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WOTUS WATER EVERYWHERE

PLUS

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HOME COURSE ADVANTAGE

JIM MOORE ON BUNKER LINERS

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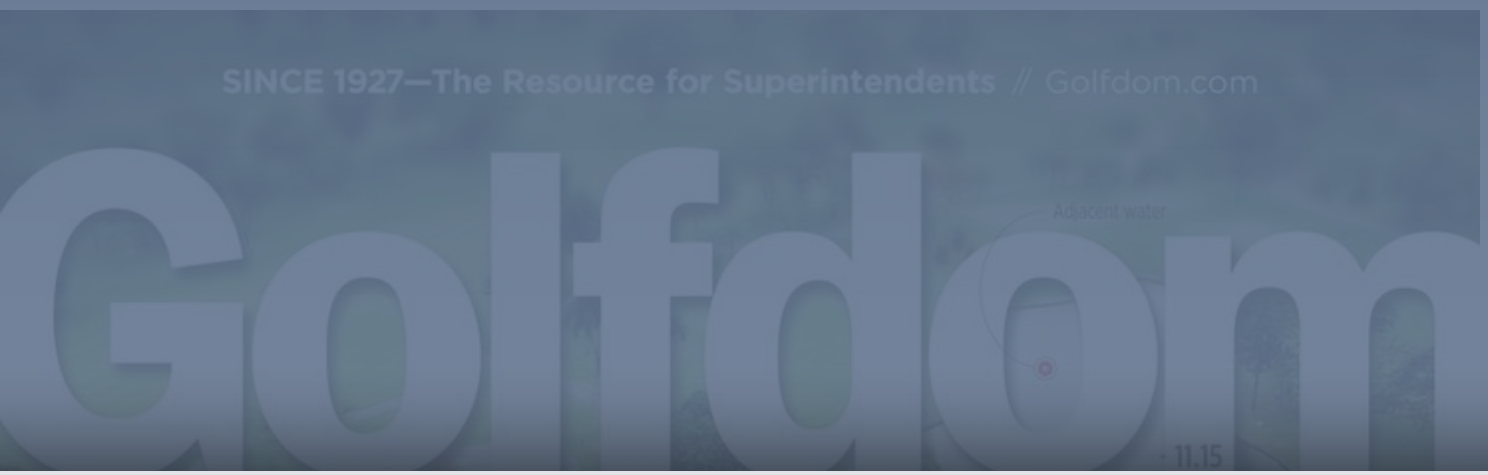

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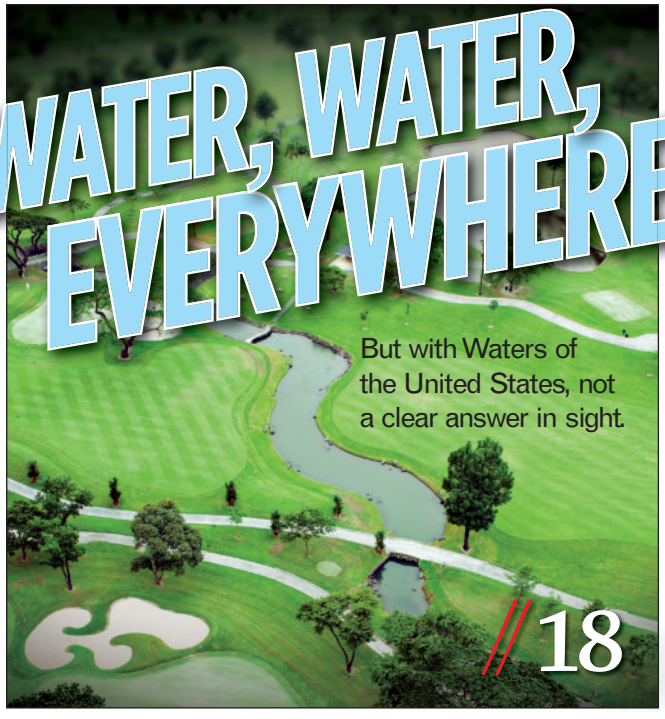

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"What used to be a day of eating and napping has turned into a day of hurry-up-and-eat-so-we-can-go-shopping."

SETH JONES, *Editor-in-Chief*

The Grinch that stole Thanksgiving

Quick, what's your favorite holiday? ¶ Mine's Thanksgiving. Well, it *was* Thanksgiving. ¶ Thanksgiving is my favorite holiday because there's no pressure as long as someone halfway competent is entrusted with the turkey. There are no expectations of what Santa did (or didn't) bring, no complicated costumes and candy, and best of all, no fear of firework dismemberments. (If I ever blow off a finger, my columns will take twice as long to type.)

Thanksgiving is just family, friends, food and football, and in my favorite time of the year, fall. Thanksgiving is my heaven on Earth with green bean casserole.

Until recently, that is. My holiday was hijacked. What used to be a day of eating and napping has turned into, at least for the Joneses and Johnsons (my sister married into another common name) a day of hurry-up-and-eat-so-we-can-go-shopping.

Black Friday is the Grinch that stole Thanksgiving.

It was one thing when Black Friday meant early-hours shopping on the Friday after Thanksgiving. My wife already is a morning person; she'd just get up at 4 a.m. and be back home mid-morning with a cheap-o flat screen TV.

But then Black Friday encroached on Thanksgiving Day. That made Thanksgiving 2014 a new low, even lower than Thanksgiving 2010, when cousin Rosalina brought her New Wave cooking to the Romero Thanksgiving. (Not only was there no turkey, but what looked like mashed potatoes actually was whipped cauliflower. My plate was loaded with it. I still have nightmares.)

Last year, six out of nine people at the Jones/Johnson Thanksgiving bailed on the latter part of the day to go wrestle with ultra-competitive shoppers at the nearby strip mall. Pro: I was left unattended with various pies. Con: I was unattended in general.

Isn't the point of Thanksgiving to bring families together? Waiting in line together for an iPad doesn't count as family time.

The question is, what will the Jones/Johnson Thanksgiving be like this year? Will we repeat last year's shopping mistake? Or will we leave the "bargains" behind and realize that the best deal we have is the rare chance to be together as a family, enjoying each other's company?

I'm hoping for the latter, and I'm already planting seeds that there's no deal worth rushing through Thanksgiving dinner. If Thanksgiving Day shopping hasn't encroached on your holiday, count yourself lucky and keep that tradition alive as long as you can.

I'm thankful there are businesses out there making a stand this year and closing on Thanksgiving Day. There aren't many as of this writing, but maybe there will be more as people realize saving a few bucks isn't as important as being with your family. Maybe employers will realize it's important to give their employees an occasional day off. Maybe we all will realize the cashier at the strip mall would rather be at home with his or her children on Thanksgiving.

