields and the golf course while pursuing a degree in Turf Management. I later got involved in the sports field construction and renovation business that ultimately led me to my current position as superintendent/turf manager. Outside of my daily operations I make time to volunteer as grounds keeper for the local high school. I am also actively involved in turf association activities and have served as president of both the Mississippi Turf Association and the Deep South Turf Expo. I served as chairman of the STMA scholarship committee for 3 years and became the first Certified Sports Field Manager in the state of Mississippi, in 2005.

Full-time staff: Doug Albritton, Mark Quintero, Dennis Earl, Craig Johnson, DeAmon Spivey, and Tyler Wales

Original construction: 2000

Rootzone: 80% sand, 20% other (Canadian Sphagnum Peat Moss)

Turfgrass variety: Certified Tifway 419 bermudagrass

Overseed: Field was overseeded in the early years after construction. We really don't go totally dormant in the Deep South and don't host major events from November through February. The bermudagrass starts to green up in mid-March so we stopped overseeding. We also saved roughly $22,000 in budget by not overseeding the complex.

Drainage: Our goal for drainage was to create a system that could percolate rainwater at a rate of at least 8 inches per hour. To achieve that, we decided on a combination of surface and sub- surface drainage. The sub-surface drainage is a trench system consisting of 1,387 linear feet of 4 inch corrugated high-density polyethylene (HDPE perforated sock pipe. The pipe is laid in trenches, encased in washed pea gravel spaced 25 feet apart and positioned on a line from the center of the field going left and right beyond the foul lines. There the pipe attaches to 340 linear feet of 6 and 8-inch collector pipes that move water off the site. The root zone is a USGA specified 80/20 sand peat mixture that is capable of percolating water at a rate of 9.5 inches an hour. The finish grade was cone lasered to a 1.5% slope. Drainage is excellent and was installed in the entire field, infield and outfield. One disadvantage is that the infield can dry out very fast. To this date we have had a few rain delays but never canceled a game because of rainy conditions.

Why STMA should consider your field a winner?

The Gulfport Sportsplex was built in 1998/99 to help boost the local economy through tournament play and also provide quality sports fields for the local recreational leagues. We were initially told that we were putting too many eggs in one basket by building a complex. After many delays in construction we finally got phase one of the project complete and the complex opened in early 2000. We started slow with only seven events and an impact of $1.3 million. Despite the setbacks of hurricanes Katrina and Ivan, the depression of 2008 and the Gulf Oil spill of 2010 we have grown on average 8% annually. I credit our growth to the hard work of the maintenance team. They are definitely a dedicated team of groundskeepers who take pride in their work. I consider them the winners if selected for Field of the Year. Our local leagues and tournament guest to this day still can't believe that such a small group of guys are maintaining all of our sports fields to such high standards. This team has developed a system of cohesion and definitely look out for the best interest of this city, our user groups and the industry as a whole. My team understands the concept of "Build it and they will come." We operate on the philosophy of "maintain it and they will come back." I consider myself fortunate to have such a team at municipal level and wouldn't trade them for a million dollars. My team has shown much love towards both the profession and myself. I've had the privilege over the past 4 years to review scholarship packets on our upcoming Sports Turf Managers while serving as chairman of the scholarship committee. I have decided to make

room for one of those deserving young turf managers whom I've had the opportunity to network with at the STMA annual conferences. The most rewarding thing that could happen for my team is that when I hand over that wad of keys, and a great team, I could also present them with the Sports Field of the Year Award. Because of their dedication and attention to detail we were among the first six to be awarded the Environmental Facility Certification by STMA for environmentally responsible management. I am extremely proud of my team for their hard work and dedication.

I will always cherish that day when an 8-year-old T-Ball player walked up to me and asked "Is this where the Pros play?" and I responded with, "No, this is where champions like you play." That's how Champs Field got its name!

SportsTurf: What attracted you to a career in sports turf management?

KEN: My childhood passion in sports was always for baseball. When that didn't work out I opted to go to the military instead. Because I knew my way around ballfields I was assigned additional duties as the non-commissioned officer in charge of base recreation facilities. In that capacity, I had the opportunity to learn from and work with the non-military turf managers assigned to the bases at six different military installations both in America and abroad. After a very successful military career and the experience and knowledge gained in the turf industry I knew that a second career in sports field management was for me.

As for Keair, as a youngster, when not involved in sports or school activity he worked for my dad doing contract maintenance work on ball fields. Keair says that by the age of 16 he really became attracted to the industry for two reasons: First, he enjoyed all the attention from the coaches, spectators and players for his work on the fields and second, he made a lot of money at an early age. He says that he is very proud to be a second-generation Sports Turf Manager and wouldn't have it any other way.

