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SportsTurf

February 2013

STMA PRESIDENT MIKE GOATLEY LEADS VIRGINIA TECH TURF TEAM

Also Inside:

Nothing minor about micronutrients

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On the cover: The Virginia Tech Turf Team: Row one, L to R: Mike Goatley, Whitnee Askew, Xunzhong Zhang; row two, Hokie Bird, Shawn Askew, Erik Ervin, Nate Reams; row three, Shaohui Wu, Julie Keating, Angela Post, Michael Cox, Sam Doak, Chantel Wilson, Richard Wade; row four, Rory Maguire, Emerson Pulliam, Tyler Brewer, Tyler Knight, Logan Horne, Kate Venner; back row, Adam Smith, Chad Kropf, Kevin Steele, Jeremy Atkins, David McCall.


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From the Sidelines

Eric Schroder
Editorial Director

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Scenes from Daytona Beach

EIGHTY DEGREES AND SUNNY may never have felt so good as it did for many in the sports turf industry who attended last month's STMA 24th Annual Conference & Exhibition in Daytona Beach, FL, especially for those of us who returned to single-digit temperatures and wind chills. Kudos to the STMA Board for selecting a great site for the show; all Conference activities and most nightspots were at the host hotel or within a few minutes' walk.

The Board tweaked this year's schedule to add education sessions and encourage attendance at general sessions and on the trade show floor. Most notable was introduction of the STMA Academy, which was a direct response to members' request for deeper educational opportunities both before and after the Conference. Education Subcommittee Chairman Jeff Fowler, an extension director and turfgrass specialist for Penn State, said, "Members asked that we offer chances to go beyond the traditional 1 hour sessions so they could learn more about a subject. So we developed the Academy, which allows students and instructors to get more in-depth on a particular topic. The feedback I've received so far has been very positive."

Also for the first time there was both a full-day and half-day Seminar on Wheel tour offered. Jeff Salmond, CSFM, director of athletic field management at the University of Oklahoma and Tours Subcommittee chair, said the half-day tour enabled attendees to arrive Tuesday and still make a tour. "Both full and half day attendees were thrilled with sites we selected, especially the Daytona Speedway," he said. "Even if you're not a NASCAR fan it was a memorable experience. The tour bus went onto the track and we got an up close look at just how steep the bank is, and how narrow the racetrack is itself." More than 200 attendees were part of the tours.

Another change was the SAFE Charity golf tournament's being moved to Tuesday with a tee time set to allow late Monday arrivers like me a chance to sleep in; my partners, Boomin' Boyd Montgomery, Deadeye Ed Hall, and Noel Hammerin' Harryman must have thought with my lackluster performance that I was still sleeping. But at least the cold beer tasted good in the sunshine.

Attendees who opted for a cold one with friends or just wanted a rest before Wednesday's Welcome Reception missed a dynamite keynote address by Ian Hill, who is best known for funding community projects in the name of our fallen soldiers. He noted that STMA members have an "irrational passion"—aka "crazy"— for turf. Hill, who emigrated to the US after an Army soldier-turned-father in Iran exchanged two cases of scotch for him, said that passion works well for turf managers because "you are in the memory business." He still knows the name of the man who maintained the football field he competed on in high school, and he pledged $1,000 to STMA's SAFE Foundation in the name of Angel Diaz. Hill then challenged the audience to donate $5, $10, or $20 immediately following his talk to STMA President Dr. Mike Goatley or Ed Chair Fowler and name a mentor or person who inspired them as they handed over their "legacy cash."

Hill asked the crowd, "When you reflect back about your life, will you think more about what you have gained or what you have given?" His own commitment to purpose was stimulating and I'm certain his call for us to put our time, fortune and sacred honor toward the betterment of others still rings in our ears. ■

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The Official Publication Of The Sports Turf Managers Association

SportsTurf MANAGERS ASSOCIATION

SportsTurf (ISSN 1061-687X) (USPS 000-292) (Reg. U.S. Pat. & T.M. Off.) is published monthly by m2media360, a Bev-Al Communications company at 1030 W. Higgins Road, Suite 230, Park Ridge, IL 60068. POSTMASTER: Send address changes to Sportsturf, PO Box 4290, Port Jervis, NY 12771. For subscription information and requests, call Subscription Services at (845) 856-2229. Subscription rates: 1 year, $40 US & Poss.; 2 years, $65 US & Poss.; 1 year, $65 Canada/Foreign Surface, 1 year, $130 Airmail. All subscriptions are payable in advance in US funds. Send payments to Sportsturf, PO Box 4290, Port Jervis, NY 12771. Phone: (845) 856-2229. Fax: (845) 856-5822. Single copies or back issues, $8 each US/Canada; $12 Foreign. Periodicals postage paid at Park Ridge, IL and additional mailing offices.

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President's Message

Dr. Mike Goatley

Goatley@vt.edu

There is no 'I' in TEAM, but might there be a 'you'?

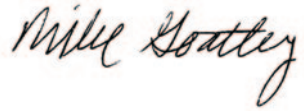
STMA's annual Conference is a highlight of every year and 2013 in Daytona Beach was no exception. The only way Conference is so successful is due to a great deal of teamwork (a tease for what is coming below). The camaraderie of our membership and the energy exuded from this annual gathering of professionals that hail from so many different backgrounds and locations serve as my springboard to tackle another year. I suspect it is similar for many of you as well. Special thanks to all of our vendors and sponsors as you are the primary reason for the financial success of our conference. Thanks to a phenomenal line-up of speakers and a new educational format that kept our participants actively engaged in learning for multiple days. Every conference is unique and I always wonder "Are we going to be able to top this next year?", and the answer is invariably "yes." I hope that you are already planning on joining us in 2014 in beautiful San Antonio.

I have the opportunity to do something a little different for this issue of *SportsTurf* in telling you about the value I place on teams and teamwork, especially my colleagues on the Virginia Tech Turf Team. But let me call a quick timeout and tell you about another team that I too often forget to mention (but is of utmost importance to me), my family. My wife Lisa is the coach, our kids Rachel and Adam are 5-star recruits, and I think I am the waterboy (H/T to Adam Sandler), but it works. Your STMA Board is also a very successful team and two members that just completed their terms deserve special recognition: Ron Hostick and Jay Warnick. A job well done, men. Your time and commitment has been invaluable to STMA. I welcome to our team our newly elected directors Andrew Gossel (K-12 Schools), Phil McQuade (Professional Facilities), and Tim VanLoo (At-large). Congratulations! The Board looks forward to the new insights and talents you bring to the group.

Another team that always gets a number one seed is our STMA Headquarters staff. Kim, Leah, Nora, Kristen, and our newest member, Shant—you all are the best and are a major reason we continue to be a thriving association. Thank you so much for everything you do every day.

And when I ponder the phrase "take one for the team," I think it applies to a former STMA Board member who was scheduled to be featured in this issue until a change in his job status altered his membership category: Martin Kaufmann. Marty demonstrated the utmost in professionalism in how he handled the entire situation and placed STMA firmly above his personal desires. Marty, I think you are our MVP for 2012; thanks for your service to the Board, but especially for how you handled a difficult situation.

Join the STMA team in some way in 2013. There are great things to be accomplished through a little teamwork. ■



Nothing minor about **micronutrients**

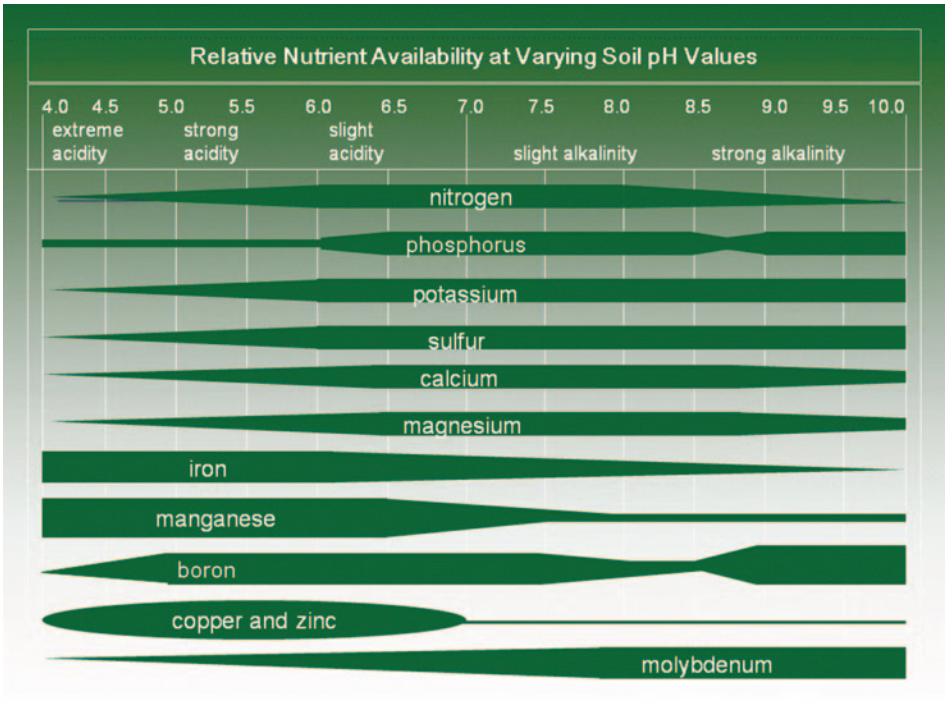
ALTHOUGH TURFGRASSES CONTAIN ONLY TRACE AMOUNTS OF BORON (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni) and zinc (Zn), these eight micronutrients are essential for plant growth and survival. When it comes to turfgrass nutrition, essential micronutrients deserve attention and should not be overlooked.

In order for a nutrient to be considered 'essential', it must 1) be required for a turfgrass plant to complete its growth cycle; 2) perform a plant function that cannot take place without it; or 3) be directly involved in photosynthesis, respiration, or the production or breakdown of organic materials within the plant, or necessary for a critical chemical reaction.

Of the essential nutrients, carbon, hydrogen and oxygen are supplied to turfgrasses by carbon dioxide and water. The majority of carbon dioxide is taken up through minute pores, or stomates, on the surface of leaves and stems. In addition to moving nutrients from one plant part to another, water also provides turfgrasses with hydrogen and oxygen.

Turfgrasses primarily absorb the remaining essential nutrients from soil. The fibrous nature of the root system and the massive number of root hairs contribute to a turfgrass plants ability to extract these mineral nutrients from a soil solution. Due to the amount turfgrasses require, nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and sulfur (S) are categorized as macronutrients. The macronutrients are often further sub-divided according to the amount required by turfgrasses. Nitrogen, P and K are primary macronutrients, while Ca, Mg and S are secondary macronutrients. Results of analyses of macronutrients in tissue are often reported as percent on a dry-weight-basis. For example, bermudagrass turf is often considered nutrient deficient if shoot tissue contains less than 2% N, 0.3% P, 1% K, 0.5% Ca, 0.3% Mg and 0.2 % S on a dry-weight-basis.

Figure 1. Soil pH chart.



EFFECT OF SOIL PH ON UPTAKE OF MICRONUTRIENTS

Micronutrients, also referred to as trace or minor nutrients, are usually found in dry turfgrass shoot tissue at levels less than 1,000 ppm. Micronutrient applications are seldom beneficial to turfgrasses growing in fertile, mineral soils with a slightly acid pH (for example, 6.0 to 6.9). However, when turfgrasses are managed in high-sand-content soils, organic soils or soils with high- or low pH, the application of a micronutrient may be very beneficial. The availability of micronutrients in soil for uptake by turfgrasses is influenced by the level of soil acidity or alkalinity. Plant availability of Fe, Mn, Cu and Zn decreases as the soil pH rises above neutral (7.0), while that of Mo increases with increasing soil pH (Figure 1).

ROLE OF MICRONUTRIENTS IN TURFGRASSES

Boron affects the formation of plant cell walls and the transport of sugars. Chlorine influences photosynthesis, the division and length of plant cells, and the opening and closing of stomates. Copper is necessary for photosynthesis and influences the lignin content and strength of cell walls. Iron is involved in the production of chlorophyll. Several enzymes associated with the transfer of energy, N fixation and the production of lignin contain Fe. Manganese is necessary for photosynthesis and is involved in the formation and breakdown of N-containing compounds. Plants deficient in Mn for an extended period of time are, most often, very low in chlorophyll. Molybdenum is involved in the formation of proteins and the use of N and S by turfgrasses. Molybdenum also affects the production of pollen. Nickel, recently classified as an essential micronutrient, is a component of an enzyme.

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Table 1.
Copper recommendations for both new and established turfgrass areas (for organic soils only).[a,b]

	Application method	
Copper, Cu	Soil broadcast	Foliar Spray[c]
Soil test level	Amount of Cu to apply/1000 sq. ft.[d]	
ppm	Pound Cu	Ounce Cu
0 to 2.5	0.1 to 0.3	0.4
> 2.5	0.0	0.0

[a] From: Rosen, C.J., P.M. Bierman and R.D. Eliason. 2008. Soil test interpretations and fertilizer management for lawns, turf, gardens, and landscape plants. Department of Soil, Water, and Climate. Regents of the University of Minnesota (http://www.extension.umn.edu/distribution/horticulture/components/1731-complete.pdf)
[b] Applications are suggested on a trial basis only.
[c] Apply foliar sprays at the recommended rate 2 to 3 times per year.
[d] Multiply by 44 to convert the rate from lb./1000 sq. ft. to lb./acre; multiply by 2.7 to convert from oz./1000 sq. ft. to lb./acre.

Table 2.
The chemical symbol, plant available form and general sufficiency range in shoot tissue of eigh essential micronutrients.[a]

Micronutrient, chemical symbol	Form absorbed by plants	General sufficiency range, ppm- dry weight basis
Boron, B	H_3BO_3, BO_3^{-3}	5 - 60
Chlorine, Cl	Cl^-	200 - 400
Copper, Cu	Cu^{+2}, $Cu(OH)^+$, Cu-chelates	5 - 20
Iron, Fe	Fe^{+2}, Fe^{+3}, Fe-chelates	50 - 100
Manganese, Mn	Mn^{+2}, Mn-chelates	20 - 100
Molybdenum, Mo	MoO_4^{-2}, $HMoO_4^-$	1 - 4
Nickel, Ni	Ni^{2+}	< 1
Zinc, Zn	Zn^{2+}, $ZnOH^+$	20 - 55

[a] Summarized from: Carrow, R.N., D.V. Waddington and P.E. Rieke, 2001. *Turfgrass soil fertility and chemical problems: assessment and management.* Hoboken, NJ: John Wiley and Sons, Inc.

Several enzymes active in the production of carbohydrates and proteins contain Zn.

Many soil testing laboratories test for available B, Cu, Fe, Mn, Mo and Zn. More than one method (Mehlich II and III, DTPA) can be used to extract micronutrients from soil and results often vary from one method to the next. After testing soil, very specific recommendations may be made regarding the application of individual micronutrients (Table 1). Interestingly, it is not uncommon for turfgrasses to respond favorably to an application of Fe even though a soil test report indicates that the concentration of the micronutrient is in the High range. An analysis of plant tissue is recommended as a supplement to soil testing. Micronutrient levels in turfgrass tissue are usually reported as ppm on a dry-weight basis. For example, bermudagrass turf is often considered nutrient deficient if shoot tissue contains less than 100 ppm Fe, 30 ppm Zn, 25 ppm Mn and 10 ppm Cu on a dry-weight-basis. Information regarding specific micronutrient sufficiency ranges for individual turfgrass species or varieties is limited, however general or common sufficiency ranges have been published (Table 2).