The summer holidays are hard on this industry. Memorial Day, Independence Day, Labor Day… they're all in peak golf season, and that time of year also is peak disease and weather pressure season. Many of you are pulled away from your families on these holidays in order to tend to the course. I'm always saddened when I hear from readers who hate these holidays because of the increased pressures from the golf course.

So let's not let the Thanksgiving holiday get wasted by shopping. I'm going to remind my family that it's important to treat Thanksgiving with respect, and do what the Pilgrims and Native Americans did: enjoy each other's company, over-eat and watch the Lions lose.

Unless cousin Rosalina is cooking our Thanksgiving meal… then I'm just going to go early to get in line at Walmart.

Contact Jones at sjones@northcoastmedia.net or via Twitter @SethAJones.

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NEWS, NOTES AND QUOTES

//STUDY BUDDIES

Hunki Yun, USGA director, Strategic Projects, speaks during the "Serving the Game" exhibit at the 2015 USGA Annual Meeting at the Waldorf Astoria in New York.

USGA AND UNIVERSITY OF MINNESOTA ANNOUNCE RESEARCH PARTNERSHIP

The United States Golf Association (USGA) and the University of Minnesota (UMN) recently announced a five-year master research partnership to study and develop solutions to golf's present and future challenges.

"Participation and growth are central issues for the health of our game, but there are many other critical and complex factors that will contribute to its long-term sustainability," said Mike Davis, USGA executive director. "This agreement will further the USGA's mission to apply fact-based research and deliver tested solutions back to the industry."

The partnership, which allows both parties to identify projects and assign funding on an individual basis, leverages the full assets of the University of Minnesota, including its Les Bolstad Golf Course. The course will be used as a living learning laboratory to support research projects, as well as a classroom for demonstrating best practices in course design, maintenance and operations.

"In this time of significant societal change, it's important that golf remain relevant to its broad customer base," said Brian Horgan, Ph.D., professor and Extension turfgrass specialist, who is leading the partnership.

With an emphasis on innovation, projects will focus on technology, resource management, best practices for facility operations and design/renovation, community and economic impact studies and participation behavior. The partnership will also utilize golf facilities nationwide for collecting data, which will be processed and analyzed by UMN students and faculty working with USGA experts.

//IT'S A MAJOR AWARD

GCSAA NAMES MCDONOUGH ENVIRONMENTAL AWARD WINNER

The GCSAA board of directors has named Peter McDonough, superintendent of Keswick (Va.) Hall and Golf Club, as the recipient of the 2016 President's Award for Environmental Stewardship.

The President's Award for Environmental Stewardship recognizes "an exceptional environmental contribution to the game of golf; a contribution that further exemplifies the golf course superintendent's image as a steward of the land."

The former Virginia GCSA and Old Dominion GCSA president's environmental accomplishments include working directly with Virginia legislators to adopt policies for water conservation and management and publishing a handbook of best management practices for Virginia golf courses.

"I am honored and flattered by the award, especially because it is given by my peers," said McDonough.

//ALL IN THE FAMILY

ADVANCED TURF SOLUTIONS AND AGRO-LOGICS COMBINE

Advanced Turf Solutions (ATS) announced that Agro-Logics would become a part of the company. The combined organization will offer a portfolio of turfgrass, ornamental and aquatic products.

"Agro-Logics and Advanced Turf Solutions have enjoyed working together with mutual suppliers for many years. Uniting these two brands will be beneficial for the employees and customers of both companies," said Alex Cannon, ATS CEO.

Combined, ATS and Agro-Logics will expand its service area to include most of Missouri, Southern Illinois, Indiana, Ohio, Western Pennsylvania, West Virginia, Kentucky and Tennessee.

Agro-Logics will continue to operate as a distinct brand through the end of the year, however, after Jan. 1, 2016, Agro-Logics will operate under the ATS brand.

PHOTO BY: KARL DANNEBERGER

//REMEMBERING A FRIEND

Tribute to Happ

Pictured at Keith Happ's celebration of life are (L to R) Bill McCarthy, U.S. Amateur Four-Ball Championship director; USGA Green Section members Kimberly Erusha, Ph.D., managing director; James Skorulski, agronomist, Northeast Region; and David Oatis, director, Northeast Region. **Turn to page 38 for Karl Danneberger's tribute to Happ.**

GO FIGURE

13.0

INCHES OF RAINFALL

New record for rainfall in 24 hours at Austin (Texas) — Bergstrom International Airport on Oct. 30.

Source: KXAN Austin

//MULLIGAN

TWO STROKE PENALTY

The September issue of *Golfdom* misinterpreted Mike Huck, an independent water management consultant, in the "Less turf, more water" article. We should have stated that removing ancillary turf areas could annually save golf courses about 14 to 20 percent in water, depending on acreage removed and annual rainfall. We apologize to Mike and hope we can save even more water soon by buying him a cold beer.

"I'm starting to believe that this would be a great job if it weren't for all the government regulations and compliance issues. I've been in the business long enough to know and understand why compliance issues are important."

MARK WOODWARD, *Contributing Editor*

It's not as easy as we make it look

Golf is hard enough for 98 percent of golfers who enjoy playing the game, but as each year passes the business of golf gets harder for those of us who make a living in this industry. ¶ Thinking about where our industry has gone in the past couple of decades makes you realize that nothing about what superintendents do is easy. Regulatory compliance issues are tightening around us every day. For years we have dealt with environmentally related issues at our facilities, issues such as fuel storage (aboveground and underground storage tanks), the proper way to dispose of oils, waste management, wetlands compliance, spill prevention and nutrient use, just to mention a few.

GCSAA's government relations department continues to do good work on all of these issues and annually looks at and refines its legislative agenda, which includes items like ADA, fertilizer, labor/immigration, pesticides, the value of golf and water management.

That helps, but the superintendent's day-to-day life still is complicated when you throw in issues like human resource management, business management, budgeting, dealing with boards, greens committees, homeowners (if your course is surrounded by homes) and managing highly technical irrigation systems. The amazing list of so-called "routine" daily tasks on superintendents' plates goes on and on.

Factor in golfers' expectations on top of everything else, and some days it's amazing that we ever get to see our golf courses. I jokingly say that if it weren't for the golfers, this would be a great job. Space constraints don't even allow me to get into the work/life balancing act that superintendents must try to maintain.

I'm starting to believe that this would be a great job if it weren't for all the government regulations and compliance issues. I've been in the business long enough to know and understand why compliance issues are important. Most regulatory mandates are put in place because someone somewhere at some time has screwed up and done something detrimental to the environment or has caused harm to someone or something. I get that. It's the same reason they put warning labels on hair dryers that tell you not to shower while blow-drying your hair.