ST: What are your biggest challenges in providing excellent playing surfaces? And how do you approach those challenges?

KEN: The biggest challenges that I faced were staffing, scheduling, communications and of course, the weather. Municipal employees always seem to think that they are not paid enough money. I found it challenging to attract, train and maintain a quality group of guys who come to work every day and on time. My turn over rate for employees averages at least three out of five per year. The only option available is to maintain an applicant pool to draw from when someone terminates. Maintenance scheduling is done a year in advance but we are failing to communicate important maintenance practices to all parties. Fields are over booked and get scheduled for use on dates when they should be closed. We must take the politics out of the equation and open the lines of communication through face-to-face discussions. An automated booking system will allow us to block out dates and take away the human factor for those who can't say no to user groups. The weather will always be a challenge. We know we can't control it so we do our best to maintain the fields after a severe weather event.

Keair says that his biggest challenge so far is the amount of use the fields are getting and having the staff to maintain them. He agrees that everyone wants to have safe, playable and aesthetically pleasing fields but nobody want to see them closed for maintenance. His approach will be to open the lines of communication with operations and all other interested parties through face-to-face discussions and the use of various other types of social media.

ST: Did you implement any changes to the field in 2016?

KEAIR: I would like to see Champs Field transformed into a more stadium type setting. Replacing the bleachers with stadium style seating could accommodate that. At current the infields are hand watered and that is not working because of the amount of time it takes to do that. I would like to see an automated sprinkler system installed to more efficiently get moisture to the infield dirt.

ST: What's the greatest pleasure you derive from your job?

KEN: We know that we can't please everyone, but knowing at the end of the day that our team have done their best and created a safe, playable and a good looking facility is rewarding enough for me. My greatest pleasure is passing on to the team the many positive comments received from coaches, players and spectators. My involvement in the STMA, MS Turf Association and the Deep South Turf Expo have brought many pleasurable moments and a network of highly qualified turf managers whom I had the honor of working with.

KEAIR: The standards were already set high. My greatest pleasure is the fact that I was accepted for the job as turf manager right out of college. Being a second-generation turf manager and only the second turf manager at the Gulfport facility is rewarding in itself. My pleasure is just being able to get up and go to work every day doing something that I really enjoy. There are no headaches; I see every situation as a challenge.

ST: What's the best piece of turf management advice you have ever received?

KEN: The best advice I ever received not necessarily related to turf management was a quote given to me by an Army General almost 30 years ago: "Ability is important but to find it in others and then develop it is the true test of a Leader."

KEAIR: Don't let the job consume you, issues will arise at the drop of a hat but as long as you can keep your composure and not break down you will be alright. We don't live in a perfect world.

ST: Are you yet involved in "sustainable" management practices? If so, what are you doing?

KEAIR: The Gulfport SportsPlex was one of the top ten facilities to achieve STMA Environmental Facility Certification. We are currently addressing sustainable issues such as composting, recycling, spraying, fertilizing and storm water run-off. Every year we evaluate our cultural practices of fertilizing and spraying and strive to find more environmentally friendly products. Our goal is to reduce the amount of chemical and fertilizer applications through the use of poly coated, urea based slow release products and sound pest management practices such as not spraying as much, just let the birds eat the worms.

ST: How are using social media at work?

KEAIR: My plans for the near future are to set up a Twitter account to share with the public what we do, why we do it, and how we do it. My department have recently hired a marketing manager who will be responsible for setting up all other social media outlets and a new website to allow the public to interact electronically with our operations. I personally use social media to connect me with my peers, other industry personnel and my turf extension office on matters concerning turf related issues. We all have the same issues and through social media we can share our experiences on how to deal with them.

ST: How do you see the sports turf manager's job changing in the future?

KEAIR: The wave of the future is in technology and automation. The day of the fax machine is gone forever. Turf managers today can spend less time in the office and more time in the field because of smart devices. We no longer must stop what we are doing to run back to the shop to research a problem, "there's an app for that." Managers can better communicate with employees, upper management and user groups from the field and instantly document issues.

ST: What factors contributed to Keair's wanting to be a turf manager?

KEAIR: One factor contributing to me wanting to be a turf manager is that I watched my dad leave for work happy and return from work happy every day. His philosophy as taught to me is to never let anyone ruin my day under any circumstance. I also wanted a career field where everybody would respect me that my work impacts, not just the boss. After attending a couple of turf conferences, I noticed how much love for the profession and other turf managers displayed respect for each other. I recognized that turf management is not a daily competition there's a time and place for that such as the STMA awards process. All of these factors contributed to me pursuing a career in turf management. Oh, and the pay is pretty good too!