POSSIBILITY OF A MICRONUTRIENT DEFICIENCY

Some micronutrients are more apt to be at low or deficient levels than others. A deficiency of Fe in turfgrasses maintained out of doors is much more common than a deficiency of the other micronutrients. Iron deficiencies are most likely to occur in poorly rooted and thatchy turfs maintained in calcium-rich soils with high P and pH (> 7.5) levels, and very little organic matter. Turfgrasses irrigated with water high in bicarbonates, P, Ca, Cu, Mn or Zn may also be deficient in Fe.

Although less commonly observed than a Fe deficiency, a Mn deficiency in turfgrasses is not unusual. A Mn deficiency, like that of Fe, may occur in plants maintained in soil with a high pH and Ca level. Extended periods of dry, warm weather reduce Mn availability in soil. Boron, Cu, Mo and Zn deficiencies are rare. High levels of Ca in soils can reduce the availability of B. Boron deficiencies are also more likely to occur in turfgrasses growing in porous, sandy soils with a high pH and high level of K. Since Cu can tightly bond with soil organic matter, deficiencies of Cu have been observed in turfgrasses growing in organic soils. Copper deficiencies have also occurred in turfgrasses maintained in sandy and alkaline soils, and soils with high N, P, Fe, Mn, Zn or pH levels. Molybdenum deficiencies are more prevalent in turfgrasses growing in acidic and sandy soils.

High levels of S, Cu, Fe and Mn may limit the amount of Mo turfgrasses absorb from soil. Zinc deficiencies have occurred more often in turfgrasses in shade, in alkaline or acidic soils, and during cool, wet weather. At present, no Cl or Ni deficiencies have been documented in turfgrasses.

Once inside a turfgrass plant, some micronutrients are much more mobile than others. Iron and Mn are immobile and Cl is mobile in turfgrass plants. Boron, Cu, Mo and Zn are somewhat mobile. The location of a deficiency symptom on a turfgrass plant is influenced by nutrient mobility. For example, due to the inability of a turfgrass plant to move the micronutrient from older to younger leaves, symptoms of a Fe and a Mn deficiency occur first on young leaves. Leaf tissue between veins of young leaves of a plant deficient in Fe often turns yellow then white. This condition is commonly referred to as interveinal chlorosis. The youngest leaves of a plant deficient in Mn usually develop small grayish-green spots before the leaf tips and the tissue between veins turn yellow. Turfs deficient in

Several factors deserve consideration when applying micronutrients in water to turfs. They include: the weather; the type, nutrient status and growth rate of turfgrass; leaf wetness; the form of the micronutrient; the product application rate, frequency and interval; the spray volume; and the spray tip.

Mn often appear mottled. Young leaves of a turfgrass plant deficient in B may have yellow or white leaf tips and exhibit interveinal chlorosis long before older leaves. The margins of young and middle-aged leaves of plants deficient in Cu often turn yellow, and leaf tips may have a bluish cast. Symptoms of a Mo deficiency are much like that of an N deficiency. The older leaves of plants deficient in Mo 'fire' when the micronutrient is mobilized and moves to young leaves. Leaves of Zn deficient plants are often mottled and stunted, and may roll or appear 'crinkled'. The symptoms of Zn deficiency may be more apparent on younger leaves.

SELECTING AND APPLYING A PRODUCT

A micronutrient deficiency can be corrected by either a foliar or soil application. Micronutrient-containing fertilizer formulations may be in solid or liquid form (Figure 2), and a micronutrient may be mixed with other nutrients (Figure 3, on page 13).

>> **Figure 2.** An example of a liquid fertilizer formulated with macronutrients and micronutrients.

Whether in liquid or solid, organic or inorganic form, a fertilizer must be applied uniformly according to label directions.

Several factors deserve consideration when applying micronutrients in water to turfs. They include: the weather; the type, nutrient status and growth rate of turfgrass; leaf wetness; the form of the micronutrient; the product application rate, frequency and interval; the spray volume; and the spray tip. The rate at which cells of leaves divide and expand is influenced by light, temperature, moisture and fertility level. The length of time between micronutrient applications can be adjusted according to the rate of growth of the aerial shoots. The recommended product application interval may decrease with increasing plant growth rate.

Several sources of an individual micronutrient may be available for use in turf (Table 3, on page 12). For example, iron (ferrous) sulfate and iron chelates are common sources of iron. Iron chelates are most often more effective as soil applications than ferrous sulfate, which can be highly effective when applied as a foliar treatment. In soil, a ferrous ion (Fe+2) from iron sulfate may quickly be converted to a ferric ion (Fe3+), which is much less available for plant uptake.

Chelates are produced by combining a positively (cation) or

negatively (anion) charged micronutrient with an organic compound or chelating agent. The reaction results in a 'protected' micronutrient cation or anion bound in a chemical ring structure. The length of time during which a chelated micronutrient remains in plant available form in soil is influenced by the soil pH, the ion that is in protected form, and the chelating agent. Citric (CIT), acetic [DTPA, diethylene triamine pentaacetic acid; EDTA, ethylene diamine tetraacetic acid; EDDHA, ethylene diamine di (o-hydroxyphenylacetic acid); and HEDTA, hydroxyethyl ethylene diamine triacetic acid] and oxalic (OX) acids are examples of chelating agents used to produce chelated micronutrients.

When foliar feeding, no more than one-half gallon of a micronutrient-containing solution is usually applied per 1,000 sq. ft. The intent of a soil-drench (one gallon of water or more per 1,000 sq. ft.) treatment is to carry the micronutrient through thatch and into the soil. Turfgrasses most often respond more quickly to a foliar feeding than a granular or soil drench application. The addition of a surfactant may, or may not, be recommended.

Thorough and uniform coverage is essential when applying a micronutrient to turf in water. The diameter of spray droplets varies depending on the spraying pressure and the spray tip installed in the nozzle body on the sprayer boom. The diameter of spray droplets may range from very coarse (> 550 microns) to very fine (< 150 microns).

Table 3.
Several fertilizer sources of essential micronutrients and their approximate nutrient content.[a]

Source	Formula	Approximate micronutrient content (%)[b]
Boron, B		
Borax	$Na_2B_4O_7{\cdot}2H_2O$	11
boric acid	H_3BO_3	17
Chlorine, Cl		
Potassium chloride	KCl	45
Copper, Cu		
Copper oxide	CuO, Cu_2O	75, 89
Copper sulfate	$CuSO_4{\cdot}H_2O$, $CuSO_4{\cdot}5H_2O$	25, 35
Copper chelate	Na_2Cu EDTA	13
Iron, Fe		
Ferric oxide	Fe_2O_3	69
Ferrous oxide	FeO	77
Ferric sulfate	$Fe_2(SO_4)_3{\cdot}4H_2O$	23
Ferrous sulfate	$FeSO_4{\cdot}7H_2O$	20
Ferrous ammonium phosphate	$Fe(NH_4)PO_4{\cdot}H_2O$	29
Ferrous ammonium sulfate	$(NH_4)_2SO_4{\cdot}FeSO_4{\cdot}6H_2O$	14
Iron chelates	NaFeDTPA, NaFeEDTA	10, 6
Manganese, Mn		
Manganese oxide	MnO	41 - 68
Manganese sulfate	$MnSO_4{\cdot}4H_2O$	27
Manganese chelate	Na_2Mn EDTA	12
Molybdenum, Mo		
Ammonium molybdate	$(NH4)_6Mo_7O_{24}$	54
Molybdenum trioxide	MoO_3	66
Sodium molybdate	$Na_2MoO_4{\cdot}2H_2O$	40
Zinc, Zn		
Zinc oxide	ZnO	78
Zinc sulfate	$ZnSO_4{\cdot}H_2O$, $ZnSO_4{\cdot}7H_2O$	35, 23
Zinc chelate	Na_2Zn EDTA	14

[a] From: Carrow, R.N., D.V. Waddington and P.E. Rieke. 2001. *Turfgrass soil fertility and chemical problems: assessment and nanagement.* Hoboken, NJ: John Wiley & Sons, Inc.
[b] The actual percentage of the micronutrient may vary depending on the purity and source of the product.

GUARANTEED ANALYSIS

Magnesium (Mg) 1.00%
1.00% Soluble Magnesium
Sulfur (S) 3.50%
3.50% Combined Sulfur
Boron (B) 0.02%
Copper (Cu) 0.25%
0.25% Chelated Copper
Iron (Fe) 4.00%
4.00% Chelated Iron
Manganese (Mn) 1.00%
1.00% Chelated Manganese
Molybdenum (Mo) 0.0005%
Zinc (Zn) 0.60%
0.60% Chelated Zinc (Zn)

Derived from: Magnesium Sulfate, Sodium Borate, Copper Glucoheptonate, Iron Glucoheptonate, Manganese Glucoheptonate, Zinc Glucoheptonate, and Sodium Molybdate

- ***Optimal liquid foliar formulation of essential plant nutrients***
- ***Aids in the prevention and correction of micronutrient deficiencies***

RECOMMENDED RATES

Turf (Fairways, Greens & Tees): Apply 2-6 oz. per 1,000 sq. ft. or 3-6 quarts per acre in enough water to cover.

Trees & Ornamentals: Apply 4-6 quarts per 100 gallons of water as a drench or foliar spray. Repeat as needed.

PRODUCT INFORMATION

Harrell's MAX Minors (complete minors package) is a liquid foliar formulation of essential nutrients and micronutrients to aid in the prevention and correction of deficiencies. The ratio of minors in Harrell's MAX Minors micronutrient package has been optimized for higher pH soils where trace elements often become unavailable to the plant. In alkaline soils, Harrell's MAX Minors will remain available longer than many other products. Harrell's MAX Minors can be applied with most pesticides and fertilizers except high phosphate materials. The addition of a non-ionic surfactant will aid surface coverage which will help leaf absorption.

DIRECTIONS FOR USE

Harrell's MAX Minors may be tank mixed with most liquid fertilizer and pesticides; however a jar compatibility test should be performed on unknown combinations.

PRECAUTIONS

Shake well before each use. Avoid getting in eyes, mucous membranes or on skin. Use of side-shielded safety glasses is recommended. Use with adequate ventilation. Keep container capped when not in use. Do not contaminate feed, seed, or water supplies. Avoid spraying on concrete or painted surfaces as staining may occur.

Keep away from Children.

FIRST AID

Skin: Remove contaminated clothing. Wash with plenty of clean water and soap. Consult a physician.
Eyes: Rinse with clean water for a minimum of 15 minutes. Seek medical attention.
Internal: Drink 2 glasses of water. DO NOT INDUCE VOMITING. Seek medical attention at once.

STORAGE AND CONTAINER DISPOSAL

Store this product in a dry place, in original container only. Keep lid tightly closed. Keep away from open flame or intense heat. Triple rinse container and offer for recycling or dispose of in accordance with federal, state and local authorities.

CONDITIONS OF SALE

Seller warrants that products will be labeled as required under state and federal laws and that they conform to the label description. Any non-conformance must be reported in writing to Seller within Thirty(30) days after purchase as a prerequisite to maintaining any claim against Seller. Buyer agrees to inspect all products purchased immediately upon delivery. The seller's liability under this warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability and fitness for a particular purpose. There are no warranties which extend beyond this statement.

Figure 3. An example product label identifying the micronutrient sources and application rates.

Manufacturers often rate the effectiveness of each type of spray tip as good, very good, excellent or not recommended, for specific applications (e.g., broadcast liquid fertilizer; contact and systemic fungicides, herbicides and insecticides; …).

Since an application may, or may not result in a visual improvement in foliage color or turfgrass health even though test results indicate that one or more micronutrients are in the low or deficient ranges, it may be advantageous to treat a limited amount of turf with a product of interest before making a broadcast application over the entire sports field. ■

Dr. Tom Samples is an extension specialist for turfgrass management; Dr. John Sorochan is associate professor, turfgrass science and management; and Adam Thoms is research leader, all at the University of Tennessee in Knoxville. Brad Jakubowski is an instructor at Doane College, Crete, NE.

>> **FIGURE 1.** A dormant but extremely dense Riviera bermudagrass field in early December 2012 at Wilson Memorial HS, Waynesboro, VA (photo courtesy of Jimmy Rodgers).

Inside look at the turf team at Virginia Tech

INSTEAD OF A TRADITIONAL ARTICLE* on the STMA President for this month's issue, I asked for the opportunity this year to tell you a little bit about the turfgrass program at Virginia Tech and some of the great work my colleagues are doing that might apply to you.

Team: a number of persons associated together in work or activity. Being a part of a team certainly does not guarantee success, but teams that continually strive to improve and work together (i.e. demonstrate teamwork) will most likely perform at the top of their abilities. Nearly every month, *SportsTurf* features an award-winning team of sports turf managers recognized as 'Field of the Year" winners. A common theme in these articles is the value of teamwork. I received exceptional mentoring regarding the importance of a team and teamwork as a young faculty member at Mississippi State University from Dr. Jeff Krans. Since those formative years in my professional career, I have made it a point to emphasize to my colleagues how much I value being a part of a team. Something that gives the members of the turfgrass program at Virginia Tech great satisfaction is how our clientele refer to us as the VT Turf Team. And nowhere have I said being part of a team is easy—securing the information for this article and getting a cover photo of the team was akin to herding cats!

The VT Turf Team's collaboration across departments, programs, and colleges in our teaching, research, and extension programs has been cited by many administrators as a model for other programs at Virginia Tech to emulate. Our VT Turf Team is also much more than just the faculty, staff, and graduate students in our traditional academic programs, but it also includes our staffs that manage all VT athletic and recreational sports fields. Our athletics turf and recreational sports programs support turfgrass research, participate in our research field days, and are constantly "on call" for field and facility tours, something very important to our fund-raising and student recruiting activities. We also proudly claim as team members a large number of allied extension agents, private individuals, industry, and professional association cooperators around the state that assist us with financial support, on-site research opportunities, and the hosting of a variety of outreach programs.

I want you to meet a few of my VT team membersand I asked them to join me in providing a brief highlight of some of our sports turf-related research projects. These reports are but very small parts of their research programs, and if you have further questions of my colleagues regarding this or other projects they are leading, please be sure to get in touch with them by way of the contact information available at www.vt.edu.

BERMUDAGRASS EXPANSION ON VIRGINIA SPORTS FIELDS-Mike Goatley. Virginia's transition zone climate makes it possible to grow either cool-season or warm-season grasses on athletic fields, but none of them very well. Either type of grass is going to regularly struggle from an extreme summer or winter season. A part of my applied research program is variety evaluation and my turfgrass program manager, Whitnee Askew, and I have spent a great deal of time assessing bermudagrasses that we believe are well suited for athletic field

The data continually indicate what great potential the latest generations of cold tolerant vegetative and seeded bermudagrasses have for sports fields.

use in our climate. The data continually indicate what great potential the latest generations of cold tolerant vegetative and seeded bermudagrasses have for sports fields.