Some compliance regulations appear to be voted on and approved without a lot of thought put into them. That's why when I was the CEO of GCSAA we worked closely with the allied associations (initially the GCSAA, PGA of America, NGCOA and CMAA) to start National Golf Day, "We Are Golf" and some of the other programs that GCSAA still focuses on today. I'm proud of the association for continuing to look out for our best interests.

WOTUS is a perfect example of an issue that we need to understand fully before we can judge its impact on our facilities. GCSAA also offers the Grassroots Ambassadors program, which allows members to participate in industry and association government relations efforts. These programs are designed to help educate policymakers locally and nationally and to protect the interests of our industry. But we all should be ambassadors for the industry in which we work.

A superintendent's job is not an easy one, and I don't anticipate it getting any easier as time goes by. We make it look easy most of the time, but if it were easy, anyone could do it. We all know that's not the case.

Mark Woodward is a senior vice president for OB Sports, principal of Damarco Golf, president of Mark Woodward and Associates and a contributing editor for *Golfdom*. He can be reached at mwoodward@obsports.com.

Jared Bumpus recently met with VGM Club's Troy Hoffman to discuss the savings and other benefits Key Golf has experienced through the Stens program. Key Golf's Jeremie Smith and George Folopoulos brought some recent purchases along while the group met on the practice green at Red Rock Country Club in Las Vegas.

The Key To Enhancing Savings Solutions in Ultra-Competitive Market

"Here in Vegas, your bottom line can get scorched if you're not careful of who you work with and the products you use," said Jared Bumpus, Regional Agronomy Director for Key Golf Management Company.

Survival in the desert and in the competitive golf course industry can be similar in that the unwary, uninformed can succumb to the environment. That's where Key Golf Management Company comes in to assist golf courses throughout the Southwest.

"We bring a unique culture into the workplace with both the crews and agronomic programs," said Bumpus. "Communication with our superintendents is crucial. I meet with our superintendents weekly and also have bi-monthly reporting on current conditions of the course and updates on upcoming projects."

Through this communication, Bumpus found a new way to save his courses' money, thus benefitting the bottom line. "VGM Club introduced us to the Stens program and how it could affect not only our bottom line but help streamline our turf maintenance equipment parts ordering process."

After the initial introduction to Stens, Bumpus recognized that Key Golf would benefit from membership pricing, shipping costs and product availability.

"Jared saw the significant savings opportunities for golf course turf equipment maintenance and wanted to get each of their courses set up with our program," commented Amy Kippenbrock, Territory Manager for Stens.

From there the rest, as they say, is history. A meeting, coordinated by VGM Club, took place with Bumpus, his superintendents and Kippenbrock at the 2015 Golf Industry Show and the relationship grew from there.

The Stens Engine Maintenance Kits are one of many products Key Golf's superintendents use to keep their turf maintenance equipment operating in the tough Vegas terrain.

"Once the connection was made, Stens knew precisely what products and parts my superintendents could utilize," said Bumpus. "They sent me their catalog, samples of parts specific to my equipment and a flyer detailing the savings with my VGM Club discount."

"Starting the relationship as we did sets us both up for success and we understand expectations on both sides." Kippenbrock added, "Effective communication to the mechanics and superintendents is crucial in making this relationship work. They know how to reach me with questions and knowing that Jared and I maintain contact with the superintendents ensures that Key Golf Management will take full advantage of the Stens program."

They say you don't need to be a full-blown survival expert to survive in the desert. You just need to be aware of your surroundings and seek out sources to keep you alive. Communication and relationship building with key vendors ensures that golf courses can save money and survive the competitive environment – especially around "Sin City."

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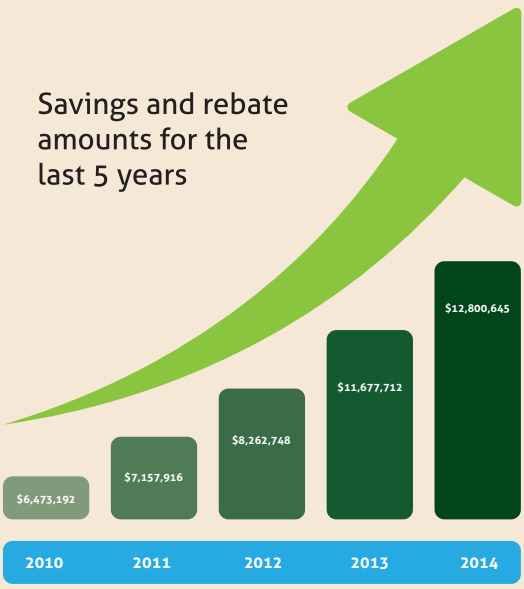

"I wonder if superintendents don't really understand the benefit of VGM like club managers do. The membership is a benefit to superintendents when purchasing everything from turf equipment to smaller items like flags and cups."

Owen Coulson, Superintendent
Vestavia Country Club, Birmingham, AL

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Don Hurter, Golf Professional
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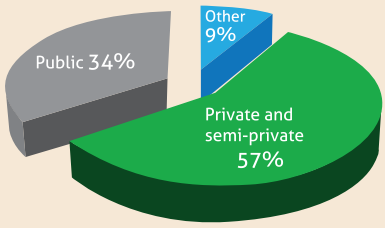

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"You can make a huge difference by taking 15 minutes per day pulling weeds with a sharp knife. Taking the time to do this also removes the weed seed that creates more weeds."

STEVEN WRIGHT, CGCS, *Pine Tree Golf Club, Boynton Beach, Fla.*

15 minutes a day

We've all heard the term "15 minutes of fame," and for well or ill, a lot of people are out doing their damnedest to achieve it. ¶ My idea of "15 minutes a day" won't make you famous, but maybe it'll make you a little more efficient and satisfied. There are hundreds of tasks you can accomplish in 15-minute increments. It just takes getting started.

Personal

Call someone important to you. Better yet, call three people and talk to each one for 5 minutes. It's easy, uplifting for both of you, and might make a real difference in someone's day.

Send a letter to someone. Remember the last time you received a personal letter? That's what I thought — it's been a while. Everyone relies on social media or email instead of the written word. It's still great to put something in the mail, especially not the junk mail!

OK, for crying out loud, if you have to, send an e-mail. It's better than nothing. Not all electronic communication is bad. I enjoy the email I get after sending a thank you note.

Spend time with a family member. I don't need to mention how important this is, but do we do it often enough? Turn off the TV and put down the phone or other distractions for 15 minutes. Guys, I'm talking about some major bonus points here.