ST: What are the most important things Keair has learned from Ken, about both taking care of turf as well as dealing with management and users?

KEAIR: First and foremost, I learned good work ethic. I was taught to always do the right thing especially when the boss is not looking. Most importantly I was taught to be tactful and diplomatic when dealing with others. Two words my dad often spoke stand out in my mind "Courage and Commitment." In our household, this meant to never be afraid to speak your mind, never tell people what you think they want to hear, and never start what you're not going to finish. As far as taking care of the turf, I learned the fundamentals while attending college. I learned from my dad that textbooks are a guide you still must use common sense and never try to solve problems on my own. I was taught to manage by the book and lead by example.

ST: Does Keair aspire to work in the NFL, MLB, college level?

KEAIR: At some point in my career I will definitely consider other levels of sports turf management. I see municipal/park and rec level as the foundation for young kids aspiring to be athletes, and for now providing the best possible playing surfaces for them is satisfying for me.

ST: What does Ken plan to do in retirement?

KEN: I started a turf maintenance and consulting company 15 years ago, as a side business. I'll continue to operate that business on a small scale no more than 15 hours a week. I'm still involved in the industry and a regular volunteer at the high school baseball field. I intend to spend some time at other facilities in the state of Mississippi encouraging other turf managers to join STMA and possibly start a local chapter. I also want to assist them with STMA Environmental Certification and field of the year applications.

On the personal side, I see a lot of travel in my plans. I enjoy having the flexibility to just take off at the spur of the moment to go visit out of town friends and family. I enjoy sleeping a little later now but Priscilla hates that she must get up for work. I'm probably going to do a lot of fishing and since we now have minor league baseball, I'm going to buy season tickets. I also have a couple of antique cars that need a little attention. My honey-do list is a mile long so I'll get started on it sometime in the near future. I am blessed to never punch a clock again!! ST

FIELD GROOMERS

THE AFFORDABLE ZEE

The Smithco Sand Star ZEE Infield Groomer has important features you're going to need:

- The power and torque of a 22-hp engine made just for ZTRs
- Optional flex-brush rear-drag implement to level and smooth your field
- An optional center-mounted scarifier
- Zero turn capability with dual hydrostatic drive
- An optional front-mounted plow
- Most affordable infield groomer Smithco makes

Smithco

RAYCAM UNIRAKE

The Raycam UniRake is designed to accurately maintain natural and synthetic grass including hybrid surfaces. A major design point of the machine is the ability to adjust the severity of the grooming. This is an extremely important aspect of the UniRake as the grooming can be tailored to work on varying wear areas. Adjusting the severity of the grooming takes no more than 30 seconds and contributes to the quick working of the unit. The machine can be used as an alternative to verticutting, offering turf managers the opportunity to lift up the sward and encourage growth without the need for conducting disruptive practices. Time is also saved because it is still extremely effective at high speeds, improving both the appearance and playability of the surface whilst being operated on a minimum 35-hp tractor.

Campey Turf Care

TORO SAND PRO 3040 AND SAND PRO 5040

Toro offers a full line of infield groomers including the Toro Sand Pro 3040 and Sand Pro 5040. The Sand Pro 3040 infield groomer is a versatile machine that does an exceptional job in a number of applications. The 3WD Series/Parallel traction drive improves traction in wet or heavy working conditions to get the job completed quickly. The Quick Attach System (QAS) allows for under-a-minute attachment changes for 20 attachments. Each attachment was specifically designed to take the operator influence out of the equation for high performance and a consistent surface finish. The Quick Attach System for front, mid and rear attachments allows for under-a-minute attachment changes. Each attachment was specifically designed to take the operator influence out of the equation for a consistent surface finish.

The Toro Company

TRIPLE-PLAY INFIELD GROOMER

The simple but rugged design of the TurfTime Equipment Triple Play Infield Groomer makes it one of the best and most efficient tools for grooming infields. Keep your maintenance team happy, your players safe and your association proud with this great infield groomer by TurfTime Equipment. Easily and quickly remove debris, uproot invading grass, scarify, groom and level the infield for consistently safer play. Replace crude drag mats, bedsprings or other floating drag devises. Our Triple-Play groomer will loosen, level, smooth, and broom finish your infield for secure footing and ball bounce players expect at a very competitive price. The groomer is designed to shave down high spots while filling in the low spots. Available in 60 and 78 inch units with the option of 3-point or tow-behind. Tow-behind unit available with manual or electric wheel kit.