Depending on your perspective (see Dr. Askew's research brief below), bermudagrass is either an outstanding sports turf grass OR it is one of the world's worst weeds. For sports turf, bermudagrass offers transition zone sports field managers the opportunity to take advantage of the exceptional density and aggressive growth rate of this grass. In particular, these grasses have now made their way onto athletic fields throughout the Valley and Ridge region of Virginia at elevations of 2,300 feet or higher. As for any natural grass field, they still must be used and managed appropriately to meet expectations, but with proper traffic management, these fields are providing exceptional playing surfaces even as dormant turfs.

The one point of caution I bring to any facility considering a conversion is the intensive mowing requirement of bermudagrass in the summer. However, if this maintenance requirement is properly addressed, the end result is usually a more uniform playing surface and fields that require much less irrigation and pesticide use than comparative cool-season fields.

The most recent success story in Virginia's Shenandoah Valley is Wilson Memorial HS where football coach (and VSTMA member) Jeremiah Major seeded Riviera bermudagrass the summer of 2012. Jeremiah and his team delivered an exceptional field by the season opener in August, but even more impressive was the quality of his turf well into the playoffs in late November (Figure 1). The performance and condition of these fields certainly captures the attention of opposing coaches, players, and parents and has led to many fact-finding inquiries about a grass that they previously considered only to be a serious weed.

BERMUDAGRASS/WIREGRASS CONTROL–Shawn Askew. Dr. Askew has statewide responsibilities for developing weed management systems in turfgrass. He conducts weed control, herbicide physiology, and weed ecology experiments in all types of turf including athletic fields. His graduate students are currently working on several projects that may impact weed management in athletic fields.

In Virginia's climate, bermudagrass is both a desirable turf and a weed. Dr. Askew and his graduate students have worked hard over the past 8 years to develop selective bermudagrass control programs for cool-season turf, especially for Kentucky bluegrass athletic fields. Fenoxaprop + triclopyr programs were developed years ago in North and South Carolina and work great for tall fescue turf. In lower height turf and Kentucky bluegrass, the ester formulation of triclopyr can be extremely injurious to Kentucky bluegrass turf and fenoxaprop is much more injurious to immature turf of any species when compared to mature turf. Both of these phenomena can be problematic for athletic field management where Kentucky bluegrass and lower mowing heights are com-

>> **FIGURE 2.** White tissue symptoms that normally occur from the topramezone treatments (center plot is topramezone alone) are reduced or nearly eliminated and bermudagrass control increases dramatically when topramezone is tank-mixed with triclopyr (plots on left or right) (photo courtesy of Shawn Askew).

mon and immature turf will always be present due to the need to manage wear areas.

Dr. Askew's research suggests that fenoxaprop + triclopyr should only be used in early spring or late fall where immature turf is less prevalent and should be replaced with mesotrione or mesotrione + triclopyr at low rates during stressful periods of summer. Applications of either mesotrione or fenoxaprop mixed with triclopyr can effectively control bermudagrass in cool-season grasses. Just remember to reduce triclopyr rates in hot weather and on Kentucky bluegrass, switch from fenoxaprop to mesotrione both to save money and reduce potential damage to the bluegrass during stressful summer weather, and concentrate on fall treatments to get the best kill (repeat treatments at a 3-4 week interval).

Two new herbicides that are currently under investigation by Dr. Askew's group include topramezone and metamifop. Both herbicides show great promise for selective bermudagrass control and topramezone could be registered within the next year (Figure 2). Both herbicides work better when mixed with triclopyr but offer superior turf safety and bermudagrass control to other herbicides currently on the market. No herbicide, however, will control bermudagrass alone but must be mixed with other herbicides and applied 4-6 times per year in a program approach to bermudagrass eradication.

TURF TOLERANCE TO RIGID TURF PROTECTION SYSTEMS–Erik Ervin.

Dr. Erik Ervin is a Professor of Turfgrass Physiology in the Crop and Soil Environmental Sciences department of Virginia Tech and has primary responsibilities in teaching and advising in the undergraduate program. This research brief summarizes work supported by VT Athletics and the U.S. National Park Service and was completed in 2012 by M.S. student John Royse.

The presidential inauguration, the national book festival, the solar decathlon, and a U2 or Dave Matthews Band concert: what do these events have in common? They are all multi-day set-up and take-down events (often involving cranes) that take place on natural turfgrass surfaces (e.g., the National Mall and MLB fields) with thousands of attendees. Many times the activities are so intense that major turf death occurs and complete re-grassing is required. Managing or softening the conditions that cause major turf loss, however, is preferred. Unfortunately, there have been almost no scientific studies investigating the positives and negatives of current practices.

In 2010 and 2011 we conducted multi-season event cover simulation trials to determine how long a mature tall fescue turf (2.5 inch mowing height on a silt loam soil) could survive and what some of the controlling factors might be (e.g., light, compression resistance, soil moisture, temperature). Two commercially available rigid high-density polypropylene covers were compared to plywood-alone or plywood over Enkamat (Table 1). Terratile is a single-sided, white, translucent cover with foot pads and air holes used primarily for seating or foot-traffic protection, while Matrax LD is a double-sided, white, translucent cover with no air holes used primarily for vehicle-traffic protection. Each spring, summer, or fall season covers remained on the turf for 2, 4, 6, 8, 10, 12, 14, 16, 18, or 20 days giving us a look at turf persistence and recovery every 2 days during a 3-week period (Figure 3). Using linear regression we were able to estimate how long tall fescue could be covered (and driven over daily with a truck) and not have more than 40% turf loss (Table 1).

We found that light availability played a major role in turf persistence and recovery. The translucent Terratile and Matrax prod-

Table 1. Light transmission, average maximum high temperature under cover, and the predicted days until 40% or greater tall fescue loss following covering of various turf protection systems in summer or fall/spring.

		High temperature under cover	Number of days under cover before >40% turf loss, tall fescue	
Cover name	**Light transmission**	**Mean across 2 summer seasons (°F**	**Summer[1]**	**Fall/Spring[1]**
Terratile	25%	108	10	>20
Matrax LD	5%	100	12	>20
Plywood over Enkamat	0%	101	1	5
Plywood	0%	104	1	5

[1]Average high air temperatures during the two summer test periods was 94°F, while that over the four spring and fall test periods was 70 °F.

JOHN MASCARO'S PHOTO QUIZ

John Mascaro is President of Turf-Tec International

Can you identify this sports turf problem?

Problem: Thin and stressed turf with trash can barrels on field
Turfgrass area: Intramural field
Location: Tallahassee, Florida
Grass Variety: 419 Bermudagrass

Answer to John Mascaro's Photo Quiz on Page 33

Background illustration courtesy of istockphoto.com

» **FIGURE 3**. Differential tall fescue response after covering for 6 days in the fall with Matrax/Terratrak (top) or Plywood+Enkamat (bottom) (photo courtesy of John Royse).
» **FIGURE 4**. Spring Dead Spot on a Riviera bermudagrass athletic field in Rocky Mount, VA (photo courtesy of David McCall).

ucts allowed 5 to 25% of photosynthetically active radiation through to the leaf blades when measured at solar noon. During cooler spring and fall periods this resulted in almost complete turf persistence and recovery even when covered for the entire 20-day test period, while both plywood treatments allowed for only 5 days of cover. During summer, extra light transmission through Terratile resulted in significantly higher temperatures reducing turf persistence to 10 days compared to 12 days for Matrax. Plywood or plywood over Enkamat resulted in almost complete turf death after only 2-4 days of cover in the summer. Our results were clear and consistent: Use of a rigid cover that allows some photosynthetically active light to reach the turf canopy is of primary importance, with air exchange and compression resistance being important, but secondary.

SPRING DEAD SPOT (SDS) MANAGEMENT IN BERMUDAGRASS –

David McCall. David is a research associate and PhD candidate in the Plant Pathology, Physiology, and Weed Science Department of Virginia Tech. He has primary responsibilities in turfgrass pathology.

In Virginia, where a growing number of athletic facilities have transitioned to improved varieties of bermudagrass, the most frequent disease-related question I hear is "What can I do about my Spring Dead Spot?" As most who have managed bermudagrass know, spring dead spot (SDS) is the most common and damaging disease of bermudagrass (Figure 4.). Not only is the disease highly unsightly, but a severe patch can be depressed to bare ground, often half an inch or more below the surviving turf stand. This can play havoc on playability and increase the chance for athlete injury.

For decades, a standard recommendation for suppressing SDS has been to use ammonium sulfate as a primary nitrogen source throughout the summertime. This was based on research on one of the pathogens, *Ophiosphaeralla herpotrica*, which is most commonly found throughout the Great Plains and other Midwestern states. The general belief was that all species of the causal agent (there is also *O. korrae*, most common in Southeastern US, and *O. namari*, most common in Australia and New Zealand) would respond the same to nitrogen sources. However, research from the turfgrass pathology program at North Carolina State clearly demonstrated that *O. herpotrica* and *O. korrae* responded differently when clean bermudagrass was inoculated. *O. herpotrica* responded as expected, and was suppressed with ammonium sulfate. *O. korrae*, on the other hand, did not respond to this, but did to calcium nitrate. While the impact on disease activity is not fully understood for each species, we do know that sulfur-based nitrogen sources will lower pH in the upper rhizosphere, and most nitrate sources have little effect on pH.

Because of the widespread problem for turf managers in Virginia, field research trials were initially established on sites with severe SDS epidemics in the spring of 2010 to see how quickly this new guideline may reduce disease. Trials were established on one soccer field (Southwestern Virginia), two golf course fairways (Central Virginia and the Eastern Shore), and one research plot at the Hampton Roads AREC in Virginia Beach. Plots with pre-existing SDS were fertilized with ammonium sulfate (21-0-0), calcium nitrate (15.5-0-0), or soluble urea (46-0-0). Two additional management strategies were applied to test confounding effects of nitrogen source. Plots were split to test whether fall applications of fungicides can speed the recovery of SDS. Interaction with late summer vertical mowing was also examined.

While the NC State research showed dramatic results for new patch development, incorporating various nitrogen sources into pre-existing conditions in our trials has not

Table 2. White grub counts in 2011 Turfgrass Soil Insecticide Efficacy Trials, Tazewell Co., VA.

Treatment/Formulation/ Application Timing1	Application rate (amt product/acre)	White grubs per sq ft (± SEM)2
Untreated check	—	24.13 (3.48) a
DPX-HGW86 20 SC April	8.0 fl oz	23.25 (5.22) a
Merit 75 WP April	6.4 oz	22.00 (4.26) a
Zylam 20SG July	32.0 oz	19.00 (3.42) ab
Allectus GCSC April	4.5 pints	9.00 (1.63) b
Acelepryn 1.67 SC July	8.0 fl oz	2.00 (1.08) c
DPX-HGW86 20SC July	8.0 fl oz	0.75 (0.48) c
Acelepryn 1.67 SC April	8.0 fl oz	0.00 (0.00) c
Merit 75 WP	6.4 oz	0.00 (0.00) c
1Early application: 20 April; late application: 19 July		
2Means within a column followed by the same letter are not significantly different at P < 0.05 according to LSD tests.		

reduced disease as rapidly. To date, results from site to site have been highly inconsistent, but no fertility regimen in combination with other management strategies has proven to be a silver bullet. What appears to be effective in one plot may have little to no response in the next. This inconsistency led to us to wonder whether each site had mixed populations of the SDS pathogen. If both species of *Ophiosphaerella* are present at one site, then no one nitrogen source would suppress the disease. One of the treatments included both ammonium sulfate and calcium nitrate, but this still has not adequately suppressed disease. While the current research will continue for at least 1 more year, we are shifting our primary focus to understanding the population dynamics across the state and within a given field. In collaboration with the Plant Disease Clinic at Virginia Tech, we are working to develop a rapid identification test that will allow turf managers to know what is causing the majority of their SDS problems. While SDS suppression strategies are still evolving, we are growing increasingly confident that our work will improve sports turf managers' ability to make well informed and site-specific management decisions.

WHITE GRUB CONTROL - Rod Youngman. Dr. Youngman is an extension entomologist with statewide responsibilities in integrated pest management in turfgrass, field corn, and forage crops.

White grubs have been the major focus of my applied research and extension outreach programs in Virginia. These root-feeding larvae feed on all of Virginia's sports turf grasses from mid-spring until killing frost, but they cause the most damage on cool-season athletic fields during the heat of summer. Damage from a heavy infestation of grubs is often made worse by the burrowing of foraging animals and birds such as skunks, raccoons, and crows. The damage can literally make fields unfit for play due to the surface damage and the subsequent poor footing of damaged turf (Figure 5).

The results of this research (Table 2 indicate several important findings regarding chemical grub control. The mid-April applications of the experimental DPX and Merit 75 WP (imidacloprid) treatments did not perform well, but at the late application (same rates) they ranged among the top performers. DPX-HGW86 is being positioned as a rescue treatment by its company. Although the traditional grubicide Merit no longer has the staying power (April-August white grub control) it once enjoyed, the performance of its July application is directly in line with the white grub life cycle. White grub egg-laying typically begins mid-July and peaks the first-second week of August in our area. Acelepryn (chlorantraniliprole) provided excellent grub control in either early or late season applications; the season-long grub control from its April application and its additional control prospects for turf caterpillars makes this a very promising insecticide for many turf uses.

>> **FIGURE 5**. Damage to a Kentucky bluegrass/perennial ryegrass athletic field from skunks foraging for white grubs.

In addition to continuing work in this area, we have also started evaluating entomopathogenic fungi and nematodes as biological control agents against annual white grubs. If successful, these combinations might greatly expand our options in biological grub control.

DALLISGRASS CONTROL IN BERMUDAGRASS - Jeffrey Derr and Adam Nichols, Hampton Roads Ag. Res. and Ext. Center. Dallisgrass *Paspalum dilatatum* is a warm-season perennial that spreads by short rhizomes as well as by seed. Dallisgrass clumps expand over time due to rhizome growth. Its wide blades and tall seed heads make the weed especially apparent in bermudagrass turf. Dallisgrass is a troublesome perennial grass in a number of turf situations, including sports turf. It invades both warm and cool-season turfgrass, where there are limited control options. MSMA, the most commonly used herbicide for dallisgrass control, currently can only be used in golf courses, sod production, and rights of way areas. It is unclear what turf labels will exist for MSMA in the future. Additional control options are needed for this weed in turf.

We have been investigating herbicides, herbicide combinations, and herbicide application timing for dallisgrass control in bermudagrass. The herbicides tested include Revolver, Celsius, Tribute Total, and Monument. We have included MSMA for comparison. All of these herbicides will injure dallisgrass, although this weed will recover from single applications. Label restrictions prevent making more than two applications per season for some of these products. We have rotated herbicides in our repeat applications to stay within label restrictions. We have tested multiple spring, multiple fall, and spring followed by fall applications. We compared broadcast applications to spot treatment. For certain herbicides, a higher dose can be applied using a spot treatment, although only about one quarter of the total turf area could be treated using these doses.

>> **FIGURE 6**. Dallisgrass is very noticeable in bermudagrass due to its wider blades and tall seed heads.