Take a walk by yourself, with your wife (refer to bonus points above), child or dog. Fifteen minutes a day of walking might not be enough for great health, but you'll still feel better that you did it.

Pray. Any amount will do here.

Relax, decompress. Take a few minutes to do nothing. As they say, just "chill."

Professional

Walk a hole instead of riding it. This will seem weird at first, but you'll get used to it and like it. At least that's what superintendents say who do it regularly.

Pull some weeds. You can make a huge difference by taking 15 minutes per day with a sharp knife. Taking the time to do this also removes the weed seed that creates more weeds. Also, buy knifes for key staff members. Divide up the task and spend a few minutes each day. I insist on it with my assistants. Try to set a good example and pull a full bucket.

Your staff also could use some increment of those 15 minutes. Five minutes here and there each day makes for some good rapport with your most important assets. When it comes to your mechanic, spend all 15 minutes with him.

Don't forget the boss. Whomever the boss is at your club, communication with them is a key element to your success and to his or her success.

Raise an irrigation head. Start around greens, then move to tees. Maybe you do this, or maybe you assign it to be done. Either way, you'll improve your irrigation efficiency tremendously. Do one or two a day, and in a month you'll have made a big difference.

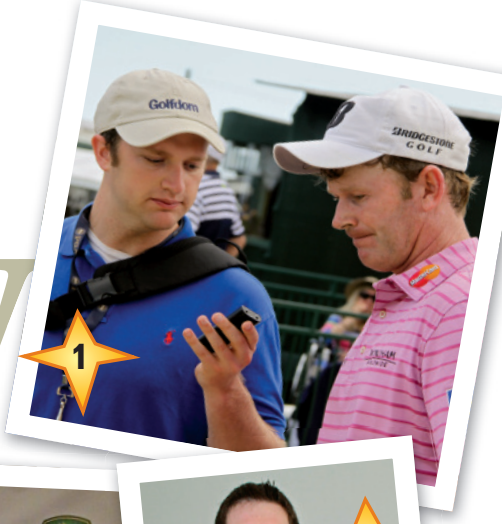
Putt or hit some chips. You say you never have time to practice or play. Yes you do, you work on a golf course.

Politicking is one of the hardest things to do. You have to put yourself out there with the members. They might ask questions or make comments. You've got this, you can handle it. Listening is the key. Look them in the eye. Practice with your peers at meetings. Brush up on technical terms if you need to. Lay it on thick (accurate and truthful), and they might get that deer-in-the headlights look.

I know that to complete this number of tips you'll need a couple of extra hours in a day. Get started by picking a couple. Mix it up, because some days will be better than others.

Steven Wright is CGCS at Pine Tree GC in Boynton Beach, Fla. He can be reached at steven_wrightcgcs@pinetreegolfclub.net or followed at @wrightsteve19.

Golfdom Gallery



1 **Quick Q&A** Associate Editor Grant B. Gannon interviews Brandt Snedeker at the PGA Championship.

2 **Green friendships** Assistant Superintendents (L to R) Sean Van Beurden, Westmont G&CC, Kitchener, Ontario, Canada; Cam Shaw, Piper's Heath GC, Milton, Ontario; Logan Murphy, Pinehurst (N.C.) Resort; Taylor Andersen, Cypress Point Club, Pebble Beach, Calif.; and Ryan Marangoni, Brantford (Ontario) G&CC, enjoy the Green Start Academy opening dinner.

3 **Participation award** Grant Jones, assistant superintendent, Brook Hollow GC, Dallas, shows off his Green Start Academy certificate.

4 **Built Polaris tough** (L to R) Shawn Jeffries, assistant superintendent, Andy Bates, head superintendent, Greg Iversen, construction superintendent and Sean Hoffman, superintendent, pose with their favorite vehicle for navigating the new construction site at Nemacolin Woodlands Resort in Farmington, Pa.

5 **Pond Hawks** Craig and Sandra Burton of Pond Hawk wanted to tell Virginia GCSA Fall Meeting attendees about their solar-powered pond aeration system but Seth's errant tee shot on No. 10 tested their reflexes too.

6 **Dolla Bills!** Cliff Moore, superintendent at Mountain Ridge CC in Caldwell, N.J., after winning a friendly $1-per-round putt off-among friends at Pinehurst Resort's Thistle Dhu putting course.

PHOTOS BY: SETH JONES (1, 4-6); GRANT B. GANNON (2-3)

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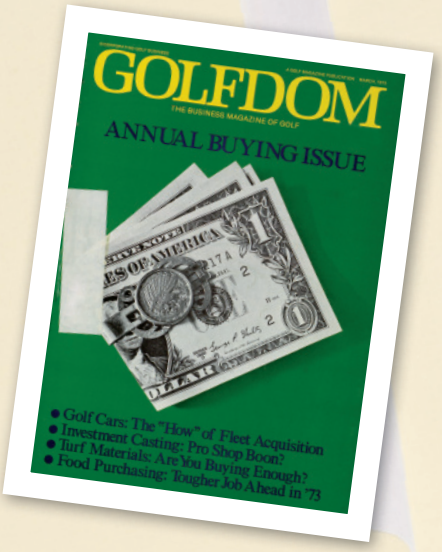


Ordering through an early order program allows superintendents to plan their maintenance program for the following year while saving money. However, other factors sometimes can change those plans. ¶ In 1972, various regions of the United States had precipitation levels well above the long-term averages. The flooding and standing water experienced in those areas caused excessively wet soil conditions. These new circumstances caused superintendents to rethink maintenance programs for 1973. To help the affected professionals prepare their courses, *Golfdom* in its March issue provided a list of problems that could occur. We have condensed that list below. To read the full article visit **golfdom.com/exclusive.**

Turf materials: Are you buying enough?

By James B. Beard, Ph.D.

SOIL COMPACTION

Excessively wet soil conditions during 1972 have most probably resulted in greater soil compaction under turfs than would normally be experienced during a growing season. Wet soils approaching field capacity are more prone to compaction than drier soils. This means that deep-soil cultivation, in the form of coring or slicing, will have to be increased during 1973.

WINTER DISEASE

The two snow mold diseases, *Typhula* blight and *Fusarium* patch, also are enhanced by wet soil conditions during winter periods when the soil is not frozen. This increased winter disease activity means that snow-mold fungicide application rates, which would normally be effective under drier conditions, may fail to give adequate control. Thus, golf courses that attempt to economize by using marginally low fungicide rates may suffer above-normal damage from snow mold diseases.

