nated with metals by industrial processes. It is hypothesized that these hyperaccumulators evolved to exploit high soil Ni concentrations to enhance plant defenses from herbivory and disease.

### NI NUTRITION AND UREA NITROGEN METABOLISM

Nickel is a highly mobile element in the plant due to chelation with organic molecules and tends to accumulate in newly formed tissue. Several enzymes in biological systems require Ni as a catalyst; however, the most well-known role of Ni in plant metabolism is its function in the activation of the enzyme urease. Urease hydrolyzes (breaks down) urea into ammonia and carbon dioxide. The hydrolysis of urea by the Ni dependent enzyme urease is necessary to make the nitrogen (N) in urea available to plants. Urease cannot work if it is not accompanied by Ni. Urea is the most popular N source in management due to its solubility, high percentage of N, low price, and ease of handling. Urease and Ni are also important for plants being fertilized with other N sources (nitrate and ammonium) because of the need to cycle urea generated as a byproduct of metabolic processes within the plant. Nickel deficiency has been recorded in several species and leads to an accumulation of urea in leaf tissue causing toxicity, foliar burn, and inefficient urea-N use. Research has determined that plants can directly absorb urea through urea specific channels and aquaporins (water channels found in cell membranes), which changes the previously hypothesized view that urea-N was absorbed by the plant only after being hydrolyzed by urease in the soil or plant surface. Soil urease inhibitors have been thoroughly researched and employed to limit gaseous N loss by ammonia volatilization after hydrolysis. However, the directly absorbed urea from leaf surfaces is directly hydrolyzed by urease in the plant tissue before being assimilated into organic N containing compounds.

#### Nickel nutrition

- Very little is known about Ni nutrition and fertilization of turfgrasses.
- Due to the extensive use of urea and the necessity of Ni in urea N metabolism, further research is required to determine best management practices for foliar urea N fertilization and supplemental Ni fertilization.
- Increased leaf tissue growth due to Ni supplementation was observed in 'Diamond' zoysiagrass and 'TifEagle' ultradwarf bermudagrass during research at Clemson University.
  - Nickel is an essential plant micronutrient
- The reduced Ni bioavailability in common turfgrass management scenarios requires further research to determine Ni sufficiency and deficiency ranges
  - Nickel is required for functional urease activity in plants
- Urease is a Ni dependent enzyme that hydrolyzes urea making the N available to plants
- Urease and Ni are important in the cycling of urea generated within the plant and can reduce urea toxicity (foliar burn)

#### **CURRENT RESEARCH**

Research conducted at Clemson University reported increases in urease activity, amino acid content, and growth of 'Diamond' zoysiagrass and 'TifEagle' bermudagrass fertilized with foliar urea and supplemental Ni. Plants not receiving supplemental Ni contained <1 ppm Ni in leaf tissue, whereas Ni supplemented plants accumulated up to 17 ppm by the conclusion of the study. At this concentration, no toxicity symptoms were observed. In a second study at Clemson University, Ni toxicity was examined in the same species. Symptoms of toxicity progressively increased as Ni concentration reached 100 ppm and resulted in growth reductions up to 32% in 'TifEagle' at the highest Ni concentration supplied. Due to these findings, 'Diamond' and 'TifEagle' are considered moderately tolerate of Ni and further research should be conducted to measure the effects of Ni supplementation and toxicity of other commonly used turf species.

#### **FUTURE PROSPECTS**

Not much is known about other roles Ni plays in the plant and current research is lacking in most agricultural crops including turfgrass. However, from the limited research already conducted, increases in growth and plant health with supplemental Ni nutrition have been recorded. Future research is required due to the popularity of urea as an N source in turfgrass management and strong relationship with the Ni containing enzyme urease that makes the N available to the plant. Further, several questions have been raised concerning Ni nutrition and turfgrass management: Can turf be established more quickly (seeding, sprigging) when supplemental Ni is applied? Are there synergistic effects with pesticides to reduce total inputs and improve plant health? What are the long-term ecological impacts of Ni supplementation? Can Ni supplementation improve urea N use efficiency and does it improve foliar uptake? Can increased Ni concentration in foliage inhibit herbivory? Is there enough Ni bioavailable for turfgrasses that supplementation is not necessary?

Currently, no Ni fertilizer sources are marketed for turfgrass, while other micronutrients with similar concentrations within the plant (Mo) are commonly included in liquid micronutrient products. Only one Ni fertilizer is currently marketed (Nickel Plus, Nipan LLC.) for use in pecan. To investigate Ni nutrition and possible turfgrass deficiency, an estimate of Ni input needs to be determined for managed turfgrass surfaces. Additional research determining bioavailability in turfgrass scenarios also needs to be conducted to examine if Ni supplementation would be beneficial.