TurfTime Equipment

FIELD GROOMERS

GREENSGROOMER TURF CONDITIONING

Reaching optimum field surface quality involves the right equipment operated by knowledgeable professionals. GreensGroomer Worldwide does both. Designed to level the infill material, keep the turf in an upright position, and relieve compaction, the Synthetic Sports Turf Groomer and Spring Tine Rake is widely accepted as the industry standard by turf professionals throughout the world. The LitterKat, a synthetic turf sweeper, is designed to pick up surface debris as well as ferrous materials both on the surface and within the infill material. When used in tandem, field playability and safety is optimized. The GreensGroomer line of products keeps operation and maintenance simple while providing a safe turf surface for athletes. GreensGroomer has provided turf conditioning equipment to more than 7000 natural and synthetic turf venues worldwide.

GreensGroomer

ABI FORCE INFIELD GROOMER

The ABI Force is a zero-turn, stand-up, self-propelled infield groomer packed with purpose-built features designed specifically for infields. It is built to give operators the control necessary to prepare and maintain the safest and most playable infields possible. At the heart of the Force's innovation is its patented, mid-mount spring system that hydraulically provides downward force for multiple attachments to address different applications. When the mid-mount spring system is combined with ABI's patent-pending VibraFlex attachment, operators can apply the perfect amount of force to break up surface tension as deep or as shallow as an infield needs. This leaves a perfectly consistent ½" of playing surface with no surprises hidden underneath. With the Force's profile blade attachment, operators can eliminate the need for roto-tilling and re-grading. The profile blades slice through the infield at a precise depth, de-compacting and aerating the ground without changing the grade. The infield can then be reset with the VibraFlex attachment and rigid drag mat and, in a couple of hours, completely change the way an infield plays.

Absolute Innovations, Inc.

DIAMOND MASTER FROM BANNERMAN

The Diamond Master, which restores and levels surfaces with every pass, can give your community ball diamonds a surface just like professional teams demand and reduce the time, effort and labor required to do the job. With the Diamond Master, once you get your diamonds in shape, it's simply a matter of re-dressing the surface before and after every game (or even between innings). This groomer is 6 feet wide and incorporates five separate tools that are all individually and easily adjustable with the aid of screw jacks. Standard equipment includes: Ripper to move large amounts of material or breakdown ridges as required; rake, adjustable from light to heavy raking or severe scarification; leveler, a double bladed leveling device floats by way of parallel linkage; roller, designed to give firmness without compacting the top layer; and brush that adds that well-groomed or maintained professional look.

Bannerman

INFIELD TURF COVERS

GreenJacket full athletic infield turf covers are rip stop reinforced engineered films and consist of high strength laminated polyethylene film. The heavy scrim reinforcement placed between the laminations greatly enhances the tear resistance of the film as well as adds in stopping the tear from migrating. Available in two styles: 6.8 oz/yrd2 GJ10WW and 7.8 oz/yd2 GJ12WB for the best durability and longevity. All seams are laminated for true impermeability. All edged furnished with double fold, double lock stitch hem. Sewn in handle furnished every 12 feet around the perimeter edge and on each corner. Sod staple available upon request.

GreenJacket

FIELD GROOMERS

INFIELD GROOMERS FROM HEYING COMPANY

Smooth isn't enough. Our groomers level infields too. Our legendary, top-selling Pro Groomer PR72 leads the way. Restore and maintain infields quickly and easily. Level, grade and smoothen for top quality, safer playing surfaces. Break up hard infields, remove weeds and deter water puddling. More lift systems to choose from than any other manufacturer. Also check out our Turf Groomers for natural and artificial turf and our Off Field maintenance equipment for Driveways, Parking Lots, Yards and more. Save time and labor with our easy to use equipment. Pull with a variety of towing machines.

Heying Company

NEW ZERO-TURN STAND-ON AERATOR FROM TURFCO

Turfco has introduced the patent-pending TurnAer XT8 stand on aerator, developed to provide a solution to turf care professionals who want to increase aeration productivity while minimizing downtime. The XT8 is designed to be nimble and fast. It can cover over 2 acres in an hour, with zero-turn agility and intuitive controls. The XT8 also offers aeration speed up to 7 mph; a 30" aerating width that can still fit through a 48" gate; and raised ground clearance to get over most curbs. The Auto-Depth Control means operators can set tine depth from 0 to 5 inches and the machine ensures that depth is kept consistent regardless of turf conditions. Its unique design minimizes downtime by keeping chains outside of the aeration area, which prevents debris from getting in wheels and chains, as well as by using sealed, self-aligning bearings near the aeration area instead of debris collecting grease zerks.