LOW-TEMPERATURE KILL

The bermudagrasses and annual bluegrass are particularly prone to this type of kill. Standing water at the soil surface, which increases the water content in the turfgrass tissues will greatly increase the proneness to direct low-temperature kill. If the wet soil conditions persist throughout the winter period and the proper combination of low temperatures and frequent freezing and thawing occur, a significant increase in turf damage caused by low-temperature kill can be expected.

RESTRICTED ROOTING

The excessively wet conditions during the 1972 growing season resulted in many golf course turfs entering the winter dormancy period with a drastically reduced root system. This means that the overall health and vigor of the turf is below the desired standard. If the winter season has been characterized by a lack of snow cover plus increased atmospheric desiccation and soil drought, the turf also will be more prone to injury from winter desiccation.

1973 FERTILIZATION PROGRAM

Excessive rainfall during 1972 has increased the degree of soil leaching, particularly nitrogen. This means somewhat higher nitrogen fertilization rates will have to be utilized to correct the situation. Most frequently, this increased nitrogen fertilization requirement due to excessive soil leaching does not become a problem until the following year. Thus, golf course maintenance personnel should be alert to this potential problem. Nitrogen fertilization levels should be adjusted somewhat higher if the normal turfgrass color, density and growth rate cannot be maintained with the nitrogen fertility levels utilized in previous years.

SPRING GREEN-UP

The earlier in the spring that the soil warms up, the earlier that turfgrass spring green-up and growth occur. The rate at which soils warm up is strongly affected by the soil mositure level. Wet soils are much slower to warm up than drier soils due to the higher specific heat of water. Thus, if the soils are excessively wet during the spring period, the turfgrass maintenance personnel should not get overly concerned and attempt to stimulate spring green-up and growth by applying nitrogen fertilizer.

"I still want to have a job in 20 years, so if people want in-cart WiFi and speakers, then so be it."

MATT NEFF, *assistant superintendent, Wedgewood G&CC, Powell, Ohio*

Give them what they want

If Old Tom Morris, Harry Vardon and Bobby Jones could see the way golf has changed over the years, they probably would collectively roll over in their graves. Everything from how the game is played to who is playing it has changed dramatically since these men roamed the links in their respective eras.

We don't think twice when we see a golfer pull out a driver with a graphite shaft and a Yugo-sized head. Golfers wearing absurd shirts that they haven't even bothered to tuck into their cargo shorts is a common sight. Walking golf is now the exception rather than the rule.

Gone are the days of featheries and hickory shafts, of sharply dressed foursomes striding down the fairway and of countless other traditions that have been considered hallmarks of the game throughout its evolution. For better or worse — depending on your perspective — things change.

Arguably the most tradition-bound (obsessed?) game in the world has changed dramatically through the years and has been dragged into the next era — no doubt kicking and screaming at times — as a result of technological improvements, changes in societal and cultural norms and the desires of the golfing public. That's undoubtedly why golf has managed to survive for as long as it has. Through all these changes the game has survived largely intact.

And yet, for all the changes that inevitably occur to an institution that is several hundred years old, it's amazing to see the amount of hand-wringing that accompanies any perceived "threat" to the grand old traditions of yore.

According to the National Golf Foundation's *Golf Participation in America, 2010-2020* report, the golf boom of the 1960s was fueled primarily by the fact that the majority of new courses were affordable public facilities. Golf was now available to the masses in a way that it never was before, and the increase in participation significantly outpaced every decade (other than the 1980s) since then, including the boom of the 1990s.

According to the NGF analysis, the reason the participation increase of the '60s was almost twice that of the '90s was affordability, and ultimately, accessibility. The boom of the '90s mainly was driven by the construction of private and upscale public facilities. Yet the booms of both decades had one thing in common: they gave the golfing public what they wanted at the time.

That's what we need to do now — give the people what they want. I still want to have a job in 20 years, so if people want in-cart WiFi and speakers, then so be it. If an idea like TopGolf gets Millennials interested in the game, more power to them. I'm as much of a golf traditionalist as the next guy, but I also realize that every generation wants to put its own stamp on the institutions they grow up with. Golf is no exception.

We should be more interested in attracting people to the game than in dogmatically upholding some esoteric set of traditions that seemingly are alienating entire groups of potential golfers.

Are manhole-sized cups or any of the alternative forms of golf the future of the game? I doubt it. They're likely passing fads that we'll all laugh about 10 years from now (actually I doubt anyone will ever laugh about replacing 8-inch plugs) so it's hard to believe that they truly threaten the long-term integrity of golf. I'm not saying we should just run roughshod over the game, but what's the harm in doing some things a little differently if it gets people interested in the game again?

The bottom line is that golf will survive. It has for centuries and will likely carry on for centuries to come. But in order to thrive again, golf needs to continue to be open to change because resistance to it can be a risky a proposition.

Matt Neff (mneff4@yahoo.com) is assistant superintendent at Wedgewood G&CC in Powell, Ohio.

Water, Water,

But with Waters of the United States, not a clear answer in sight

BY SETH JONES

Last month's second annual Virginia GCSA Fall Conference offered an impressive list of speakers — well known turf experts like Virginia Tech's Erik Ervin, Ph.D., GCSAA's Rafael Barajas, CGCS, and the USGA's Elliott Dowling.

But the banquet room at Hermitage Country Club in Manakin-Sabot, Va., was at its fullest when a young Washington D.C.-based attorney previously unknown to the group walked up to the podium mid-morning, the second speaker of the day.

Kerry McGrath, an attorney in the office of Hunton & Williams, LLP, was there to deliver her presentation, "The Final 'Waters of the United States' Rule: Implications and Implementation." For the attendees, this was a chance to get some questions answered: *What is the future of Waters of the United States? What permits will I need? Where do I go for these permits?*

McGrath answered the questions as best she could. Many were hard to answer — though no fault of her own, but simply because of the current legal morass that is Waters of the United States.


Kerry McGrath

The most frustratingly difficult question to answer: What should superintendents be doing right now?

"The really unsatisfactory answer for right now: What you can do is look at your property and think, 'What would (the Environmental Protection Agency and U.S. Army Corps of Engineers) say is jurisdictional? And what kind of evidence can I gather to make a case that it isn't?'" she said.

Fair's fair — a really unsatisfactory answer for a really unsatisfactory rule.

Turbulent Waters

The rise and fall (and rise again?) of WOTUS has spanned more than 40 years. Here's a look at the landmarks of WOTUS, from the passing of the Clean Water Act in 1972 to the recent blocking of the ruling.

1970

OCTOBER 18, 1972
The Clean Water Act of 1972 goes into effect with the first written use of the term "Waters of the United States."