Two applications of Celsius plus Revolver in spring provided 45% dallisgrass control in summer, but the dallisgrass com-

Continued on page 45

Clarifying and magnifying concepts in the pesticide industry

I SAT IN ON AN INTERESTING DISCUSSION at the National Entomological Society of America meeting in Reno, NV in late 2011. There were talks on the uses, advantages and disadvantages of simultaneous pesticide combinations in integrated pest management strategies. Here are some of the highlights:

First of all, the terminology is confusing and certain words mean different things to different people. Let me define a few terms according to the Insecticide Resistance Action Committee (IRAC) before I go too far.

Pesticide combinations: applications of two or more compounds to the same pests at the same time. Specific examples are tank mixes and premixes.

Tank mix: a mixture of two or more products (they don't just have to be insecticides) on-site or on a mix/load pad by an applicator. Each product is often applied at a high labeled rate. Sometimes a "tank mix" may be thought of as mixing one product with water in a tank, but that is not how I'm using the term in this article.

Premix: a commercial product containing two or more active ingredients. At least one active ingredient is usually applied at a lower rate than if used alone. This "premix" category is different from the use of something like water-soluble packaging of a single insecticide.

Why would anyone use a combination of products, rather than just applying one product at a time? There can be pros and cons, either way. The most common reason to combine pesticides is to kill more pests with one application. Many of the newer insecticides have fewer target pests (are "narrow-spectrum") and may have different routes of entry (contact vs. plant systemic), so if you apply two or more at one time, then you have a more "broad-spectrum" treatment. Other benefits may include reducing transportation costs (if you kill most pests initially, there may be fewer call-backs), like saving on fuel, reducing the amount of packaging, decreasing possible turf injury from repeated traffic or soil compaction and decreasing the spread of disease or pests on equipment. Client satisfaction (at least in agriculture) tends to be higher when mixtures are used, and mixtures may be less expensive than do-it-yourself tank mixes.

Another reason to use a mixture or pesticide combination is to slow down the development of resistance in some pests. However, this is not the typical motivation of applicators, and I would appeal to you to weigh the pros and cons of this when choosing your pesticide inventory. I was amazed that in agriculture, a lot of insecticide mixtures have been used over the last 50+ years—e.g., abamectin (Avid) plus thiamethoxam (Meridian) on pears against psyllids and aphids. The list was so long, I couldn't write down all of the combinations.

Mixing products is not as easy as it sounds. With any kind of mixture, there are some things to watch out for. It is possible to get "**antagonism**" between compounds, which means that the mixture is less effective than when the single products are used alone. There is also the risk of plant damage or "**phytotoxicity**," which is more likely to occur when mixtures are applied to stressed plants (e.g., drought-stress), but separate applications of the compounds would not hurt a plant. And, "**physical incompatibility**" can happen if two compounds or formulations react to each other or physically can't combine (an issue of compatible solubility). The result could be a big glob of goo in your spray tank.

Some cautions to be aware of: Avoid mixing insecticides that have the same "mode of action" or are in the same chemical class. From a resistance management perspective, if an insect is resistant to one insecticide (e.g., bifenthrin), then what good would it do to add another pyrethroid (e.g., permethrin, deltamethrin, lambda-cyhalothrin, etc.) to the mix? There could be cross-resistance within the same chemical class or even across other classes, so you would only be exerting the same selection pressure to the pest. For example, carbamates and organophosphates act essentially the same way on an insect, and pyrethroids and DDT similiarly have some cross-resistance. Hopefully, you remember that a mode of action is how an insecticide acts (e.g., interferes with the sodium channel) at its target site (e.g., the nervous system) within the insect.

Another caution is to avoid using the same mode of action (single product or mixture) against the same generation or life stage of the target pest. This may be easier said than done in the southeastern US, especially Florida and the Caribbean, where we have overlapping life stages of pests nearly year-round. Ideally, one treatment could be used to knock out most of one pest generation, then if needed, you could come back to treat the next generation or whenever damage reoccurs.

Similarly, if a treatment of some product doesn't work the first time, don't keep applying it again in the hopes that attempt #2 or #3 might be more worthwhile. Doing the same thing over and over again when you know it doesn't work is insanity (and arguably unethical if you're getting paid for the job). Be aware that treating with a brand name product and at the same time with a generic product at the highest labeled rates equals a 2X application, which is illegal. Again, the goal is to reduce selection pressure and use products wisely, not nuke everything. Modes of action can be determined by finding the "Group" number on a product label or by looking up the active ingredients on the IRAC website (http://www.irac-online.org).

The last caution I heard at the meeting was that premixes should not be used unless all components within the product are needed.

ADVANTAGES, DISADVANTAGES OF MIXES

The advantages and disadvantages of tank mixes and premixes were thoroughly discussed at this meeting. For example, commercial premixes have the advantages of being convenient to use, the active ingredient rates are unchangeable, the component rates and formulations are optimized during development, no mixing or stability issues should exist, and at least one component is usually applied at a lower-than-labeled rate. Some disadvantages include the inability of an applicator to change the active ingredients, all target pests should be present at the same time, and premixes may have been designed for specific pests or regions of the US but could be used outside of the optimal treatment zone. From an economic standpoint, premixes may be created by manufacturers as part of a post-patent marketing plan to obtain a licensing extension.

Some advantages of tank mixtures include giving the applicator some flexibility to provide treatments that fit the pest control need at that time, and they help to reduce any excess pesticide inventory that might exist. However, the flip side is that creating a tank mixture is less convenient, it's potentially hazardous to people who are not trained to properly mix products, "homemade" tank mixes may not be as stable as a premix, and the products being combined tend to be mixed at the highest labeled rates.

According to IRAC there are some requirements for a mixture to be considered effective. First, all toxins should persist the same length of

time where the mixture is applied. Complete coverage of the treated plant is essential. There should be no cross-resistance between the toxins. In effect, both compounds should each be able to kill the target pest, which is called "**redundant killing**." As turfgrass managers, we are not chemists, and we don't know if only one of the compounds in the mix is doing all the heavy lifting or if there is really a benefit to having both compounds in the mix.

Whether or not mixtures are useful in pesticide resistance management is controversial among applicators, researchers and regulators. Some say that the use of mixtures in resistance management is not supported by either computer models or field experiments, although lab tests can make mixtures appear to work. It is possible that a mixture could incompletely kill multiple life stages of a pest, instead of killing everything it was intended to kill. That means that some bugs still survive, lay eggs and pass on their resistance genes to the next generation.

I asked someone at that meeting if they thought it might be possible to restore the use of a product when resistance levels were really high (like bifenthrin and chinch bugs in parts of Florida), and they pessimistically said that it was too late. I hope that's not true. They also said that resistance management should start **before** field failures occur. So the time is NOW to determine how to delay resistance development in the neonicotinoids like Arena (clothianidin), Meridian (thiamethoxam) and Merit (imidacloprid).

RESISTANCE MANAGEMENT STRATEGY

Okay, so I also had the question of what a resistance management strategy should look like. Should each pest generation only be exposed to one active ingredient? Should all of a species' populations be treated with the same compound at the same time, or should each infested site be treated differently? In lawn care, that is what we do—each lawn is treated differently often by different companies, thereby creating a "mosaic" effect, unless a whole neighborhood is under the management of one pest management company. If property 1 is treated with bifenthrin (Talstar) and neighboring property 2 is treated with clothianidin (Arena), then what happens next? Any surviving insects on either property may find each other, mate and have offspring that can better survive an application of either compound applied alone or mixed together. Almost sounds like a cliff-hanger; we can't predict how fast resistance will develop to another compound in this common type of scenario.

So, what does this all mean? Be good product stewards and help us develop a functional resistance management plan for turf. Implement integrated pest management or IPM. Avoid treating turfgrass unless you absolutely have to, which admittedly challenging for a route-based business. Just because you treat green grass and it stays green after an application does not mean that a product worked—it may mean that no pests were present and causing damage at the time of application. Overuse of products like this is one route to developing product failures down the road. ■

Dr. Eileen Buss is an associate professor, Entomology & Nematology Dept., University of Florida. This article first appeared in the Florida Turf Digest's July/August 2012 issue.

Getting faster turf recovery coming out of winter

Editor's note: *We asked some top-of-their-game STMA members about strategies they employ to help their fields recover from winter more quickly. Here are the questions:*

1. What's your experience with fertility strategies coming out of winter?
2. What's your experience in controlling any winter diseases you've seen?
3. What topdressing materials do you use? Why those particular materials?
4. If you overseed, what's your advice on removing the overseeded grasses?

GRANT SPEAR, CSFM

Athletic Fields Supervisor
University of Nevada, Las Vegas

Winter in Las Vegas typically means dormant bermudagrass fields for 3-4 months. If a field is not overseeded, the bermudagrass will start to slowly grow in March. Fertilizing with a 3/4 to 1 pound N per thousand square feet and 4% Fe in late March or early April following topdressing with sand or better yet, sand with 20 to 30% peat helps to speed things along (the darker the topdressing, the better). Of course longer days and 80+ degree highs and 60+ lows help much more. I have yet to see any disease issues other than physical damage from excessive use of a dormant field when it's wet in the winter.

Overseeded fields behave and are treated differently here. Typically, ryegrass remains green but grows very little for us after mid-November until the end of January. Topdressing with a dark sand helps a little but most fertilizer seems to have very little effect until the days get longer in early February. Late January, I start fertilizing overseeded turf at about 3/4 pound of N per thousand square feet with about 4% Fe every 3-4 weeks until about a month before I want to transition the turf back to bermudagrass.

The bermudagrass base turf is much slower coming back when competing with perennial ryegrass, but by late May it's usually coming back. Depending on field use in May through the end of June we spur the bermudagrass along by controlling the water to stress the ryegrass and lowering the mowing height from 1" to 3/4" or from 5/8" to 5/16" on infield turf. Heavier applications of urea (1-1.5 lbs N per thousand square feet) add to the stress on the rye and speed the encroaching bermudagrass.

If more complete, quick removal of the rye is optimal and adequate time is available for the bermudagrass to grow, transitioning herbicides like Monument and Revolver are the way to go. One week after treatment, I start to hit it with fertilizer again.

JEFF HAAG

Sports Turf Specialist
John Carroll University, University Heights, OH

Currently I try to avoid making any fertilization application in this region until late April so that I don't deplete the carbohydrate reserves I have built up heading into winter for our cool-season grass. If there would be a need to apply any I would try to limit it strictly to recovery areas and not as a blanket application for an entire field.

I do apply a dormant fertilization application to continue to store carbohydrates for the following spring and summer the last week of November. Last year it was applied on November 26.

In this part of the country (outside Cleveland) the main concern is pink snow mold; however, here at John Carroll we do not apply any fungicides to any of the athletic fields. But when I was the golf course superintendent/sports turf manager at Bowling Green State University, I applied a tank mixture of iprodione (Chipco 26GT) and Daconil (chlorothalonil) as a preventive for pink snow mold with great success.

I topdress using a coarse USGA spec sand because the coarser grade allows for better drainage.

Since we have cool-season grasses here at John Carroll we do not have to overseed. When I was at the University of Louisville we overseeded the bermuda fields with perennial rye, and found that the product Katana removed the rye the quickest and with minimal turf discoloration.

CHRIS "BUTTER" BALL

Sports Turf Manager
Gwinnett Braves (GA)

Typically we load up our bermuda with potassium for the winter. We usually apply 1-1.5 lbs of N all winter, typically done with one granular app, supplemented by foliars. In the Southeast it has been rare the last few years that the bermuda has gone totally dormant, in my opinion, which really helps as the weather starts to turn. We start the spring by lowering the mowing heights on our ryegrass, and applying small but frequent amounts of N as soon as the air temp breaks 65-70 and our bermuda starts to show signs of life.

Most of the winter diseases we see in the Southeast are on our ryegrass. Preventative apps of broad spectrum fungicides made starting in late January and early February, usually do the trick. We also are on a phosphate program that has been a large piece of our puzzle the past few years. I also believe it is a must that getting your potassium built up in late summer and all fall is a vital to a healthy transition.

We typically use a sand for topdressing that is very similar to our rootzone base. We are 100% sand and have found a source that matches our rootzone very, very closely. We also topdress with green sand in thin and wear areas as needed. Kiln-dried green sand is a must in our program.

We do overseed, (unfortunately) due to some of the February and March games we play. My philosophy the past 10 years or so has been to go out late and very light with our ryegrass seed. Last year (2011) we were close to 5lbs/M and this year (2102) we are at 4-4.5lbs/M.

We do not take the rye out chemically for transition. We start to drop the mowing heights as soon as possible (late March-early April) typically from 5/8" to 1/2". When our team is on the road for an extended period of time we will often take our turf down to 3/8". We will apply a poly-coated N-P-K granular and really start to pour our foliar program to our turf by spraying small amounts of N every 7-10 days. We also use green pigments as much as possible to draw heat into the plant and start to aerify with small solid tines as much as possible early during transition, while large core aerification is done in June, July, August, and September. Frequent light topdressings also help us push our transition.

TODD TRIBBLE
Athletic Field Superintendent
Oklahoma State University

Like most athletic fields in the transition zone we are forced to overseed our bermuda stand with perennial ryegrass. We have to stay fairly lean on our nitrogen inputs on our baseball field in mid-September and October when the overseed is somewhat weak and hasn't yet begun to tiller and mature. During this time we supplement once a week with a light foliar application until November. As soon as fall practice is over the first of November we push out a starter application of 18-24-12 at 0.75lbsN/1000.

Our other go-to product when the soil temps begin to drop to the upper 50's at a 4" level has always been an IBDU product at 1.5 lbsN/1000. This is a can't-miss product for us here. It is perfect for cool season grasses such as rye as it is slowly soluble and the release is based on moisture availability, not temperature or the activity of microorganisms. Usually we will come back 8 weeks later at 1lbN/1000 of the same product to get us through the end of February when our soil temps are warm enough to use more conventional fertilizer methods such as ammonium sulfate.

If I see a 4 or 5 day window of warmish weather for Stillwater during January or February (mid-upper 60's) we will usually go out at light rates (.25-.33lbsN/1000) of a soluble product to give our rye a quick kick of growth and allow for some recovery from the daily practices and games. Unfortunately, after this winter draws to an end we will be forced to find a different slow release source that mimics IBDU as it is more or less unavailable to us now. Beyond the end of February, we use a 13-2-13 at 0.75lb rates to help with repair and color maintenance until early June when the season comes to an end. We know that with fairly low nitrogen rates for that 7-month time frame our team is playing on rye we can keep growth where we need it[DASH HERE]not too lush but still be able mow each day and remove some tissue.

We have been fairly fortunate here in Stillwater to not have great winter disease pressure. We do get snowfall each year but in all years but one it has burned off within 4 days or so. In the winter of 2010 we did get 9" of snow and in our right field corner at baseball snow drifts piled up 3+ feet of snow. It took about 2 weeks of good temperatures for this to burn off and we did see some light instances of snow mold. Consequently, I will only spray preventatively for snow mold if we have a storm coming that will blanket us fairly heavily with snow and the 10-day forecast does not allow for melting. In such cases I will use a chemical with a combination of the active ingredients chlorothalonil, propicanozole and fludioxonil before the storm arrives.