Turfco Manufacturing

TIRE PLUGGER

Ideally all tubeless tires should be repaired from the inside/out. But in an emergency situation that's not always possible. The Stop & Go - Tire Plugger can do what no other tire repair kit can. It allows for an 'on the spot' and 'on the wheel' repair to virtually any tubeless tire. And it seals the puncture on the inside. The Plugger is a spring-loaded gun that 'drives' the plug into the hole. The shaft of the plug expands under pressure to fill the puncture. The mushroom head of the plug seats on the inner wall allowing no air to escape. This insures maximum reliability from its' revolutionary design. And it's easily stored - so you're always prepared.

Stop & Go

COMPACT TRACK LOADER

ASV LLC introduces the large-frame, radial-lift Posi-Track RT-75 compact track loader. The RT-75 features highly efficient hydraulics and an innovative, high capacity cooling system while delivering superior serviceability. ASV's patented Posi-Track undercarriage provides the industry's highest ground clearance, lowest ground pressure, best traction and longest track life. The machine features ASV's patented Posi-Track rubber track suspension. The dual-level suspension of the RT-75 features both suspended wheels and axles, allowing it to manage every type of terrain and at faster speeds. The suspended wheels and fully flexible track conform to the ground assuring maximum traction in the roughest conditions. In addition, the multiple wheel contact points and triple-guide lugs achieve maximum performance on steep slopes. The RT-75 comes standard with 18-inch-wide tracks, resulting in a ground pressure of only 3.6 psi.

ASV LLC

Welcome!

NEW STMA

Adams Bob
Anderson Lee
Armstrong Ashlee Brooke
Arrington Craig
Austin Paul Mike
Austin Trevor J
Baisa Freddie
Ball Brandon Edward
Beck Matt
Beckas Tyler
Bernard Paul
Bernstein Blake
Blackhurst James
Bowling William Jackson
Bragg Davon
Breeden William
Breier Tim
Brincefield Ray N
Brown Vince
Burbrink Conlan
Butler Allison
Buzard James
Bybee Kim
Campbell Brock William
Caparelli Larry
Capecelatro Kevin
Carrick Kenny
Carroll Sean
Carson Troy
Cassata Vincent P
Catlett Tyson
Cheatham Jaison
Clark Christopher
Clark Joseph
Clinton Garrison
Clintsman John DeWitt
Cobb Cameron
Cochran John
Coghlan Jim
Colandro Joseph Henry
Collingbourne Matthew
Collins Tanner G
Colson Willis
Connell Mike
Cooper John
Coquillard Taylor
Couch Fletcher
Couture Andrew S
Cowing Todd
Creech Jonathan
Cregg Russ
Cross Grant
Dalsgaard Tim
Davis Brett
Davis Eddie
Davison Nick
DeFouw Seth Richard
Dietzig Cordel
Dixon Charlie
Doebler Collin B
Doss Kenneth
Douglas Carson
Dumond Mike
Dusa Eric Greggory
Duval Dillon Leo
Dykstra Aaron
Eckenroth Kyle
Endres Kendall
Exner Ed
Fair Tim
Fandrei Gavin
Feick Dan
Felix Andrew
Ferguson Will
Fitzgerald Joseph
Flynn Gary
Flynn Nolan
Forslund Dave
Foster Henry
Fowler Greg D.
Frost Ronald
Gaa Brian
Gasparini Joe
Geisel Conor
Gess Nicholas
Gibson Justin Tyler
Gleason Benjamin P.
Glover Kenneth
Goedde Adam
Golden James S
Goodman Kyle R
Gorczyca Mark
Grammer Chris
Guastaferro Louis
Hall Brent
Hall Marlin
Hall Roland
Hampton Arthur
Hanna Austin
Harris Dan
Hartzler Ian
Hastriter Adam Baum
Hathaway Traronius Eugene
Haunert BJ
Haverstick Tim
Haynes Nicholas
Heacock Thad
Heimann Kevin
Henry Josh
Herzfeldt Matthew Charles
Hibbs Tyler
Hock Kevin
Hoffman Brenda
Hoover Christopher Allen
Hopkins Austin
Hopkins Tyler
Hough Steve
Howard Warren Henry
Huebner Bryce
Huffman Billy Michael
Hughes Michael Todd
Humphrey Kenneth
Hunter Rob
Hyde Brendon
Jackson Bradley
Jackson Danny
Jackson Scott
Jacobson Matthew Craig
Jacobson Zoe Frances
Jakobsen Ben
James Bret
James Winston
Jarrett Dave
Jarrett Ryan
Jeffries Matt
Jennings Shelley
Jensen corey
Johnson Jim A.
Jones Cason
Jones Tradd
Jordan Jackie
Kain Ethan
Kammer Brad
Keane Brendan Thomas
Keeler John
Keller Andrew
Key Chris
Kiermaier Daniel
King Jeffrey Michael
Klee Keaton William
Knight Joseph Patrick
Knudson Gage
Koonce Jace
Kos JoAnne
Kowalski Brian
Kramer Victoria A`ine
Kyriazes Theresa
Lajeunesse Neil
Lamot Ivo
Lannon William Thomas
Lazar Brian
Leavey Michael
Leidig Nicolaas Sigmond
Leigh Logan
Lewis Kaleb
Lieb Will Samuel
Lin Allen Yuhung
Linstead Grant
Long Donald J
Lorigan Joseph Daniel
Lowder John
Lucas Trent
Lupold Scott A
Lutz Alexander James
Machuca Jose Rafael
MacNamara Jon
Maguire Patrick
Mahute Madison L.
Mallion Simon John
Mallion Steve
Manley Rose
Manning Connor John
Marrero Joshua
Martin Brandon
Martinez Raymond John
Mathis Philip
Mayer Henrique
McConnell Justin
McCrimmon James
McFadden Bryan
McGee Marshall
McIntosh Stephen Craig
Medina Julio
Menna Jeremy
Merrick Mark
Miller Casey
Miller Jody
Miller Mark
Miller Nick James
Miller Paul Jeffrey
Mills Jason
Mizutani Yoshitaka
Montgomery Jordon C
Moore Curt Bradley
Moore Timothy
Moreira Trisha
Moret Jacob Ross
Morrow Doug
Mosher Alden G
Mosquera Mike
Mroz Kyle
Mulholland Chad A
Murphy Colin
Murray Joshua J
Narozanick Lee
Nash Jared
Nehila Dave
Neuhaus Sawyer
Nobbs David
Nsafoah Annie
Oblath Daniel Mario
O'Brien Marcus
Olszyk Jeffrey
Owens Chad
Oxner G Dewey
Palombo Andrew
Palombo Benny
palombo benny jr
Palombo Ferdinand
Palombo Fernando M.
Park Richard E
Paullus Caleb Warren
Pedersen Stephen
Pendegrast Mark