1980

DECEMBER 4, 1985
Supreme Court case United States v. Riverside Bayview first challenged the definition of "Waters of the United States" and unanimously ruled that the federal government does have the power to control intrastate wetlands.

1990

Everywhere

Defining what is water

Waters of the United States, or WOTUS, is an attempt by the Obama Administration to better define what constitute the "waters of the United States." The Clean Water Act, implemented in 1972 (see timeline below) is the current rule, but has met resistance in the U.S. Supreme Court over the last 30 years.

WOTUS, which many argue was created without properly involving all stakeholders, was issued in June of this year. WOTUS adds significant federal control of land and water resources, and complicates and expands what is considered a body of water.

But this Waters of the United States rule, ironically, doesn't hold water. How else to describe a rule that declares locations within the 100-year floodplain and within 1,500 feet of water, no matter how dry, bodies of water?

"The way this reads, the definitions are so loose, it sounds like if you have a puddle in the middle of a fairway, that's theirs now," says Kevin Hicks, superintendent at Coeur d'Alene (Idaho) Resort Golf Course. "Which is preposterous, but that's the way it reads if you read it literally."

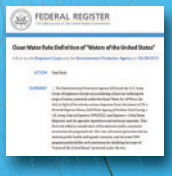
Last month the U.S. Court of Appeals for the 6th Circuit temporarily blocked the rule with a stay, making it unenforceable. Organizations across the country applauded that decision, but with the understanding that it is only a temporary victory.

"The judges expressed deep concerns over the basic legality of this rule," Bob Stallman, president of the American Farm Bureau Federation, said in a statement. "We're not in the least surprised. This is the worst EPA order we have seen since the agency was established more than 40 years ago. The court clearly understood our arguments. Unfortunately, we also know stays don't last forever, and cases

Continued on page 20

JUNE 19, 2006
The Rapanos v. United States Supreme Court case calls into question the definition of the terms "significant nexus" and "navigable waters" as a part of the "Waters of the United States."

2000



APRIL 21, 2014
Citing the confusion from Rapanos v. U.S., the EPA and U.S. Army Corps of Engineers publish a draft of WOTUS for public comment.

MAY 27, 2015
EPA announces new definition of the term "Waters of the United States" will be published in the June 29 Federal Register.

2010

AUGUST 27, 2015
Federal trial judge in North Dakota blocks WOTUS in 13 states, Alaska, Arizona, Arkansas, Colorado, Idaho, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota and Wyoming.

OCTOBER 9, 2015
Cincinnati-based 6th U.S. Circuit Court of Appeals votes 2-1 to stay WOTUS.

AUGUST 28, 2015
WOTUS goes into effect in the 37 other U.S. states.

2020

Continued from page 19

like this almost always take years to win."

So while WOTUS is currently adrift, it hasn't set sail.

"My gut says they'll let things die down — public memory is short," Hicks says. "Then they'll jam it through again."

"I'd say within the next few months, it's possible the stay could be lifted," McGrath told *Golfdom*. "I think there's a good chance of the rule getting defeated in litigation later on, but it'll probably go into effect before that all sorts itself out."

"We weren't part of the process from the very start, and that's something that bothers golf," Helland says. "I think had we been part of the process from the very start, golf could have offered a unique viewpoint. ...We've had a dialogue with the EPA after the rule was first promulgated. At that point you're playing catch-up."

GCSAA's Chava McKeel and Robert Helland last month on Capitol Hill.

Could get crazy

For Chava McKeel, GCSAA's director of government affairs, Waters of the United States caught her eye right away as being a major concern for members of the association.

"When the rule came out, I thought it was a game-changer. I think it ranks really, really high of anything that's happened in the 17 years I've worked (for GCSAA)," McKeel says. "It's something superintendents need to pay attention to."

As Kevin Hicks says, the trouble with WOTUS is its broad, enigmatic definition of bodies of water, and therefore what permits a superintendent might need to be in compliance. For a superintendent like Hicks, who has 3,000 feet of shoreline of Lake Coeur d'Alene to deal with along with a floating green, it's a nightmare. But WOTUS could just as likely keep superintendents up at night in the desert Southwest.

"The rule is aimed at getting the smaller features, that's what the environmentalists are pushing them to go after," McGrath told the attendees at the VGCSA meeting. "It's not the big lakes and ponds, but smaller ephemeral streams. This could get crazy — you might need permits for these smaller features that you previously didn't need."

Though WOTUS currently is under the Court's stay, that doesn't mean it should be forgotten, McKeel warns.

"My message is that WOTUS has been put on hold, but the Clean Water Act has not," McKeel says. "Our superintendents need, as a best practice, to assess the water bodies on their courses; they need to determine which water bodies are Waters of the United States... because when you perform activities in, over, around or near them, it might kick in some obligations to get permits to do those activities."

Gray areas

The WOTUS rule adds four new categories of

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13

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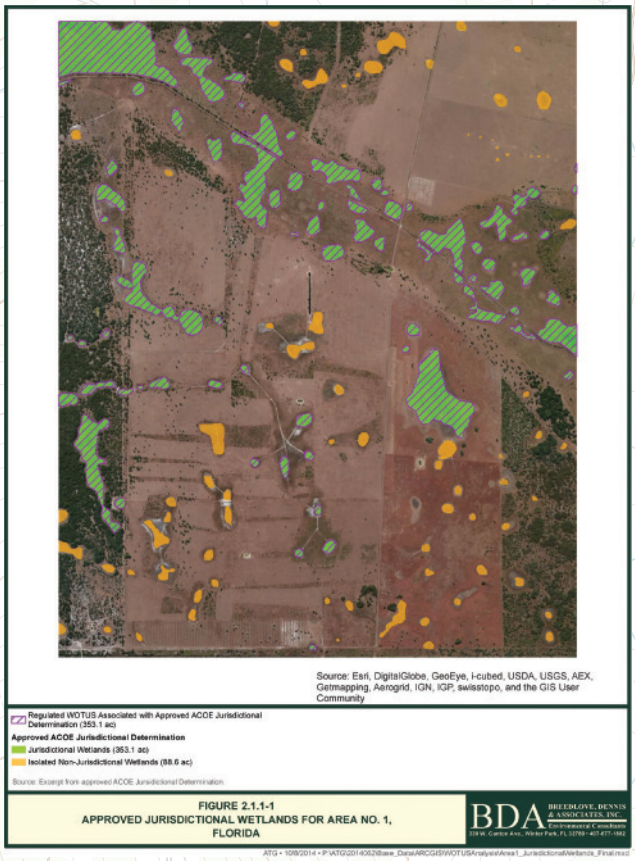