The practice of topdressing is important for many reasons, including quicker recovery from turf injury/damage, enhanced overseed, thatch decomposition, and smoothing out our playing surfaces. We are always sure that the material we use is of a similar or slightly coarser particle size than our overall rootzone. If you really want to take a sci-

On our other fields I also consider how aeration will mix the existing soil and topdressing material as not to upset the rule of thumb; coarse materials over fine equal positive drainage.

entific approach to it, test the percolation rates of your field as is, then test your proposed sand. If the sand from the supplier drains at a faster pace than what your current perc rates are, that might be a good option for a topdressing material; just make sure it isn't too course so that it can't be worked into the turf canopy with a mat.

A particle size that is finer than what was used at the time the fields were built can lock up pore space, decreasing air, water and gas movement, impacting the availability of nutrients due to roots hitting a "physical barrier" in the rootzone, and create compaction issues over time. Obviously for us, it is important to find a USGA spec type sand that fits our needs and is not much more expensive per ton than a local, "dirtier" type of masonry sand. We recently built a new 4-acre football complex and are lucky enough to get our sand from the same plant as the one who provided the rootzone mix at time of initial construction.

Certainly we overseed in Stillwater with our being in the transition zone. Each year we use perennial ryegrass to keep our softball, soccer, and baseball fields green for the late fall/winter/spring months. As soon as the season ends for each sport we immediately (day after) eliminate the stand of rye chemically with the active ingredient foramsulfuron. We are fortunate in the fact that our coaches understand our urgent approach to ryegrass removal. Our camp schedules in the summer are usually played on a weaker stand of bermuda as it recovers from the smothering of the overseed. Like most turf scientists have included in their presentations, the importance of having as close to a 100-day time frame of having a healthy stand of pure bermuda cannot be overstated.

For our baseball field specifically this can be a difficult thing to accomplish with the season extending into June. The past two seasons we have regularly maintained our rye at 0.75" but dropped to 0.625" when the team is out of town. This imparts some stress on the rye for that time period and we hope that our permanent stand of bermuda can jump in and slowly overtake the rye in May. During this same time we begin to up our nitrogen inputs to further encourage the bermuda to take off. These two practices certainly do not lead to a 100% stand of bermuda and probably never will but it does allow us to cheat a little before June 5 spray out time. Rye that isn't removed simply hangs on all summer in clumps and alters the uniformity of the bermuda.

AMY J. FOUTY, CSFM
Athletic Turf Manager
Michigan State University

The fall and winter in Michigan can be very different from year to year. Over the years I have changed my fertility strategies to best match the changing environment. I have gone away from late fall applications of fertilizer and typically wait to fertilize in the spring time until the soil temperatures averages 50 degrees. Fifty degree soil temperatures signify that the ground will most likely not freeze again and that the turfgrass plant is beginning to actively grow. We often get periods of rains and warm spells during the winter months that unthaw the ground; by waiting I feel that we do not waste our fertilizer or money. As far as the type of fertilizer we use in that first application I like a quick to medium release to quickly green up the turf and start the rejuvenation process for the plant.

We use a combination of cultural practices and chemical applications to control winter diseases. We typically do not push the bluegrass with a lot of N in the fall. I believe that the plant can better store carbohydrates using this fertility method and prepare the plant naturally to defend against the winter if I am not pushing shoot growth. Second, we try to solid deep tine aerate the fields that we need to get out on the earliest in the spring so that the soil and plants have the healthiest environment possible through the winter months.

Diseased areas are often low light areas or compacted soils that do not drain well, so we try to alleviate these issues as best we can by opening them up in the late fall. Finally, at the end of our fall season we typically make preventative snow mold application. I like to wrap these applications up the last week of November.

The type of topdressing materials that we use is based on the existing soil structure in each of our facilities. For example, we have an engineered sand system in Spartan Stadium that we have matched sod and soil to, and then in 2010 engineered topdressing material for as well. It is all based on the distribution of the particle size of our soil test to maintain positive drainage and air movement through the soil structure.

Finding the proper balance of fines, medium, and course particles is critical for stability and drainage. Basically it equates to 95% well graded sand and 5% silt and clay in the stadium. On our other fields I also consider how aeration will mix the existing soil and topdressing material as not to upset the rule of thumb; coarse materials over fine equal positive drainage.

In our northern climate we typically overseed year round with Kentucky bluegrass seed mixes on the fields just before events, camps, and rentals for the athletes to work in the seed. We have had great success over the years just sticking with the Kentucky bluegrass. The only fields that receive any rye/Kentucky bluegrass blends of seed are our practice fields in the fall. The winter weather typically desiccates the rye for us so there is no need to chemically remove it. We start again in the spring with straight Kentucky bluegrass.

JOHN WATT, CSFM
Athletic Field Manager
North Kansas City Schools

My best results of turf quality coming out of the winter come from applying a pound of nitrogen that is quick release in the late fall. Then in late winter months, end of February, we apply ½ pound of nitrogen to kick start the bluegrass. Three weeks later, when soil temperatures warm up, apply the ½ pound of nitrogen to continue growth and recovery from spring sports. At the K-12 level, spring sports season is very short, so we need to start as early as possible to get the grass growing for quick recovery.

My budget doesn't allow for a preventative fungicide program, so I try to stick to cultural practices going into the winter months. My crew and I use growth blankets as much as possible. We focus in areas that can be prone to winter disease or where there is a low threshold for thin turf

when spring season starts up, for example soccer goal mouths.

I usually use a 90/10 sand:peat mixture. I choose this for ease of application and addition of organic material into the native soil.

We don't overseed.

VINCE HENDERSON, Park Services Manager
JASON MELTON, Sports Turf Manager
Henrico (VA) County Parks & Rec

We are 100% warm season turf and since we are in the transition zone we try to be patient with our nitrogen fertility on overseeded and non overseeded fields. We overseed mostly for color on our baseball fields and for early season tournaments on soccer fields. We start fertilizing these fields when we begin mowing and typically use a water soluble fertilizer such as ammonium sulphate or urea with a urease inhibitor at .25 -.50/ lb per 1000 rate. We are even more patient with non overseeded fields due to the possibility of a late freeze. Very mild winters usually lead to early green-up of these fields, but a late heavy frost or freeze can really hurt these fields if they are too lush. We really take a wait and see approach to these fields. Sometimes we may get into April and need to push them a little, but more often we try to wait until the grass wants to grow.

The only major problem we have with disease has been spring dead spot on our baseball stadium field. We have had mostly good results in using fenarimol (Rubigan) at split 4 oz/1000 rates. The best timing for the applications has been late August or early September and then again 4 weeks later. Going forward, Rubigan will not be available, so we will have to use an alternative fungicide if we decide to continue with fungicide applications.

Another way we have tried to combat this problem is the use of nitrogen sources. Calcium nitrate seems to help, but we cannot be sure if it is the fertilizer source or the fungicide applications or a combination of both that has helped. We have tried to use information from Dave McCall at Virginia Tech and research done by Dr. Lane Tredway at North Carolina State to combat this problem.

Over the years we have mostly used sand to topdress our fields, but we have moved more to using compost on all of our fields except our sand-based stadium field. The sand-based field is topdressed with a matching sand when we core aerate. We do not use compost on this field so that we keep from creating a layer that will inhibit drainage.

On our native soil fields we try to incorporate .25" of compost with some type of cultivation process, whether it is core or solid time aeration. We have seen a great response with using compost in early spring to promote growth and enhance color and believe that over a period of time we will create a better soil structure. We have also found that topdressing compost in conjunction with sprigging has really helped our grow-in process.

We started using compost due to a recommendation by Dr. Andy McNitt at Penn State when we renovated a native soil field to improve soil structure and drainage. This particular renovation required 2" of compost be tilled into the top 8" of soil. The results were excellent, so we have since incorporated this into our cultural practices.

It is important to note that we have found an excellent source for compost that is clean of sticks and debris and is easy to spread and also free of weed seeds due to their composting process. The cost of compost has also been cheaper than sand. The truth is that with the number of fields we maintain (81 irrigated fields) we don't have enough time to topdress as much as we would like.

This question really depends on the type of weather we have. Our perfect scenario would be to scalp the rye and turn off our irrigation systems for a week or so and let Mother Nature take care of the rest. This also works well with some type of cultivation process such as slicing. If it is a cooler-than-normal spring and the ryegrass is thriving and the bermuda is lagging a little we may wait a short time, but then use a chemical application to reduce the competition between the two grasses.

Another factor to consider is if we will need to sprig or repair worn areas of a field that has been overseeded. In this case, we must be careful to plan the chemical application accordingly in case a window of time is needed. We have typically used trifloxysulfuron-sodium (Monument), because we are also able to control sedges and some broadleaf weeds if needed. We try to use as few chemical applications as possible.

SHANE YOUNG, CSFM
Grounds Supervisor
Prince William County (VA) Park Authority

I don't fertilize warm or cold season turf until my pre-emergent app in early April.

Since being in my current position for past 12 years, I have only seen spring dead spot on bermuda. It usually it grows right out of it.

I don't topdress my bermuda soccer fields anymore because the reward wasn't worth the cost.

I overseed my bermuda and let it transition out naturally. I use transitional rye though. ■

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Use earthworm castings tea for better turf

HOW CAN EARTHWORMS BE BENEFICIAL TO US AS TURF MANAGERS? We know of the natural aerification that takes place from earthworm activity in the soil, ultimately opening up pore space for root growth and improving water and oxygen movement, but is there any other way that we can benefit from these slimy creatures? It turns out that through a process called vermicomposting we can potentially reap countless advantages in making turfgrass more stress tolerant while improving soil structure while reducing dependence on chemical and pesticide use.

Vermicomposting is an organic process used to convert agricultural and other waste into valuable living soil amendments. The end result of the vermicomposting process is the production of earthworm excrement, referred to as castings. These castings are packed with beneficial nematodes, protozoa, fungi, organic matter, plant growth regulators (humates and fulvates), plant growth hormones (IAA and gibberellins), and soluble nutrients (N, P, K, Ca, and Mg).

Organic matter serves as a storehouse for nutrients in the soil.

SOIL NEEDS ORGANIC MATTER AND MICROBES

To fully understand the benefits of worm castings, it is best to first comprehend the need for sufficient organic matter and healthy microbial activity in the soil. Organic matter serves as a storehouse for nutrients in the soil. Unlike soluble synthetic fertilizers, the nutrients stored in organic matter and microbial bodies do not easily leach out. The organic matter forms aggregates with fungus and other beneficial bacteria making it difficult for nutrient leaching from heavy water movement through the soil profile.

The diverse addition of microbial life to the plant's leaf surface and rootzone has many benefits, but perhaps the greatest and most direct benefit comes as a population addition to the soil food web. This addition helps to maximize a continual cycle of breaking down and releasing nutrients into plant-available forms accessible to the roots. As bacteria and fungi feed on organic matter in the soil, they store nutrients within their body while releasing others. Then as nematodes and protozoa in turn prey on them, nutrients are released from the bacterial and fungal bodies into the soil in a plant available-form ready for

Worm image ©istockphoto.com/knorre

>> **THE BEGINNING** of the brewing process—the straining bag of worm castings is placed in water.

root uptake. When organic matter is fed to the soil, the microbial life then feeds nutrients to the plant.

BENEFITS OF WORM CASTINGS

Nutrient Cycling and Retention: As mentioned earlier, aggregates formed from microorganisms within the soil greatly reduce nutrient loss, ultimately reducing groundwater contamination. Less nutrient leaching, coupled with a healthy microbial population unlocking nutrients already in the soil, leads to a lessened need for the quantity of fertilizer output.

Microbial Diversity: The addition of an incredibly diverse population of microorganisms from the worm castings helps maximize the productivity of the soil food web.

Water Retention: As the amount of organic matter within the soil increases, so too does the water holding capacity of that soil.

Disease Suppression: Spraying worm castings tea populates the soil and leaf surface with an exorbitant amount of microbes all searching for a food source to survive.

» **LEFT:** The middle of the brewing process. The foam indicates good microbial activity in the tea.
» **RIGHT:** This is the finished solution with a tea bag in the foreground.

This diversity ensures that all of the organisms have a predator in the soil; because of this, no one organism can easily reach populations high enough to cause damage of any significance. Working symbiotically with the plant's roots system in this way helps to eliminate harmful molds and fungi from inoculating the plant's surface.

Worm castings don't do miracles against all plant disease; however, research completed by Dr. Norman Arancon and Dr. Clive Edwards at Ohio State has shown that worm castings suppress *Pythium ultimum* and *Rhizoctonia solani* diseases. Further research conducted by the Plant Sciences Department at Cornell University shows that the beneficial microbes colonize seed surfaces masking the chemical signaling needed for the pathogen to locate the host material.

» **THIS IS OUR BREWING SET-UP** with the air compressor in the middle of the four containers and PVC piping branching off of that.

Insect Control: Worm castings are rich in chitinase, a chemical that decomposes the exoskeleton of insects. Many researchers believe that its presence in the castings prove inhibitory to many damage-causing insects.

Plant Available Nutrients: Worm castings provide soluble nutrients to the plant. The nutritional analysis can vary depending on the food source during the vermicomposting process, but generally the castings have around 1-3% N, .5-1% P, and 1-2% K. These levels are low, but they are immediately ready for plant uptake.

» **CLOSE-UP** view of the dry worm castings.

APPLICATION PROCESS

Worm castings can be applied a couple of different ways. Like any compost, the castings can be spread in a finely ground, dry formulation. Dry application would be more useful in a situation when it could be added directly to the soil profile during a renovation or construction.

When applied to the plant, the best and most cost effective application method is by making a tea from the castings. Much like making a pot of tea at home, the concept of this tea is to simply use water to extract all of the "good stuff" from the worm castings into a liquid solution that can easily be applied. This process can be done two different ways: extracted or aerobically brewed. Aerobically brewed teas require more time to produce, but the end product is a solution with exponentially higher microbial populations than that of extracted teas.

This aerobic tea brewing process is fairly simple, but it does require some time, attention, and know how. A variety of brewing containers and methods are available and can be used; however, a key point to keep in mind when producing the castings tea is that because the tea is a living solution, oxygen and a food source must be continually available to the microorganisms in the tea for survival and maximum population growth.

During the STMA Conference last year in Long Beach, CA I sat in on an educational program presented by Leif Dickinson about his practices with growth regulators on his bermudagrass at Del Mar Thoroughbred Club. During the presentation he mentioned his use of worm castings tea brewed with alfalfa to jump start his turf out of large patch symptoms in the spring time. Our field had experienced large patch the previous fall, so this concept caught my attention. I began looking for any additional information or research anywhere about the benefits or drawbacks from the usage of worm castings tea on turfgrass. What I found was a wealth of success stories from gardeners, crop producers, and the greenhouse production industry, but nothing more documenting real success on turfgrass. After reading all of the different uses and benefits, I came to the realization that once you strip everything down, growing quality turfgrass isn't really that much different from growing other crops, so I decided to give brewing an aerobic castings tea a try.

For the brewing system I retrofitted an air bubbling system off of a 10-gallon air compressor we had sitting around. We began spraying in mid-March as our bermudagrass had begun coming out of dormancy. My intention was to make three applications on 2-week intervals with my last application coming in mid-April; instead I got hooked on the results we were having and continued spraying on the bi-monthly interval schedule for the remainder of the growing season.