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## ARE YOU "INTERVIEW-READY"?

**IN TODAY'S CHANGING JOB CLIMATE** and transitional workforce, the average employee changes jobs every 2 to 3 years. It is estimated the average worker could have as many as 20 different jobs in his or her working lifetime. Some occupations average longer periods than others, but the days of working for the same company until retirement are almost unheard of. With that in mind, how prepared would you be if you had an interview today? The truth is we should be conducting ourselves as "interview-ready" everyday.

Each day we are presenting ourselves to employment "decision makers," in both our work and private lives. Unfortunately we don't always take advantage of these encounters by either being underprepared or by failing to market ourselves in a professional, positive manner. By being cognizant of the fact our professional image is always on display to current and potential employers/decision makers, we can position ourselves into an "interview-ready" state simply by taking a few important steps:

bursement for college classes or will pay for continuing education courses through trade industry seminars. These classes, paid out of pocket, can be worth thousands of dollars, but are worth far more as future career-building and advancement tools. If reimbursement funds are not available, ask your HR department about what courses are currently available through your organization. Often supervisory classes, time management, first responder courses, etc., are available through your company. These classes are not

only resume builders but sends a message to HR and company officials that you want to grow and improve yourself.

If classes through your company are not available, check the website at your local library or county extension office: computer classes, public speaking courses, etc., are

available for little to no out of pocket cost. Upon completion of any course, be sure to forward your HR department a copy of your certificate of completion to update your employee file with the personal improvements you've made. Most importantly, update and maintain a running list of the names, locations, dates, and thesis or summary statements of any courses you complete for a resume attachment. Showing potential employers a desire to continually educate yourself and update skills is always impressive.

Resumes must be current and a hard copy within reach at all times with no exceptions! Even with all of the electronic media available for posting online resumes, there is something special about being able to present a current, well-written, hard-copy resume in person. Your resume should be a growing/changing record of your career, and with today's technology there is NO EXCUSE for not keeping it updated and current. The need for having a copy of your resume available at all times is because you never know when those "in-person" meetings with decision makers will be. Luck has been described as "being prepared for great opportunities." Make your own luck happen by being prepared to introduce/sell yourself to potential employers wherever you may meet them. Have multiple copies of your resume stashed every-



Know who your target audience/potential employers and "decision makers" are. The short answer is—EVERYONE. Potential employers and decision makers are everywhere. People mistakenly think of potential employers as being limited to owners/ managers in their chosen field. But decision makers can be those in associated fields who have connections. Vendors for instance, call on numerous customers/organizations in your same industry and may know of potential job openings. Sometimes they are even asked their opinions/references on job candidates. Co-workers who are not in positions of authority today could be promoted to positions of authority tomorrow at your, or an associated, organization. Your industry peers may be used as references or asked for name suggestions when organizations are looking at potential openings. Are you treating these and other potential decision makers every day with the same respect and professionalism as you would a potential employer?

Give yourself a raise today; make your resume a constantly growing and updated reflection of you. In today's economic times, raises can be few and far between, especially with local/state government employers or schools. But why wait for a raise when you can reward yourself? Many employers still offer reim-

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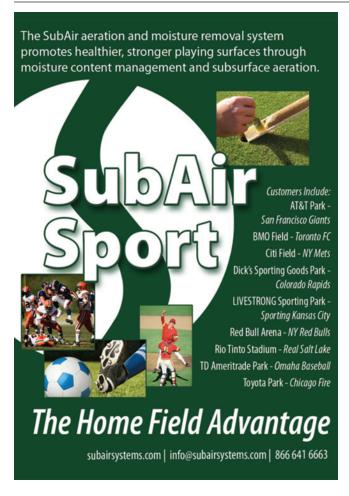
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where; your briefcase, your car, at work, at home, etc. Never fly without a resume handy; talk about the place for a truly "captive audience"! A resume instantly provides someone access to your best selling points, all the ways in which you can be contacted, etc. Anyone trying to get "discovered" in the music industry never leaves home without a demo CD to sell themselves; why should a resume be any different?

Network! Network! As important as resumes are in providing a decision maker with a synopsis of your skills/work experience, they do not open doors like they used to. The days of sending your resume to a random person on a company listing/ website and receiving a callback are almost extinct. Doors are opened by who you know and, more importantly, who knows you! Joining industry and local networking groups can be crucial in keeping you informed of upcoming job openings and keep your name in the right circles for opportunities. Media social circles can cast your net beyond local boundaries to opportunities throughout the state, country, even the world. Joining sites like LinkedIn, Facebook, Twitter and industry-specific websites allows your resume to be in the hands of decision makers before you are even aware of a job opening. According to the online magazine *The* Recruiter File, one in every six people gets hired using a form of social media.