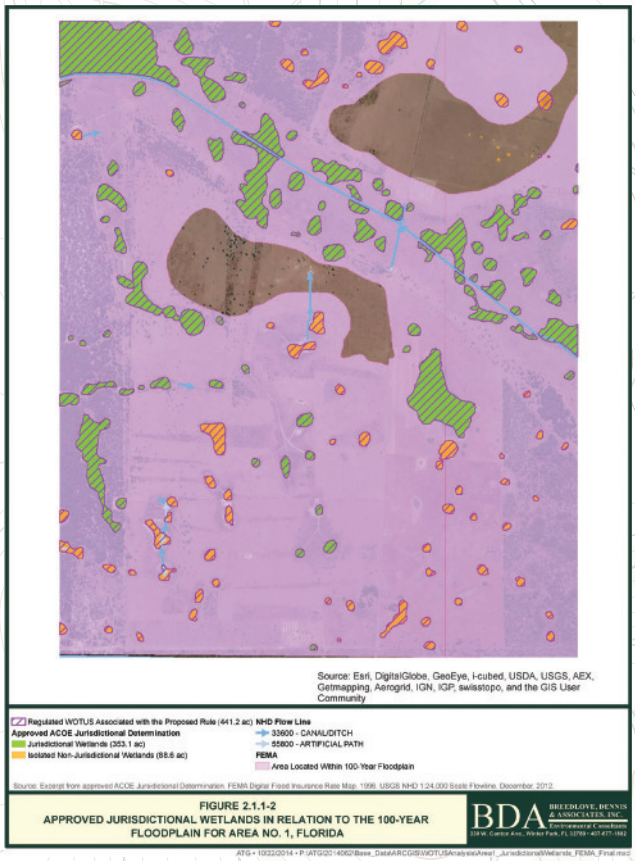

On the left, an aerial view of a jurisdictional determination done in 2013 of a Florida wetlands. On the right, the same image, overlaid with the inclusion of the 100-year floodplain in pink, which would be a new addition to the Waters of the U.S. "I think the fear is, depending on the way agencies interpret and apply (WOTUS), it can be very expansive," McGrath says.

Continued from page 20

water that the EPA and Corps of Engineers can monitor (see sidebar, "Whoa Unto Us," page 24.) The verbiage is complicated ("a significant nexus") and throws into the mix man-made ditches, dried-out creek beds and areas that have "historically" seen water.

"I think you'd be hard-pressed to find a spot on the landscape where you're not, let's say, within 1,500 feet from one of these small features," McGrath says. "I think the fear is, depending on the way the agencies interpret and apply (WOTUS), it can be very expansive."

"Under this rule, there is going to be a lot of differences of opinion as to what is a Water of the United States and what isn't, and that isn't very helpful when you want to have all the permits that you need."

— KERRY MCGRATH

For superintendents, it's very frustrating.

"There's such a gray area, and we don't know how it's going to be enforced," says Brian Palmer, superintendent at Shoreacres in Lake Bluff, Ill. "My course is right on Lake Michigan, and I feel like whomever would be enforcing the rule would be blocking my projects."

Brian Palmer

"I hate it, I absolutely hate it," Hicks says. "To me this seems really rushed. The permitting process isn't defined at all — they don't know if it's going to cost us $50,000 or $250,000. I'm not sure what the goal was, but it's unfortunate that it got this far before someone said, 'Wait a minute, let's see what this is actually doing.'"

Palmer has hired an environmental consultant to make sure everything remains copa-

IMAGE COURTESY: BREEDLOVE, DENNIS & ASSOC.

cetic. "He's up on all the legislation, the necessary forms and when to submit them," he says.

Hicks, meanwhile, wonders how WOTUS would even be enforced.

"There aren't enough resources to enforce this," Hicks says. "If they're going to make a rule and have it this important, and then not have the resources to back it up… I don't see what the point is."

Hicks' biggest concern with Waters of the U.S. isn't the definitions or the money; it's the lack of resources to enforce the rule. That's because part of WOTUS calls for third-party whistleblowers to help enforce it.

"That is the scariest piece of the puzzle," Hicks says. "We've all had neighbors that have an axe to grind with us. That should scare all of us in the golf industry."

Like-minded industries

GCSAA is being proactive in the WOTUS battle. When *Golfdom* interviewed McKeel, she was in D.C., attending meetings of the Water Advocacy Coalition (WAC) and speaking with federal policy makers.

And she wasn't alone.

Robert Helland, GCSAA's new "boots on the ground" advocate, was with her. Helland worked for the law firm of Reed Smith, LLC, and was the association's federal lobbyist for 10 years. Now the association's director of congressional and federal affairs, GCSAA has dissolved its relationship with Reed Smith and hired one of their former aces full-time.

When Helland is speaking against WOTUS he's not alone, he says. WAC isn't dominated by any one group, but includes such powerhouse industries as agriculture, transportation and home builders.

"I'm working hard with like-minded industries that are impacted by this rule to make an effort to basically go back and say, 'Start over,'" Helland says. "Our current efforts are to defund the rule and ask Congress to not put any money toward it until

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PHOTO COURTESY: SCOTT RAMSAY, GGCS

A recent National Golf Day visit to U.S. Senator Pat Roberts' (standing, center) office with a contingent from GCSAA, including Helland, McKeel and Rhett Evans, CEO (seated, left-to-right).

ONLINE EXCLUSIVE
MCGRATH PREDICTS FUTURE OF WOTUS

For a video interview with Washington, D.C.-based attorney Kerry McGrath on all things WOTUS, including her prediction on the future of the ruling, visit **Golfdom.com/exclusive.**

Continued from page 23

we've had an opportunity to involve all the stakeholders and bring them to the table for a better alternative."

Helland says that on the litigation side, which GCSAA is not directly involved with, the courts are currently trying to decide which court is the best one to handle the case.

"It's a bit complicated because the underlying act is complicated," Helland says. "The dust hasn't settled on that yet. I think it could go all the way to the Supreme Court."

McKeel stresses that GCSAA and its partners in WAC aren't looking for freedom from water regulations, but simply a seat at the table.

"There's a need for stakeholders to be a part of the process of developing the rule with EPA and the Corps," McKeel says, "rather than developing something behind closed doors."

Lunch break

The Virginia GCSA Fall Conference has broken for lunch, and following an interview with *Golfdom*TV (visit **Golfdom.com** to see the interview), McGrath sits down to lunch with Virginia GCSA Executive Director David Norman and a handful of his members.

Idle lunchtime chitchat quickly flies out the door. McGrath might as well be behind the podium again, because she's once again taking questions on the topic of WOTUS and what it means for golf courses. She shares superintendents' frustration with the rule, she says.