OBSERVATIONS FROM TRIAL AND ERROR APPROACH

• Because our field displayed the visual symptoms of large patch in the fall, I naturally anticipated those same areas to appear as the field broke dormancy in the spring. When the turf woke up from the winter, the infected areas from the previous fall where nowhere to be found.

• I was amazed how well the "usual suspect" wear areas handled traffic throughout the year. Even before the bermudagrass season really kicks into gear, the turf dealt with our 18 high school game, pre-Lookouts season slate with ease. From my observation, this improved wear tolerance continued throughout the 2012 season.

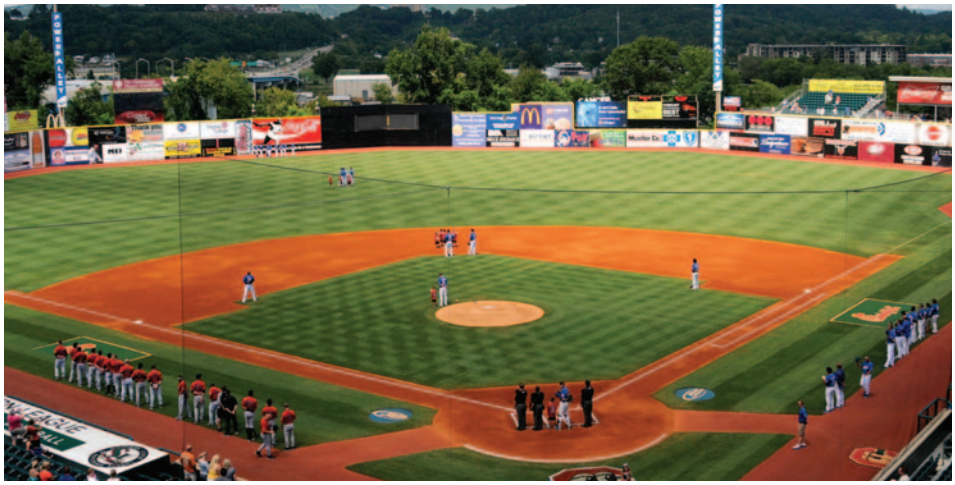
• Even though we had a substantially drier summer, two different observations I made this year can speak to improved water retention in our soil. First, we did not have an occurrence of fairy ring, which the field had experienced the previous six seasons.

Our fairy ring symptoms are the result of the inability of water to penetrate through the hydrophobic tendencies of the thatch layer, ultimately resulting in a plant thirsty for water. Secondly, we dodged having to babysit any dry spots resulting from our deficient irrigation system.

These are only the observations over the course of the 2012 growing season when compared to the previous season. Are these results an anomaly or were they because of a tweak in our cultural and fertility management? I would be naïve to think that these results can be only be attributed to the addition of the worm castings tea, but I do believe when coupled with good management practices, positive results will follow.

WHERE TO GO FROM HERE

The idea of turfgrass benefiting from vermicompost is a relatively new concept. Much additional education and research is needed about the functionality of the addition of these microorganisms from the worm castings to the soil; however, our results over the past season indicate that there is a place for castings tea in environmentally friendly turfgrass management practices. Whether it be reducing synthetic fertilizer, pesticides, groundwater contamination, water use, etc., it is becoming difficult to escape ever-growing environmental concerns and restrictions. Because of this, any product or concept that can assist in limiting negative environmental impacts while working in conjunction with our daily management practices should be explored. ■



>> **BEFORE A GAME** on August 14, 2012.

Joey Fitzgerald is the head groundskeeper for the Chattanooga Lookouts.

SportsTurf

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JOHN MASCARO'S PHOTO QUIZ

Answers from page 17

Like many colleges in the county, Florida State's main campus in Tallahassee has run out of room and in the never-ending challenge to find space, these lighted intramural fields are not only used for football as well as soccer, rugby and just about every other sport known to man; they are also used for stadium overflow parking during FSU home football games. The trash barrels were also placed on these fields to serve as temporary traffic lane markers and also allow people to put trash in them after pregame tailgating. The resulting thin and stressed turf can only be expected after subjecting turf to the hours of play they are subjected to in addition to the abuse they take from the vehicle traffic and tailgating festivities. This photo exemplifies the challenges that many Sports Turf Managers face when posed with the challenges of providing a quality playing surface while also being faced with multiple uses and abuses that are imposed on our fields by outside forces. Only activities like aerification, extra fertilization and sometimes a little prayer allow us to grow turf in these situations.

Thank you to Bobby Broome, Facilities Superintendent, and Richard Hunt, Maintenance Supervisor for Campus Recreation, Florida State University in Tallahassee for allowing me to take these photographs. ■

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.

More educational opportunities & networking highlight 24th Annual STMA Conference & Exhibition

APPROXIMATELY 1,600 PEOPLE participated in the Sports Turf Managers Association's 24th Annual Conference and Exhibition last month in sunny Daytona Beach, FL. The crowd included sports turf managers, academics, and other industry professionals from across the globe.

STMA's new format for Daytona Beach included STMA Academy and the addition of a number of new educational tracks, as well as changing times for several events; this reporter found nothing but positive reviews of the new format in informal chats with attendees and exhibitors.

STMA President Dr. Mike Goatley made a point to congratulate Martin Kaufman, CSFM, Conference Chairman, for his diligence and tireless effort in organizing the Conference. And congratulations from this corner to the STMA Headquarters staff for another smoothly running show, set in a perfect venue and surrounding area. Way to go, CEO Kim Heck, Kristen Althouse, Leah Craig, Nora Dunnaway, and Shant Thomas.

Simon Gumbrill, sales director of Campey Turf Care Systems, travelled from Great Britain to exhibit and said he was pleased with the attention his product line received during the revamped trade show hours. Mike Davis, president of Greens-Groomer, said his product line, designed mainly to maintain synthetic turf surfaces, was also drawing a lot of attention, and John Walther, vice president, Barenbrug USA, credited his company's increased sales in the US on their presence at the past few STMA Conferences.

This correspondent attended as many education sessions as time allowed and this year the best I witnessed was "Athletic Field Use and Maintenance Planning" by Rebecca Auchter, the manager of grounds maintenance for Cranberry (PA) Township. Her professional and organized approach to dealing with issues that face most sports turf managers focused on creating and managing expectations of those whose agendas are often contrary to what is best for fields. I recommend checking STMA.org for more information from her presentation.

FOUNDERS' AWARD WINNERS

Friday night's Awards Banquet was topped off with presentation of the industry's most prestigious awards—STMA's Founders' Awards. Honored were:

Dick Ericson Award - **Amy Fouty, CSFM**, Michigan State

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President Mike Goatley, PhD, Turfgrass Specialist, Virginia Tech

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University Intercollegiate Athletics; George Toma "Golden Rake" Award - **Michael Boettcher**, Milwaukee Brewers; Dr. William H. Daniel Award - **Elizabeth Guertal, PhD**, Auburn University; and Harry C. Gill Memorial Award – **Richard Moffitt**, Moffitt & Associates, LLC.

PRESIDENT'S AWARD FOR LEADERSHIP

STMA President Dr. Mike Goatley said, "This year we have two very deserving recipients of this award. The basis of good leadership is honorable character and selfless service, and these two award winners have gone far above typical service to STMA. Both have served their local chapters; both have been presenters at our national conferences; both have volunteered on many STMA committees; both have served on your national STMA board of directors; both helped to guide STMA through its early years; and both reached a milestone in 2012. It is with great pleasure that I present the STMA Presidents Award for Leadership to newly retired members **David Rulli** and **Steve Wightman**.

GRANT & SCHOLARSHIP WINNERS

Nik Wooldridge of Colorado State University was a double winner this year. Wooldridge, who interned at Fenway Park in Boston, earned the 2012 Gary Vanden Berg Internship Grant as well as a James R. Watson Scholarship, presented by The Toro Company, for 4-year institutions. The James R. Watson Scholarship program was established in 1998 in honor of Dr. James R. Watson, a long-time agronomist at Toro.

Two graduate winners, both from University of Tennessee at Knoxville, also won scholarships; **Kyley Dickson** won the James R. Watson Scholarship, and **Eric Reasor** won the other graduate scholarship.

Gabriel Mitchell from San Diego State University and member of the Southern California Chapter of STMA won the The Terry Mellor Continuing Education Grant, sponsored by Turface Athletics. This grant funds an STMA affiliated chapter member's attendance to the Conference and honors the importance of continuing education that Terry strongly supported his entire life.

SAFE's top scholarship in a 2-year program is named after Fred Grau, the first turfgrass extension specialist in the US. The 2013 Fred Grau winner was**Casey Gural** from Guilford Technical Community College, Jamestown, NC. SAFE scholarship winners from a 4-year institutions were: **Tylor Meppelink**, Michigan State University; **Jacob Leadbetter**, Penn State University; **Kevin Hansen**, Iowa State University; and **Andrew Wilhelm**, Purdue University.

STMA ACADEMY

A major change in this year's Conference was the introduction of the STMA Academy, as well the addition of a number of new educational tracks. "Members through the years have asked for a higher level of opportunities to learn beyond the normal 1-hour sessions we offer," said Education Subcommittee Chairman Jeff Fowler, an extension director and turfgrass specialist for Penn State. "So we developed the Academy, which allows students and instructors to get more in-depth on a particular topic. And we plan to build on that education in future conferences. The feedback I've received has been very positive."

SAFE FOUNDATION

The Foundation for Safer Athletic Fields (SAFE), STMA's charitable foundation with a mission "To enrich communities through championing safe, sustainable sports and recreation fields for all athletes" raised more than $35,000 during the Conference. Events included the 13th Annual Golf Tournament, played at the LPGA International's Legends Course, a Casino Night held in conjunction with the Welcome Reception, a Live Auction before Friday night's Awards Banquet, and Silent Auctions on the trade show floor Thursday and Friday. Raffle tickets also were on sale throughout the Conference for prizes.

Live Auction items included Graco FieldLazer S90, custom stencils from Pioneer Athletics, a GreensGroomer, a Toro 30" mower and a Toro blower, Jacobsen logo'd bar stools, being a groundskeeper for a day with the Seattle Mariners, and a full-page ad in this magazine.

Golf hole sponsors included Carolina Green; Diamond Pro/TXI; Luck Stone Company; JSM Services; DryJect, Inc.; and Turfco.

Continued on page 42

Employing conditioners a must for infields without water access

What advice can you offer to turf managers who have no access, or very limited access, to water but are tasked with keeping infield skins playable?

MANAGING MOISTURE MOST IMPORTANT

For anyone maintaining infield skins with little or no access to water, managing what moisture is available from Mother Nature is the big key, says Turface Athletics brand manager Jeff Langner. At the parks and rec level and for many K-12 schools, basic soil science knowledge is where every turf manager needs to start. "Knowing how much sand, silt and clay is in your infield enables you to better understand how moisture will affect it," he says. "An infield with high sand content will drain well, but may be too loose if you can't keep water on it. A field with high clay content can get slimy when it rains, and then becomes hard and cracked when it dries out later in the summer months. Managing moisture correctly throughout the season is the way to keep the field safe and playable."

Langner adds that using calcined clay conditioners is a must for skins that don't receive regular irrigation. "Conditioners are a moisture management tool for infield skins; they manage excess water by increasing absorption levels, and their ability to hold water and release it over time provides the sought-after balance," he says. "Turface is an ideal conditioner that has high porosity and adds water-holding capacity."

He recommends that calcined clay be incorporated into the top 4 inches of your infield mix, if resources allow, but at the very least should be used as a topdressing to provide a buffer between players' cleats and the infield clay. Using calcined clay is especially important in the mid to late summer months, Langner says, when infields really begin to dry out. "If you can't add moisture daily the clay will get hard. Turface will relieve compaction, and when Mother Nature does provide moisture, the conditioner will work like a sponge, holding onto the water and then releasing it over time, prolonging the time before the skin starts to crack."

Langner says not all conditioners are created equally and that water-holding capacity should be more important than appearance when making buying decisions. "Moisture management is why you use these products," he says. "If you cut conditioners out of your budget you're doing a disservice to your infield skin and might not save money anyway, since your labor other costs will go up trying to get the field playable."

STRIVE FOR CONSISTENCY

As we all know, water is the key to making any field safe or playable. When fields are being constructed, one of the first things discussed is will the field be irrigated or not? If it is being irrigated, location of quick couplers is very important to allow for optimal watering of the skinned infield. If the field is not irrigated (typically found on older, existing fields), then the job for the turf manager just became harder and he/she has to be more creative in ways to create a safe/playable skinned infield.

Some things to keep in mind for the fields that are in the no access/limited access to water are the products that are purchased for the infield skinned. With the right products, the situation presented above can minimized with these selections.

We recommend the following:

• Proper Infield Mix. You want to find an

infield mix that has a higher sand content, lower silt percentage to help reduce the amount of dust, and have an SCR (silt:clay ratio) ideally of ~.5:1. You will need to get your infield mix tested to see what the percentages are in the blend. Conditioners can be added to help retain water that is either applied on a limited basis by the turf manager or from rain that falls on the field. This will be a temporary fix and a short-lived solution to making the field playable.

• The turf manager should become creative in ways to water the field. We have heard of fire departments adding water to the field the night before a tournament.

• If water is available, try to do deep heavy watering to saturate the infield mix. As the field dries, the water will move to the top of the skinned infield and help keep it playable. If you have ever had a field too wet (muddy) for a game, then you know the limits that your field can take when it comes to watering.

• Water on a routine basis to help keep the field consistent. A well maintained field plays its best when it is consistent day in and day out. With any field, that is what the turf manager should strive for and give the players the best opportunity to be successful in the game.-Glenn Lucas and Bill Marbet, Southern Athletic Fields

USING CONDITIONERS A MUST

Managing infield skins with limited water is where the importance of a product like Pro's Choice comes into play. Because Pro's Choice conditioners are made from calcined montmorillionite clays they have the ability to absorb moisture, release it and absorb again. When properly installed throughout the top 3 inches of your infield mix, these conditioners will absorb the water from rain, hold it in the granules, and release it back into the surface as the base clays dry out. Pro's Choice conditioners help keep moisture in your profile when you don't have the benefit of a hose.-Dave Cygan, Pro's Choice/Oil Dri.

TOPDRESS WITH CONDITIONER AT THE MINIMUM

Moisture management is key to the success of an infield. When a sports turf manager is unable to add water to a field, it becomes critical that they conserve the water that does reach the infield. This can be accomplished by adjusting infield mix composition, adding an infield topdressing, tarping, and adjusting dragging techniques.

Choosing an infield mix with a higher percentage of silt and clay and a lower percentage of sand allows the infield to store water longer. Fields with higher silt and clay content move water more slowly through the profile. Those same field surfaces will become extremely hard when dry. Fields with higher sand content lose their store of water faster and can become too loose when dry.

Adding an infield topdressing can help shield the infield mix from losing moisture through evaporation. Effective topdressings include calcined clays, vitrified clays, or crushed aggregates. Likewise, placing a tarp over the infield traps and conserves that much-needed moisture.