MEMBERS

Penland Joe
Pierce Brian
Piper Michael
Poore Mark
Porch Brandon
Poth Dane
Preisendorf Jerry V
Purcell Matthew
Putnam David
Puumala Ryan
Rahoi Reid John
Raines Kenneth
Ramirez Ryan
Redfern Kyle M
Rittenhouse Jacob Dalton
Roberson Travis L
Roberts Eric
Robertson Stephen
Rodgers Benjamin
Rodriguez Luis
Rowland J. Roy
Russo Billy
Sadler James
Saldutti Michael
Sanders Jim
Sartoretto Carlos Eduardo
Savage McCoy
Scarbary James
Schallenberg Doug M
Schwartau Kurt
Seaton Casey
Seay DP
Shavel Steven
Shelby Clint R
Sheppard Ken
Shmulevich Ronen
Smith Patrick
Smoot Jonathan Kory
Snyder James
South Case
Spotts Chris
Standridge Marty
Stanley Dalton
Stevens Gary N.
Stevens Sarah
Stewart Brian
Stoker Lee
Straw Tom
stuart travis
Stubbert Amy
Stuhr Colin
Stumpo Joe
Summerfeldt Madeley Cindy
Sutton Caroline
Swanson Travis
Taylor Jonathan Eric
Tazzia Charlie
Thieme Nathan
Thomas John
Thorpe Elliot
Tice Andrew
Tolley Craig
Triplett Seth
Truschel Jeff J
Turner Sam Didcoct
Van Osmond
VanDeHey Thomas David
VanKleek Craig
Voss Benjamin
Wacendak Andrew
Waddell Roger C.
Walker Tyler
Wargo Josh
Watson Tim
Weber Levi
Wilber Amy
Wilber Sarah
Wilhelm Harold
Williams Ben
Williams James D
Williamson Zack Aaron
Wilson Fawn
Windham Kevin
Windschitl Noah
Woffod Hank
Wolf Jonathan
Wood John Anthony
Workman Dalton
Wynja Patrick
Youngblood Jonathan Pierre

STMA Affiliated Chapters Contact Information

Sports Turf Managers Association of Arizona: www.azstma.org

Colorado Sports Turf Managers Association: www.cstma.org

Florida #1 Chapter (South):
305-235-5101 (Bruce Bates) or
Tom Curran CTomSell@aol.com

Florida #2 Chapter (North):
850-580-4026,
John Mascaro, john@turf-tec.com

Florida #3 Chapter (Central):
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Dale Croft, dale.croft@ocps.net

Gateway Chapter Sports Turf Managers Association:
www.gatewaystma.org.