You are your own marketing department. Every day, every encounter, every project, every "tweet," every Facebook entry; you are selling yourself. But are you selling yourself to potential decision makers in an "interview-ready" mode? As helpful as social media can be in opening doors, it also has the ability to shut doors tightly when not used correctly. We would like to think that our private life is separate and apart from our work image; but social media has blurred those lines like never before. Companies want to know what potential employees are interested in, what they are like, and how they work with others; social media can be a great insight to these questions. It's not hard to "Google" anyone, and some hiring companies now request that job seekers provide their LinkedIn, Twitter, and Facebook links as part of the interview process. While college friends may appreciate hearing about late Saturday night activities, will potential employers appreciate it as well? If you are working hard to market yourself in the best light, make sure you are covering all of your bases.

Carole Daily has more than 15 years in the Human Resource industry in factions such as retail, corporate, manufacturing, and consulting. She specializes in business communications. Her husband is Darian Daily, head groundskeeper for the Cincinnati Bengals.





# SYNTHETIC FIELDS: END-OF-LIFE ISSUES: How do you evaluate an older field? What's the next step?

othing lasts forever. Including, unfortunately, your synthetic turf field. And that field, which has remained cheerfully green and bright through wins, losses, sun and rain, is now showing its age.

It hardly seems fair. But if it helps any, you're not the only one going through this.

"A lot of fields are now coming up on their end-of-life," says Zach Burns of the Motz Group in Cincinnati, OH.

The first generation of synthetic fields, installed approximately a decade ago (give or take a few years), is showing its age. Field builders, and those who work with sports facilities, say the symptoms are easily recognizable.

"The fibers start to degrade," notes Darren Gill of Field Turf in Montreal, Canada. "You'll notice a 'hairing' of the fibers and they will start to break. You'll start walking off the field with broken fibers on your shoes. The infill also hardens."

According to John Schedler of AirFieldturf in Spokane Valley, WA field owners can walk the field and find definitive signs of wear.

"Areas of wear typically are between the hash marks and on the sidelines of a football field where there is the most use or foot traffic and around the goal mouth and corner kicks on a soccer field. Baseball and softball are different but typically you'll see the highest wear in the

▼ Beginning of life. All photos courtesy of The Motz Corporation, Cincinnati, OH



SportsTurf | May 2014 www.sportsturfonline.com

batter's box area and pitcher's mound area. Other areas to be watching are around the bases and sliding areas as well as where the players for each position typically place themselves."

The signs of wear, he adds, can be deceiving. "Most fields will have a displacement of infill in the higher wear areas. This exposes the fibers to more UV exposure and more wear from use. The infill is key to protecting the fiber and keeping it upright and preventing what is called lay-over. Maintaining the infill levels is a key part of any synthetic surfacing system by checking the high wear areas and grooming them specifically on a more regular basis than the rest of the field. The more stable the infill the more protected the fiber is from laying over. Fiber lay-over is the beginning of the breakdown process."

For those with access to testing equipment, the field's Gmax level will also be a telling point. "The field's Gmax will begin to rise," adds Gill. "It should be monitored and as it approaches 200 gs, the field should be remediated or replaced."

Remediated. Replaced. "Gosh," you're thinking. "Isn't this why I got a synthetic field in the first place, so I wouldn't have to go through this?"

Well, yes and no. For years, you've avoided mowing, sodding, weeding, seeding and feeding, the remediation and replacement other field owners go through regularly. But nothing lasts forever and that includes synthetic fields.

According to Burns, a field that needs to be replaced may show a

"But again, the key is to follow the operations and maintenance guidelines submitted by your manufacturer and keeping in touch with your manufacturer's rep for the life of the field. A phone call or e-mail with pictures of any area of concern can be handled quickly by the manufacturer's rep and can keep the field manager protected."

— John Schedler.

decrease in performance and/or it may present a danger to users. However, he notes, there always are those owners who try to eke out a little more time.

"Sometimes, we know the field needs to be replaced, but we hear, 'Maybe we can get another year out of it.' More often than not, you'll hear that because people just don't have the money right now to replace it. We do have some people who have budgeted for this and planned for replacement in year eight, though. It depends on the owner."



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#### **Facility & Operations**

If the field is safe for the users, he adds, an owner may try to keep the facility going. However, all builders agree: safety should always be the paramount concern.