Finally, field managers can adjust their maintenance practices. Avoid deep tine dragging which brings more infield mix to the surface. This dries and loosens the field. When dragging is necessary, disturb as little of the infield surface as possible by mat dragging or light nail dragging.-Dena DiVincenzo, Waupaca Sand & Solutions

CONSERVING WATER EVEN IF YOU HAVE IT

In the southwest the numbers 1,075 and 1,145 have great significance. Contained behind the Hoover Dam are the waters of Lake Mead that supplements the water supply for Arizona, California and Nevada. When the waters are above 1,145 feet, it constitutes a surplus. When the waters are below 1,075 feet it is considered a shortage and triggers agricultural water reduction for the states involved. The average water level in Lake Mead is lower than it has been in more than 40 years.

While we won't get into a discussion about the intricacy of Arizona-California-Nevada water rights, the low levels at Lake Mead, devastating drought nationwide, and 2012 being the warmest year on record for the US, all serve as reminders for us field managers in the southwest, to conserve water.

Research in soil and moisture interaction have uncovered that at a 4-12% moisture content, groundskeepers of baseball and softball fields can take advantage of natural moisture binding of the soil by surface tension forces of attraction. This simply means that the ideal moisture content for play on any infield is a "damp soil consistency." For managers of baseball and softball fields, to prevent soil particles from destabilizing, increase field use and ultimately minimize injury potential, the main concern should be achieving the ideal moisture content of 4-12%. But how can this be accomplished with little access to water?

While having the correct particle size on your infield to begin with is important, you know just as well as I do that water (or lack of) changes the stability of any field, regardless of particle size. In engineering terms, the load bearing and shear strength of the infield will increase and decrease with varying amounts of moisture. We have focused our research on the interaction of water and soil particles for the past 30 years. During this time span, we started to view damp soil consistency as more of a range or window, rather than a specific destination. In the Southwest, this window can be very short. During monsoon season (July through September), a groundskeeper may have to maintain an infield on a dry, 100+ degree day, and in an instant a monsoon storm could drop 2 inches of rain. The window has been shortened on both sides—too dry (below 4%) and now too wet (over 12%).

Imagine trying to maintain this window on a 14 field, professional spring training complex. Observing this struggle led us to develop Stabilizer, which blends into the pore space between soil particles. It absorbs 15x its weight in water and forms a cohesive gel, expanding the damp soil consistency window longer.

There is just one thing Stabilizer needs to help lengthen the damp soil consistency window: at least some water. What if you don't have access to water at all? Polymer technology now provides the soil particles with the same amount of cohesion that damp soil tends to have, eliminating the need for water and any water related downtime. With Hilltopper products, we can actually guarantee more playing time during weather extremes. You will notice there is no need to water between a dry doubleheader and on the flipside no downtime after a storm. Since water sheds off the surface laterally, it cannot penetrate the soil, and therefore will not freeze in the winter.

Remember, keeping an infield between 4-12% moisture content should be one of the highest priorities on an infield skin to maintain playability and reduce injury potential. Finding ways to expand your damp soil consistency window now will pay off tremendously in the future.-Clayton Hubbs, Stabilizer Solutions, Inc.

DIFFERENT CONDITIONERS FOR DIFFERENT SITUATIONS

When considering how to manage skins with limited access to water, there is a difference between the multi-play type sport complexes that host multiple games every day and single play facilities such as a school's baseball or softball field that has limited play. The answer is somewhat similar to each problem but the selection of infield mix will differ.

For high-use sport complexes that have multiple fields and limited staff it simply is not possible to water the skins thoroughly between back to back to back games. They would rather have firm fields that do not tear apart after a day of heavy play knowing that tomorrow will be the same. Clients may complain that the skins are hard and dry but a hard skin that stays in place is safer than an infield skin that is loose and breaking up more.

Furthermore, maintenance is reduced when wear areas such as short stop and first base are minor compared to large loose areas that will require a lot of water to compact. Gail Materials supplies all of the Big League Dream facilities in southern California and we provide a mix that has a combined silt plus clay content around 40-45%. We also follow best known science as it pertains to infield mix production with the material all passing the 2mm sieve and the silt to clay ratio always between .5:1.

For single play facilities that have limited play, an infield mix with lower combined silt plus clay content in the range of 25-30% is suggested. Of course all best science also applies with a .5:1 silt to clay ratio etc. The sandier mix will allow faster water penetration and thus easier to maintain however failure to stay on top of the maintenance can result in a looser more unstable surface.

When you have a limited access to water you have to make the water work for you and a great tool to make the water work more efficient is to use a wetting agent. Wetting agents make the water "wetter" by reducing the surface tension of the water, which then allows the water to penetrate deeper in the skin profile. Not all wetting agents are the same nor do they have the same chemistry and they can come in granular and liquid form.

Any reputable chemical or fertilizer representative should be able to assist in the proper selection of a wetting agent. I would suggest using a "straight block co-polymer" which is long term product and is effective for +/- 90 days. The Moltan Company, producers of Red Diamond calcined clay, have developed a new patent pending product where calcined clay is impregnated with a patented wetting agent that was specifically formulated for the sports field industry. Moltan's new product was introduced and displayed to professional sports turf managers for the first time at the national STMA in Daytona Beach. It's a brilliant idea and preliminary field testing has yielded positive results. It's killing two birds with one stone.

Calcined clay is already widely accepted as a standard tool when it comes to infield skin care. Adding a wetting agent to it will just enhance the efficiently and add to the

value. I foresee this product being of particular value in arid regions where infield soils can become sodic as a result of frequent shallow watering and often with poor quality water. Sodic soils particularly ones with high silt and clay can have poor water infiltration. Providing calcined clay that is impregnated with a wetting agent can only help in these situations, and produce faster infiltration of applied water or rainfall enhancing the infield skin for safer play.

The most important point is to pick the right infield mix based on your needs. Calcined clay and or vitrified clay are still one of the best tools in a groundskeeper's arsenal. Use them! When renovating infield skins always make sure you till in any new mix that may be added to void soil layering. Also try making your water more effective by using wetting agents.-David Dzwilewski, Gail Materials ■

Keeping your infield playable

By Grant C. McKnight

Editor's note: Grant McKnight is CEO/President of Natural Sand Company, Slippery Rock, PA.

The question on the table is, "What advice can you offer to turf managers who have no access, or very limited access to water, but are tasked with keeping infield skins playable?"

With the record breaking heat throughout most of the United States during the summer of 2012, this general question from turf managers was a recurring one. "How do I keep my infield from getting so hard?"

Any discussion I had concerning this issue always revolved around first educating the turf manager as to why this was happening not only with the a DuraEdge surface, but any other high clay content surface during a normal compaction cycle. (I define a high clay content surface as any one over 15% clay content and possessing an SCR [silt to clay ratio] of less than 1.5.) Infield surfaces that fall into this category are inevitably going to firm up with normal use. The infield surface continually compacts with normal foot traffic and tire roll during dragging between games. This mechanical force coupled with the natural evaporation of the moisture from the top one inch of material will create greater and greater surface soil tension until the surface becomes nearly unable to penetrate with normal maintenance practices. The difficult question now becomes how does a manager relieve this condition with limited time in between tournaments or games without destroying the integrity of the grade on the infield surface.

Be flexible

The obvious answer is just to add moisture; however if you don't have irrigation and it has not rained in a month then a mechanical approach must be employed. I refer to this process as "Light Renovation." It is aimed at relieving excess compaction mid-season without tilling and re-grading, all in less than 4 hours total labor per field.

The first step is to understand that in order to perform this process a little moisture in the profile goes a long way; and that just adding water will only show positive results for a short time. If you have limited access to water, plan your schedule accordingly, and perform the Light Renovation after you add sufficient moisture.

For those that have no access to water they must adapt their schedule to working with what Mother Nature gives. When you get a shower, then you need to get out as soon as you can and use to your advantage the valuable moisture that is sitting in the profile currently. Too many times I see managers miss the opportunity to relieve soil compaction by letting a little bit of moisture that could just soften the surface enough to work it harmlessly evaporate because it came at a time that the manager was not normally working the surface. Whether you have access to water or not, be as flexible as possible in using what Mother Nature gives you.

Think sub-surface

Now that you have a little moisture in the profile, take advantage. Throughout last year I used an Infield Rascal equipped with a Profile Blade (ABI, Inc., Osceola, IN) to attack an over-compacted infield. The Profile Blade was adapted from the equine industry, where the tool which looks like a knife blade is pulled through the infield surface profile at a depth of 2-3 inches. This mechanical action, acting somewhat like a tidal wave motion, lifts the soil the thickness of the Profile Blade and shatters the soil tension. This action leaves the infield surface loose without causing a need for re-grading. A significant advantage for the Profile Blade over traditional tilling and grading techniques to relieve over-compaction is the reduced equipment costs. Many small budgets do not have access to tractors with high enough horsepower to till and the subsequent need for re-grading afterward can be far out of budget for a typical manager to even consider in-season. A Profile Blade can be pulled with any traditional vehicles that are readily available at most facilities. The need for outside labor is minimal as this process can easily be performed in-house.

Following the Profile Blade, I switch to a VibraFlex ¼ inch nail drag (also by ABI) to float out the loosened infield mix. Acting like a traditional nail board this unit is designed to break up the small pieces and allow a manager to use a mat drag to put a nice finish on the field. The end result is a surface that will accept water more readily and play softer throughout the cycle until another Light Renovation is required.

Use all the tools available

Once a manager performs a Light Renovation, the next step is understanding the cycle that all infields go through, and maintaining them properly until the next Light Renovation situation inevitably occurs. Now that the surface is de-compacted it will remain that way until weather and normal uses firm the surface again. I recommend limiting the wheeled traffic as much as possible following a Light Renovation, unless you get rain. Take advantage of the softer infield surface when it is drier. It will not firm up until significant amounts of water and traffic are applied. Therefore if you are not expecting rain, your surface will remain fairly consistent the less traffic it gets. Simply light drag in between games and keep the surface consistent.

Once you have a rain or begin to add water voluntarily it is important that you break the surface soil tension that occurs as the clay particles begin to join back together. If you manage this issue in the top ½ inch at least once per week then your surface will play much more consistently throughout the cycle. In order to manage surface soil tension I recommend using a combination of topdressing of your choice and the VibraFlex nail drag with 1/8 inch nails on a 2- inch spacing. The action of the VibraFlex drag will break down the compaction and work the topdressing into the top ½ inch of the mix for a recreational facility and make the sliding surface more consistent without compromising the integrity of the base soil.

Significant compaction only occurs when optimum moisture is achieved inside the profile and a mechanical means is applied to compress the surface. It is an inevitable process, so don't worry about why it happens, make a plan, be flexible, use what Mother Nature gives you, select an appropriate topdressing, and have the right equipment on hand to maintain your surface throughout its multiple season cycles and your high clay content infield skin will perform like a big league manager's daily. ■

Displace, a new calcium soil specialty product

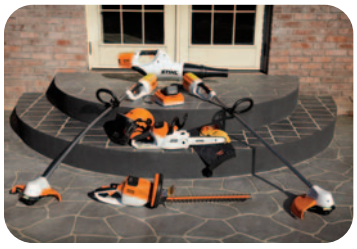
Grigg Brothers Introduces Displace 12% Calcium, a new calcium soil specialty product formulated with a unique wetting agent technology. The specially formulated soil surfactant will enhance product infiltration and facilitate uniform placement of calcium throughout the soil profile for optimal efficacy. Displace contains 12% Calcium that will remain in solution and react directly with the soil to displace sodium ions. "Combining a high quality calcium product with the proprietary wetting agent for a dual purpose product represents the best of both technologies" says Grigg Brothers President Mark Grigg. Displace is backed by independent university testing that shows it can improve turf performance and quality by reducing high bicarbonate accumulation from poor irrigation water. Displace™ is also specially designed to improve hydrophobic soil conditions and localized dry spots.

Grigg Brothers

New tool for cleaning infield skin material

Equi-Tee Shake'n Rake cleans sand and soil by auto-screening unwanted debris. As light and easy to use as a scoop, it has a battery powered motor that does the "shaking" for you, eliminating manual agitation. Easily separates glass, rocks, clay, pet waste and other objects from sand. Uses include beach and resort cleaning, infield skin spoils sifting, municipal playground sanitizing and other uses where clean sand is necessary.

Equi-Tee Mfg



STIHL Battery KombiSystem: Performance and power for less than ten cents an hour

The 36-volt lithium-ion STIHL Battery KombiSystem is packed with user-friendly benefits, offering multiple tools that can all be powered by one interchangeable battery. No mixing fuel, no exhaust emissions, no power cords, just pull the trigger and go.

Customers will also find lower operating costs a plus with this new environmentally responsible option. The lithium-ion battery costs as low as $0.02 per hour to operate as compared to $0.88 or more for gasoline-powered equivalents, providing convenience and cost savings with this multitask line. The 36-volt STIHL Lithium-Ion batteries feature long run times with no gradual drop in power, as well as fast recharges.

STIHL

RedMax backpack blower

This backpack blower and features the Strato-Charged 2-stroke engine with ultra-low emissions and high power. The Max Cooled back pad uses air from the fan housing to cool operators and keep them comfortable during hot days. Super wide straps and contoured back pad are oversized for greater comfort. The EBZ8050 is also equipped with wide-sweep elbow rotation for full operator mobility and maneuverability, even in cold weather and RedMax's Free Flow Air Net, a two-way air cleaner system that reduces air intake blockage providing maximum blowing performance.

RedMax

TurfEx MS4500 electric-powered topdresser

TurfEx introduces its 1.4 cubic-yard capacity MS4500 topdresser. Featuring polyethylene construction and fully electric operation, this trailer-mounted unit has the ability to spread crumb rubber for synthetic turf fields. The MS4500's heavy-duty polyethylene construction eliminates the corrosion and maintenance concerns associated with similar steel built models, while also making the unit up to 40-percent lighter. Furthermore, it features large flotation tires and exerts only 18 psi when fully loaded, allowing safe operation on delicate surfaces. The lightweight construction also lessens fuel consumption for the towing vehicle. Another feature unique to the MS4500 is that it's a completely electric-powered unit – meaning no hydraulics or gas engines. It also equals quieter operation than gas engine or hydraulic powered models, and further reduces weight, maintenance requirements and fuel consumption.

TurfEx

Bobcat's A770 all-wheel steer loader

Bobcat Company has updated its line of all-wheel steer loaders by introducing the Bobcat® A770. The new unit offers both all-wheel steer and skid-steer drive options by simply pressing a switch, and has a vertical lift path and a 3325 lb. rated operating capacity. The A770 replaces the A300 model, and was designed to meet the needs of users who require the low ground disturbance, reduced tire wear and faster travel speed of a small wheel loader, but also the maneuverability and versatility of a skid-steer. The A770 is equipped with a 92-horsepower, liquid-cooled Tier 3 diesel engine and has an operating weight of 9,460 pounds.