Georgia Sports Turf Managers Association: www.gstma.org.

Greater L.A. Basin Chapter of the Sports Turf Managers Association:
www.stmalabasin.com.

Illinois Chapter STMA:
www.ILSTMA.org.

Intermountain Chapter of the Sports Turf Managers Association:
http://imstma.blogspot.com/

Indiana - Contact Clayton Dame, Claytondame@hotmail.com or Brian Bornino, bornino@purdue.edu or Contact Joey Stevenson, jstevenson@indyindians.com

Iowa Sports Turf Managers Association:
www.iowaturfgrass.org.

Kentucky Sports Turf Managers Association: www.kystma.org.

Keystone Athletic Field Managers Org. (KAFMO/STMA): www.kafmo.org.

Michigan Sports Turf Managers Association (MiSTMA):
www.mistma.org.

Minnesota Park and Sports Turf Managers Association: www.mpstma.org
MO-KAN Sports Turf Managers Association: www.mokanstma.com.

New England STMA (NESTMA):
www.nestma.org.

Sports Field Managers Association of New Jersey: www.sfmanj.org.

Sports Turf Managers of New York:
www.stmony.org.

North Carolina Chapter of STMA:
www.ncsportsturf.org.

Northern California STMA:
www.norcalstma.org.

Ohio Sports Turf Managers Association (OSTMA):
www.ostma.org.

Oklahoma Chapter STMA:
405-744-5729; Contact:
Dr. Justin Moss okstma@gmail.com

Oregon STMA Chapter:
www.oregonsportsturfmanagers.org
oregonstma@gmail.com

Ozarks STMA: www.ozarksstma.org.

Pacific Northwest Sports Turf Managers Association: www.pnwstma.org.

Southern California Chapter:
www.socalstma.com.

South Carolina Chapter of STMA:
www.scstma.org.

Tennessee Valley Sports Turf Managers Association (TVSTMA): www.tvstma.com.

Texas Sports Turf Managers Association:
www.txstma.org

Virginia Sports Turf Managers Association: www.vstma.org.

Wisconsin Sports Turf Managers Association: www.wstma.org.

Chapter Sponsors

Continued from page 11

"Iowa State Athletics was extremely lucky to have Tim join our staff in 2010. He's an exceptional leader and by every measure is recognized here as an exceptionally high achieving professional. STMA strives to have members recognized in their workplace circle and in their communities as professionals. Not many have the level of respect Tim does here and throughout the turf industry. His soft skills are as strong as his science skills yet the ability to focus sharply may be his strongest skill. When the work world around Tim gets "noisy" he's able to shut the noise out and deliver exceptional results. As demands of him increase, his embrace of the challenge gets tighter.

"As someone who had the honor years ago of serving as President I can assure the staff and membership Tim lives and breathes this profession and understands our role and responsibility within the green industry. Those of us lucky enough to know Tim know he has great pride but no ego. Tim sincerely wants your opportunities and dreams to be fulfilled and rich, more than even his own. I'm blessed to see him live this every day."

— Mike Andresen, CSFM,
facilities & grounds director, Iowa State

ST: In your experience, what are the benefits of being an STMA member?

Van Loo: Access to the best sports turf managers and sports turf researchers to better prepare safe sports fields. If it is watching presentations or reading this magazine, learning from the experts is easy to do when you are a member of the STMA.

ST: What are most important issues facing STMA members today? And how do you think the Board can best address those issues?

Van Loo: As our fields increase in quality we are being asked to do more and more on the fields. With outside events and extra play sports turf managers are being asked to do a lot more than in years past. Continuing to train our members in how to "unplug" when they can I think is being addressed with many of the professional development courses held at Conference every year. The increased awareness on safety will ultimately change how our job is viewed. Being ahead of these protocols and training our members on how to use the tools properly is also very important as we continue to make fields safe for the athletes that use them. The Board continues to try and spread awareness and importance of our profession. Jumping into social media is another way to spread our message and this will continue. ST

Q&A with Pamela Sherratt

Questions? Send them to 202 Kottman Hall, 2001 Coffey Road, Columbus, OH 43210 or sherratt.1@osu.edu
Or, send your question to Grady Miller at North Carolina State University, Box 7620, Raleigh, NC 27695-7620, or email grady_miller@ncsu.edu

Q: While attending a conference session on gray leaf spot disease recently, I heard a speaker advise the audience to use a blend of turfgrass cultivars that displayed good genetic resistance to the disease. Using more resistant cultivars was just one tactic in a broader, more holistic approach that he felt was necessary to combat this pervasive disease. At the end of the presentation, an audience member asked where he might go to find more information about turfgrass cultivar selection and how to access the names of the best performing cultivars. I will attempt to address that question here.