While the majority of fields that are being installed in North America are supplied with a specific year-term warranty, Burns says the actual longevity of a field will depend on a number of factors including but not limited to use, climate, system component quality, maintenance and installation quality.

"I think something that would be incredibly helpful for a manager is a yearly assessment (including seam integrity, fiber loss, testing protocol, infill depth, etc.) of the field conducted by the field manufacturer or an industry expert," he notes. "Having a benchmark set at installation and then an annual check provides the manager and owner data to weigh when a field is ready to be replaced. Most turf manufacturers conduct this kind of service."

Regular maintenance, including grooming the fibers and maintaining the level of infill, as well as addressing any minor problems, can help the field perform well during its useful life.

"Consulting with your manufacturer is key during the life of the field," says John Schedler. "Make sure you're following the maintenance procedures lined out by the manufacturer and keeping the field clean and free from as much debris/contamination as possible. Spot maintenance is also key in the high-wear areas. Sometimes, overall field grooming and brushing isn't necessary

▼ Worn fibers



"Consulting with your manufacturer is key during the life of the field," says John Schedler. "Make sure you're following the maintenance procedures lined out by the manufacturer and keeping the field clean and free from as much debris/contamination as possible.

if the high-wear areas are maintained separately. But again, the key is to follow the operations and maintenance guidelines submitted by your manufacturer and keeping in touch with your manufacturer's rep for the life of the field. A phone call or e-mail with pictures of any area of concern can be handled quickly by the manufacturer's rep and can keep the field manager protected."

However, when regular repairs can no longer keep the playing surface consistent, when the field starts feeling hard, looking bald or patchy or shiny, or when other symptoms appear, it is time to take that next step.

Having the field replaced might seem like a daunting prospect but, says Burns, "It's not as disruptive of an event as the first installation. You're not doing what you did initially, which included excavating and bringing in stone and pipe. The benefit is it's a lot less time the facility is out of use. You are talking about three to four weeks instead of eight to ten weeks."

And this brings up another question: once the surface of the old field is trucked away, what is the next step for it?

"Most customers aren't thinking about recycling very much," says Darren Gill, "but they should be."

The next article in this series will discuss synthetic sustainability and turf recycling.

Mary Helen Sprecher is a free lance writer who wrote this article on behalf of the American Sports Builders Association. ASBA is a non-profit association helping designers, builders, owners, operators and users understand quality athletic field construction. ASBA offers the publication, "Sports Fields: A Construction and Maintenance Manual," which discusses, among other topics, sustainability in the construction and maintenance of synthetic fields, as well as synthetic turf recycling. For information, visit www.sportsbuilders.org.



## Q&A WITH MURRAY COOK ON MLB IN AUSTRALIA

Editor's note: Sports Turf caught up with global traveler Murray Cook, president of the Sports Turf Services Division of the Brickman Group, former president of the Sports Turf Managers Association, and the international face of field preparation for Major League Baseball, to ask questions about his experience preparing the cricket grounds in Australia for MLB's Opening Day series last March.

## ▼ Tom Nicholson, Director of MLB's

Oceania office, left,

with Murray Cook.

#### **SportsTurf:** What is your relationship with MLB?

**Cook:** I've worked for the Commissioner's office in varying roles over the past 25+ years managing Opening Day games and numerous MLB events around the world. Over the past 12 years, the consultation and project management services have been provided through our Brickman Sportsturf team, which is a division of Brickman.

#### **ST:** What other projects have you worked on for MLB?

**Cook:** MLB has played games internationally for many years and we typically oversee the entire field of play operations for those games. In addition we assist with new ballpark evaluations and educational clinics related to field and ballpark maintenance. Field safety is a major issue with MLB and the MLBPA.



We have managed MLB games in numerous countries; when the Montreal Expos (now Washington Nationals) played parts of two seasons in Puerto Rico I wore a couple hats, Head Groundskeeper/ Stadium Ops at Hiram Bithorn Stadium. We continue to manage this venue's MLB events including the past World Baseball Classic in 2013 and New York Mets series in 2011. MLB also receives requests from international federations to use professional players to compete in international tournaments. Some of those events have been the Olympics and Olympic qualifying games, Baseball World Cups, IBAF tournaments and the World Baseball Classic. Since players' contracts are owned by MLB clubs, we are responsible for evaluating and managing field of play operations in each of these countries before and during the tournament.