Bobcat Company

Cushman introduces 1600XD 4x4 Utility Vehicle

Cushman introduces the 1600XD 4x4 utility vehicle that combines 4WD capability with a 22-hp, 1,007cc 3e-cylinder OHV diesel engine to handle large tasks on tough terrain. Its performance is further enhanced by an automatic, continuously variable transmission (CVT) with low- and high-gear ratios, a user-selectable locking rear differential which can be engaged in both 2WD and 4WD operation, four-wheel independent suspension, and exceptional hauling and towing capacity, with a maximum vehicle load of 1,600 pounds. It also features MacPherson struts on its front wheels and a double A-arm "wishbone" suspension on its rear axle to provide sure traction and a comfortable ride over deep ruts and tough trails.

Cushman

Membership Application

SportsTurf MANAGERS ASSOCIATION

Experts on the Field, Partners in the Game.

Fax to: (785) 843-2977

Or mail with payment to:
Sports Turf
Managers Association
P.O. Box 414029
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Signature _____

Direct Supervisor Name _____

Membership Category:

❑ Sports Turf Manager $110

❑ Sports Turf Manager Associate* (Additional member(s) from the same facility) $75

Please select the primary facility type where you are employed:

❍ Professional Sports ❍ Higher Education ❍ Schools K-12 ❍ Parks and Recreation

❑ Academic $95

❑ Student (verification of enrollment) $25

❑ Commercial $295

❑ Commercial Associate* (Additional member(s) from the same commercial company) $75

❑ Affiliate (Person who is indirectly or on a part-time basis, involved in the maintenance/management of sports fields) $50

❑ Chapter Dues (contact headquarters for amount)
Chapter name) _____ $_____

❑ Contribution To SAFE Foundation (research, education and scholarship): $_____

Total Amount Enclosed: $_____

"I know I am a better sports turf manager because of this association. As sports turf managers, we take the challenge seriously to make our fields the best possible for the next game. The resources I have access to through STMA helps me do it."

— Bob Campbell, CSFM
Higher Education
Membership Segment

Payment Method:

❑ Check ❑ Money Order ❑ Purchase Order #:_____

Credit Card: ❑ Mastercard ❑ Visa ❑ American Express ❑ Discover

Name on Card _____

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*There must already be a national sports turf manager from your facility or commercial member from your company before you may sign up in the Associate category.

Phone: 800-323-3875 **www.STMA.org**

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SAFE Conference sponsors included: Barenbrug USA; Covermaster; Diamond Pro; Hunter Industries; John Deere; Toro; TurfNet Sports; and World Class Athletic Surfaces.

SEMINARS ON WHEELS

This year there were two tours, one full day and one half day; both tours ended up at the famous Daytona International Speedway, where they were treated to a bus ride around the track and a tour through pit row, as well as hearing from Daytona turf manager Sam Newpher on how his use of two different grasses creates the stunning visual in front of the main grandstand, among other topics.

"Our overall reaction was great for both tours. We had more than 210 people and several of those who came into Daytona Beach Tuesday morning expressed how happy they were that we had the half-day option," said Tour Subcommittee chairman Jeff Salmond, CSFM, director of athletic field management at the University of Oklahoma. "The sites selected were well-received, especially Daytona Speedway. We all were just 'wowed' by the work Sam Newpher and his crew does with what they call their 'football field'. The entire experience was memorable simply by being inside such an historic facility."

"I'm looking forward to identifying other interesting sites beyond the usual when making our selections for next year's tours in San Antonio," Salmond said.

David Pinnonseault, CSFM, CPRP, public grounds superintendent, Town of Lexington (MA) and President-Elect of STMA, led the half-day tour. "Mike Geiger of the Daytona Cubs did a great job explaining how he and his small staff, with a limited budget, produce a quality surface. Lots of people on the tour could directly relate to those circumstances; we especially appreciated learning how Mike works with city officials and local golf supers to borrow equipment."

STUDENT CHALLENGE

Hunter Industries and the SAFE Foundation once again sponsored the STMA Student Challenge, featuring 34 teams. As the indefatigable Lynda Wightman from Hunter explained to the closing session crowd before announcing the 2013 winners, the Challenge consists of several parts, including an exam with multiple-choice, fill-in-the-blank, matching, reading passages, and short answer sections. Some questions require physical or visual identification of plant materials, pests, supplies, tools, equipment, irrigation components, ballfield soils and materials, and more.

Wightman added that the Challenge began in 2005 with 16 teams and that the first winning team, from Penn State, included current STMA education manager Kristen Althouse.

This year's winners were:

2-Year Division

1st place: Horry-Georgetown Technical College, Myrtle Beach, SC - Team 202

2nd place: Mt. San Antonio College, Walnut, CA - Team 203

Scholarships

NIK WOOLDRIDGE of Colorado State University won the 2012 Gary Vanden Berg Internship Grant as well as a James R. Watson Scholarship, being presented here by Boomin' Boyd Montgomery of Toro.

KYLEY DICKSON, University of Tennessee at Knoxville, won a graduate student James R. Watson Scholarship. At left is former SAFE chairman Boyd Montgomery of Toro.

ERIC REASOR won a SAFE Foundation graduate scholarship, presented to him here by Toro's Boyd Montgomery.

GABRIEL MITCHELL, right, from San Diego State University won the The Terry Mellor Continuing Education Grant. Presenter is Boyd Montgomery of Toro.

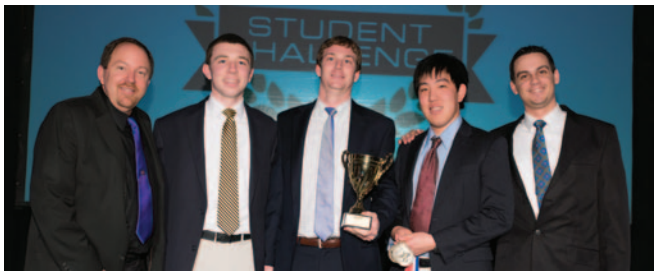
The 2013 Fred Grau Scholarship winner was **CASEY GURAL** from Guilford Technical Community College, Jamestown, NC. At left is presenter Boyd Montgomery of Toro.

TYLOR MEPPELINK, Michigan State, SAFE Scholarship winner on the right with former SAFE chairman Boyd Montgomery of Toro, left.

JACOB LEADBETTER, Penn State, SAFE Scholarship winner, right, with Toro's Boyd Montgomery.

KEVIN HANSEN, Iowa State, SAFE Scholarship winner, right, with Boyd Montgomery, past chairman of the SAFE Foundation.

ANDREW WILHELM, Purdue University, SAFE Scholarship winner, right, with Boyd Montgomery of Toro presenting.



STMA PRESIDENT DR. MIKE GOATLEY poses with Student Challenge 4-year Division winners from the University of Maryland-Team 412. From left to right: Ryan Higgins, Justin Patenaude, Matt Park, and Scott Hosier. Their coach is Dr. Justin Mathias.

STMA PRESIDENT DR. MIKE GOATLEY poses with Student Challenge 2-year Division winners from Horry-Georgetown Technical College-Team 202. From left to right: Kyle Hamilton, Kevin Nason, Bradley Stokes, and Jay Richardson. Their coach is Ashley Wilkinson. The students also received coaching from adjunct faculty member Corey Russell, who is the sports turf manager for the Myrtle Beach Pelicans.

3rd place: Penn State University - Team 204

4-Year Division
1st place: University of Maryland - Team 412

2nd place: Penn State University - Team 407

3rd place: Virginia Tech University - Team 421

INNOVATION AWARD

The 2013 STMA Award for Commercial Innovation was presented by STMA Commercial Vice President Rene Asprion of Diamond Pro to Paul Carlson, president of Green Source, Inc., Plainfield, IL. Carlson said the winning product, called Sidekick, was designed as an attachment to sod installation machines so as not to require an additional machine on the job site. "We needed it to be powerful and compact, mobile, and easy to operate and not require an additional operator. We also needed it to not damage to the existing grade and more importantly, to the sod being installed," Carlson said. "That meant it could not touch the grass. This was accomplished instead by using the ground force to keep the pushing edge completely square with the edge of the sod."

Products entered are judged by the STMA Awards Committee to substantially enhance the efficiency and effectiveness of sports turf managers, and to make playing surfaces safer and more playable. ■

Award Winners

AMY FOUTY, CSFM, athletic turf manager, Michigan State, receives the Dick Ericson Award from last year's winner, Darian Daily.

MICHAEL BOETTCHER, right, grounds manager for the Milwaukee Brewers, receives the George Toma "Golden Rake" Award from banquet emcee Tim Moore, CSFM.

ELIZABETH GUERTAL, PHD, right, Auburn University professor of turfgrass and nutrient management, receives the Dr. William H. Daniel Award from last year's winner, Leah Brilman, PhD.

RICHARD MOFFITT, right, Moffitt & Associates, LLC, receives the Harry C. Gill Memorial Award from last year's winner, Mike Andresen, CSFM.

RECENTLY RETIRED DAVE RULLI, shown here at an earlier awards banquet, was named one of two recipients of the President's Award for Leadership.

STEVE WIGHTMAN, right, former turf manager for the San Diego Chargers, was honored with a President's Award for Leadership by STMA President Dr. Mike Goatley.

PAUL CARLSON, left, president of Green Source, Inc., Plainfield, IL won the 2013 STMA Award for Commercial Innovation. The winning product is Sidekick, an attachment to sod installation machines that uses ground force to keep the pushing edge square with the edge of the sod.

CATHY BRADLEY, Executive Director of the Baseball Tomorrow Fund, has assumed leadership of the SAFE Foundation as its Chairman of the Board of Trustees.

STMA Affiliated Chapters Contact Information

Sports Turf Managers Association of Arizona: arizonastma@gmail.com

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): 407-518-2347, Scott Grace, scott@sundome.org

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: www.imstma.org.

Indiana -FORMING - Contact Clayton Dame, Claytondame@hotmail.com or Brian Bornino, bornino@purdue.edu

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.

Nebraska Sports Turf Managers Association: sphillips4@unlnotes.unl.edu

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

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pletely recovered by fall. Applying a single Celsius plus Revolver treatment in spring followed by a single Celsius plus Revolver treatment in the fall also did not provide acceptable long-term control of this weed. Two applications of Celsius plus Revolver in fall, two applications of Celsius plus Revolver in spring followed by two applications of Monument in the fall, or two spring applications of Monument in spring followed by two applications of Celsius plus Revolver in fall are all providing 80% or greater dallisgrass control going into winter, comparable to that seen with multiple applications of MSMA. Multiple fall applications of Tribute Total have injured dallisgrass, but have not provided acceptable long-term control. Injury to the bermudagrass was noticeable but not unacceptable, especially at higher doses, for certain of the herbicides tested, and longer lasting in the fall.

We will be following these trials in the spring to determine if dallisgrass can outgrow the effects of these treatments. With the products available for dallisgrass suppression in bermudagrass, it appears that multiple spring and fall applications will be needed for acceptable dallisgrass control. Applications may need to be timed to spring when dallisgrass greens up and resumes growth in spring, as well as treatments in the fall to weaken the plant going into winter. Adjuvant addition, including ammonium sulfate and methylated seed oil, may also be beneficial in these spray programs.

Those reports come from a few of my VT Turf Team colleagues. I encourage you to also get to know your state or regional college and university turf teams and familiarize yourself with the work that they are doing. You never know when a turf emergency might arise where you could use another set of eyes and ears to help you solve a problem. Your support of these programs makes you a part of the team and teamwork is always a key to success.

*Martin Kaufman, CSFM was to be the new STMA President but when he took a new position last year he was forced to resign per association bylaws so Dr. Goatley agreed to stay on the job through 2013. ■

Q&A

I've got questions, too

BY DR. DAVID MINNER

Professor, Iowa State University

Questions?

Send them to David Minner at Iowa State University, 106 Horticulture Hall, Ames, IA 50011 or email dminner@iastate.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.

I ATTENDED THE STMA CONFERENCE THIS YEAR with a list of specific questions I wanted answered. But as usual I came away with a whole lot more from networking with speakers, sports turf managers, and exhibitors.

I've been having problems with summer patch on baseball fields that we have made over with a process of killing the existing grass, coring, topdressing, and planting the top varieties of low mow bluegrasses. We push the fields with 4-6 lbs N/1000 sq ft during the first year of grow in and mow at 0.5 to 0.75 inches. The fields make an amazing playing surface; pro quality at the high school level and everyone is really pleased.

The problem is that we are being inundated with summer patch even in the first summer season after fall planting. Dr. Mike Fidanza's disease management workshop provided answers to managing this disease along with a host of tips for battling other common sports turf diseases. The high 8.0 pH sand we use combined with a low mowing height favors the disease, but most sands in Iowa have a high pH and the low mowing height is needed for the playing quality and ball roll we wanted to achieve. Based on his recommendation we will switch to acidulating fertilizers like ammonium sulfate to help lower the pH in the surface layers where this soil-borne fungus attacks crowns, surface roots, and rhizomes.

The frogeye patches are most noticeable June thru September but the fungus actually grows undetected in May before it begins to show in hand-sized wilted patches of sunken turf. Fungicides applied after the frogeye patches have formed are less effective so fungicide applications need to go out before you see severe symptoms. Since we are seeing patches in late May/early June Dr. Fidanza recommends making preventative fungicide applications April 15 and again on May 15 when the undetected fungus is first starting to become infective. A third application may be applied in mid-June if needed.

> The Clean Water Act of 1972 is finding its way into P restrictions for turf and landscape applications in some states and it is likely that this will eventually impact all states.

Since these high profile fields are starting to host district playoffs in late July we will likely make the third fungicide application. He also strongly recommended to solid tine/needle tine/core the area before applying fungicide. Apply the product in 2 gallons of water-carrier per 1,000 sq ft and then immediately water-in the fungicide with several turns of the irrigation heads to get the material off the turf canopy and into the upper rootzone, where the fungus is most active; get that upper soil rootzone wet.

Dr. Fidanza also presented research showing the benefits of selecting the right nozzles types for improved disease control. To further get the fungicide dispersed into the surface he suggested a wetting agent like Revolution applied at 6 fl oz per 1000 sq ft. The DMI fungicides like Banner and Bayleton are good choices and they also have a plant growth regulator effect that reduces mowing. For one of my fields where equipment limitations require only granular application I use a QoI type fungicide such as Heritage G or Pillar G with the same emphasis on punching holes in the surface and watering-in the product.

Another question I wanted answered involves phosphorus fertilizer applications. Most of you are aware that farmers and landscapers are trying to do their part to keep P out of water. The Clean Water Act of 1972 is finding its way into P restrictions for turf and landscape applications in some states and it is likely that this will eventually impact all states.

Most states that completely restrict P usually give an exception when soil tests show a need for P or without a soil test when areas are newly seeded because of the past research that shows benefit from P application during seedling establishment. Dr. Beth Guertal gave an excellent presentation on the proper use of phosphorus in turf but there remains a question about what is the soil test level where no more P application is needed for enhance seedling growth. Sports turf managers are constantly overseeding worn areas; should P be applied to these areas even if a soil test of 20 ppm is already in the very high category? Perhaps Dr. Guertal will have that sorted out by the time we meet next year.

If you didn't make it to the conference this year you can check out some of the online presentations at STMA.org. The ability to quickly assess information today is remarkable, but for me there is nothing like being able to have your specific questions answered and discussed with the leading experts in our field today. See you January 20-24, 2014 in San Antonio, TX for next year's conference. ■

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