A: The quick answer to the question about turfgrass cultivar performance is to recommend the National Turfgrass Evaluation Program (NTEP.org) website. NTEP is a non-profit organization that has (together with USDA) developed uniform evaluation trials of turfgrass species in the US and Canada. Trials are conducted at various locations and data is collected and disseminated on an annual basis. Trials include data on turfgrass quality, spring green-up, resistance to diseases and insects, tolerance to heat, cold, drought and traffic tolerance, etc.

This information is available through annual progress reports posted on the website. In addition to the NTEP data posted online, many schools, particularly land-grant universities, conduct turfgrass cultivar performance trials and publish their findings in annual research proceedings. Examples of schools that conduct trials and publish reports include Rutgers University, North Carolina State, University of Minnesota, University of Georgia, Oklahoma State, and Virginia Tech.

The Turf Breeders Association is a good place to look if you are searching for a turf breeder or seed-producer in your location. Turf breeders may be based at a university or with a seed company and they have extensive knowledge about the cultivars they sell and the availability of seed that year. Many of these turf breeders speak at STMA and regional conferences and have successful outreach programs. Dr. Bill Meyer and Dr. Leah Brilman are two that spring to mind. It's also a good idea to have a rapport with a local seed supplier, as they will know what's new and what is performing best in cultivar trials. Keep in mind that some of the cultivars listed in trials may not be commercially available yet, or may not produce consistent seed yields to make them commercially viable. This is sometimes the case with Kentucky bluegrass cultivars.

Evaluating the data from cultivar performance trials also deserves a mention. The cultivars are ranked 1-9, with 1 representing worst and 9 representing best. A quality rating of 6 or lower is considered unacceptable. The best rating of 9 is given to healthy turf with a fine leaf texture, high density and dark green color. The ratings are typically made monthly and are subjective in nature, though there are NTEP guidelines that each grader follows. Other data includes percent ground cover and depth of thatch. Cultivar differences are based on use of Least Significant Difference (LSD) statistics for mean separation. Per the NTEP website: "The LSD value(s) is located at the bottom of each table. To determine whether a cultivar's performance is truly different from another, subtract one entry's mean from another entry's mean. If this value is larger than the LSD value, the observed difference in cultivar performance is significant and did not happen by chance. For example, two cultivars, 'X' and 'Y', have mean turfgrass quality values of 7.0 and 5.0, respectively, with the LSD value being 1.0. Since the difference between 'X' and 'Y' (2.0) is larger than the LSD value (1.0), cultivar 'X' performed significantly better than cultivar 'Y' for mean turfgrass quality. Please remember that results can vary from year to year and from location to location. Therefore, always reference the LSD value when interpreting test results."

One of the most important considerations when selecting athletic field cultivars is its ability to withstand wear injury and compaction stress. As defined in the NTEP rating guidelines, wear injury occurs immediately upon trafficking a turf. Wear injury symptoms are often expressed within hours and definitely within days. Compaction stress injury is more chronic and is expressed over time. Traffic tolerance ratings are conducted at several sites and simulated traffic is applied using different types of equipment, so there may be some variation among results, but the data does give a good indication of a particular cultivar's tolerance level. Since not all states have a traffic trial it's important to use data from the closest regional trial.

Since so much perennial ryegrass is used on sports fields, another important consideration when selecting athletic field cultivars is disease resistance, particularly the level of tolerance to destructive diseases like gray leaf spot, Pythium and brown patch. It's important to note that some cultivars are more resistant to disease than others, but none are immune. Other criteria that are particularly desirable for turf on athletic fields include spring green-up (important for spring sports like lacrosse and baseball), seedling vigor and overall turf quality, which is a combination of color, texture and density.

In summary, the NTEP website is an invaluable tool for selecting the best cultivars for athletic fields in a given location, but establish a good rapport with your local seed supplier to see which of your preferred cultivars are available. ST

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Barenbrug has a long and durable partnership with the sports turf industry. We've been a player for decades, experiencing what persistent use and play does to turf grass. In pursuit of ever tougher, traffic-resistant turf, Barenbrug develops and tests varieties for durability under foot and in world class competitive conditions. Barenbrug is the only seed company in the U.S. with a breeding program that selects and tests varieties for tolerance to heavy, sustained beating by traffic simulators. Aggressive establishment, traffic tolerant, strong recovery: **Barenbrug turf is built for play!**

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