#### ST: How far in advance of the games in Australia did you begin planning on the work that had to be done?

Cook: Planning for the MLB opener in Sydney actually began about 16 months ago. The Sydney Cricket Grounds (SCG) has a storied past rich in history that goes back to the mid 1850's. It is the holy grail of cricket in Australia. Due to our past experience in working with the folks in Australia on projects like the Sydney 2000 Olympics and the Australian baseball league, we had a pretty good idea what it would take to build a baseball field there. However, constructing a Major League level field at the SCG we knew would be a challenge. Back in 1993 we did play an MLB exhibition series at the Oval in London so understanding a cricket pitch a bit was a huge plus. The challenge of this project was more than just constructing a field; we had to create a ballpark. That meant fencing, padding, backstop, batters eye, bullpens, batting tunnel, locker rooms, dugouts, foul poles, etc. And just to add a twist, we had to get it all completed in 16 days.

#### ST: Share with us what exactly you had to do with the field in Australia and include any especially interesting details or problems that you had to overcome.

**Cook:** It's amazing what great things we can do when no one worries about who gets the credit. The recognition for the success of this historical event belongs to a huge team effort. The vision for bringing the game to Australia belongs to Jason Moore (Promoter) and Tom Nicholson, MLB's Director of Oceana Operations. The core players in the project management were Tom Parker, the head curator, and project manager Scott Egelton. These guys were just remarkable. From this group we had to assemble the right team of contractors and vendors. Evergreen, better known as Dad & Dave's turf farm, was selected to perform the transition. Graeme, Mark and Chappo not only had to execute the transition but after baseball was through they had to flip it back to NRL rugby in a week. Back in February 2013, we found that the slope of the pitch on the northern end where the infield would be placed would not allow us to construct a level infield; therefore a proper mound would have been difficult to install. In the fall of 2013 the SCG engaged Evergreen to level the area and re-sod before the Ashes took place in January. The Ashes event is comparable to MLB's All Star series. It's a



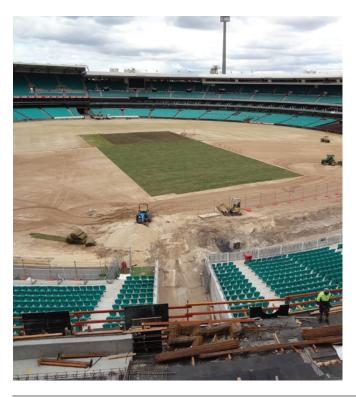
▲ Laying out field and first harvest of sod from warning track area.

Some of the items we needed for the project became difficult to find and or create in Australia. One key item to the field was locating the infield clay and mound clays.

match that pits England vs. Australia, which has been going on for more than a century. Other key players in the development of the games include Piers Morgan, Jamie Barkley and Michael Bangle, representing SCG Trust. They supported the event throughout the process which helped Tom, Scott and I to create something very special. It's great when the front office has your back.

Some of the items we needed for the project became difficult to find and or create in Australia. One key item to the field was locating the infield clay and mound clays. We worked closely with Andy McNitt's lab in the testing of soils to try and find a mix locally and after numerous tests and blending samples we were at a point of needing to order the clay from the USA. We gave Gail Materials a call and they helped out with a clay shipment that was transported in 11 containers (220 1-ton sacks). We also needed padding for the fence structure. We engaged Bob and Ken Curry of Covermaster to develop the pads and they had Greg Meeks from Turbo Link come over and handle the installation. We found a great terra cotta mix locally for the warning track.

The local turf, better known as cooch grass, is a hybrid bermuda-type turfgrass. We visited Evergreen's sod farm to see the



October 2013 renovation of leveling area where infield would be placed.

"ready-play" sod several times. We had to use the ready-play in front of the dugouts and it was amazing. During cricket season it is mowed at 10 mil and we needed to raise the cut to 23 mm. Since the cricket season didn't end until February 27 we couldn't start until the 28th. The wear on the wicket was extensive and we knew this would be a challenge but in the end it looked pretty good.

Once the construction was completed we had to switch to maintenance mode. Early in the winter we engaged Jim Myrland from Beacon Athletics to assist us with the backstop design and also field maintenance equipment, BP equipment and various materials.

Tom Parker's staff of 12 became our core maintenance staff during the games. Their experience in managing the wicket clays was similar to our infield and mound clays; a few of Tom's guys did not know a great deal about the game of baseball but were eager to learn. Again, they were just awesome. The tarp crew was a group of volunteers, 40 guys in two shifts. These guys were life savers when it came to going above and beyond the call of duty. They were at the park for 16 hours a day taking time off from work and family just to be a part of this historical event. It was really special getting to know some of these guys who were members of local baseball club leagues around Australia.



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