"It's frustrating, because we'll show these photos of dry creek beds to the policymakers, and ask them, 'Did you mean for this to be included when you wrote this?' And they'll say, 'No, of course not.' And we'll say, 'But you did.'" McGrath says. "The problem is, the people making these policies are so disconnected from what they're trying to regulate… we have to open their eyes for them."

An assistant superintendent raises an eyebrow and says, without even a hint of sarcasm, "Isn't that politics?"

The table falls silent. For the first time, WOTUS makes sense.

Golfdom Associate Editor Grant B. Gannon contributed to this story.

WHOA UNTO US

Under WOTUS, the following categories of waters are subject to federal jurisdiction:

1. Traditional navigable waters
2. Interstate waters
3. Territorial seas
4. Impoundments or otherwise jurisdictional waters
5. Tributaries
6. Adjacent waters
7. Enumerated regional features with a significant nexus
8. Waters in the 100-year floodplain or within 4,000 feet of a water of the U.S. with a significant nexus

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By hosting superintendents on their corporate turf, companies hope to build relationships that will last a lifetime.

BY THE GOLFDOM STAFF

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Companies hosting superintendents on their corporate turf is nothing new. A look back at the *Golfdom* archive shows an event hosted by the Toro Co. featured in the "News of the Industry" section of the January 1975 issue. Toro was offering free tuition for classes ranging from two to nine days about turf equipment maintenance and operation, held at its new training center in the Minneapolis suburb of Eden Prairie.

In recent years, these events seem to have become even more important. The major companies in the business, both iron and chemical, don't want to just meet at neutral locations like at the Golf Industry Show or a local chapter meeting.

No, they want customers to visit them on their home turf.

"Hosting folks like future turf managers, current and potential customers and dealers, industry association representatives, technicians and others in our home city of Charlotte, N.C., is a critical part of our focus on building relationships," says David Withers, president of Jacobsen. "When people get a firsthand look at our products being made and get to meet the talented people that work here, they feel an instant connection to our brand and what we stand for."

Fifty assistant superintendents from the U.S. and Canada travel to Raleigh, N.C., for the Green Start Academy. The event recently celebrated its 10th anniversary.

Learning solutions

The Pinehurst Experience, hosted by BASF, boasts the site of back-to-back U.S. Opens as its home turf. Located at Pinehurst Resort in the Village of Pinehurst, N.C., in the middle of BASF country (the company has several locations in the state), the event now includes research test plots co-hosted by the company and North Carolina State University.

Gary Myers, a former certified superintendent, left the duties of maintaining his own course behind in order to lead the new event. Now wrapping up his second year hosting the event full-time, Myers hosts 34 groups a year, meeting with about 425 superintendents at Pinehurst Resort annually.

"I really enjoy spending time with other superintendents, and I've always been intrigued with trying new products," Myers says. "Being a former superintendent, I feel like I do relate to a lot of these guys. I relate to what they're going through and the day-to-day frustrations that they may have. It's a great opportunity for me to meet new people, but also just talk turf."

It doesn't hurt that the group also gets to play Pinehurst No. 2, one of the top courses in America. But perhaps as exciting to this group of turf pros is the presentation from one of the most well known superintendents in the country, Bob Farren, CGCS, director of golf courses maintenance and grounds for Pinehurst.

"(The best part of the Pinehurst Experience) varies from group to group, but everyone always enjoys listening to Bob's presentation," Myers says. "And hopefully while they're here, they're also learning some solutions to problems, and also networking with guys who might not be from their territory."

"They are trying to prepare us for the next level and get us into that superintendent position," says Nick Alley, assistant superintendent at Baltusrol.

PHOTO COURTESY: JOHN DEERE(TOP)/ PHOTO BY: GRANT B. GANNON

Up-and-comers

It's not only grizzled veterans of the turf industry who are getting these invites. Companies also are looking to the young guns, the up-and-coming assistant superintendents in the industry.

Take, for example, the Green Start Academy. The event, hosted by John Deere and Bayer, brings in 50 assistants from around the country every year.

Ren Wilkes

"These assistants are the best in the business and they also get to spend time with each other," says Ren Wilkes, tactical marketing manager, John Deere. "We had former attendees, Dave (Delsandro, director of U.S.

Continued on page 28

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Open operations and projects, Oakmont Country Club) and Tyler (Otero, superintendent, North Jersey Country Club), back this year and they told me they still talk to some of the guys they attended with. Which I truly think is the best part of the event."

The event isn't a sales pitch, but a chance to teach the young turf pros and make a good impression for the future.

"The presentations on résumés or how to interact with your members, I think that's what surprises attendees the most about the Green Start Academy," Wilkes says. "It's not a lesson on diseases or how to manage the soil. It gives them a whole different idea how to manage the other side of the business. Topics that I think the turf schools are coming around to, but the Green Start Academy teaches them everyday instruction on how to run a golf course."

John Deere has made multiple visits this year with superintendents off-site to Pursell Farms, Sylacauga, Ala., to demo products on its FarmLinks Golf Club.

The Green Start Academy presentations take place over two days at both Bayer's and John Deere's headquarters.

"The Green Start Academy is a great experience because you get everything here," Nick Alley, assistant superintendent at Baltusrol GC, says. "You learn about the business from some of the top guys in the industry, you get to network with your peers and you have a lot of fun."

Nick Alley

Another event looking for youth is the Jacobsen Future Turf Managers event. Each year, 50 students recommended by their professors converge in Charlotte for lectures, a tour of the Jacobsen plant and a ride and drive event. The event has been going on for 30 years, and like others now brings back successful alumni of the event.

"Speaking at the event brought me back to when I was there (as a student) in 2007," Steven Loughran, superintendent at Rock Ridge CC in Newtown, Conn., recalls. "It was nice to see a lot of young faces and pass along a little of my experiences as an assistant and now a superintendent."

The new research test plots in an out-of-play area at Pinehurst Resort include both bermudagrass and bentgrass studies. Previously used as parking for the back-to-back U.S. Opens in 2014, the area now is a living classroom for attendees of the Pinehurst Experience, hosted by BASF. "Both BASF and N.C. State are doing programs, but ultimately N.C. State is doing all the ratings and compiling all the results," Myers says. "It's been a great opportunity for us to work with Dr. Jim Kerns."

Apply yourself

So how do turf professionals get invited to these events?

It helps to apply online and to be available to take a few days away from the course. Most events are seeking willing participants.

"A lot of people get invited by their local sales rep," Myers says. "But really, anybody can be invited — we're open to everybody."

PHOTOS BY: GRANT B. GANNON; SETH JONES (BOTTOM)


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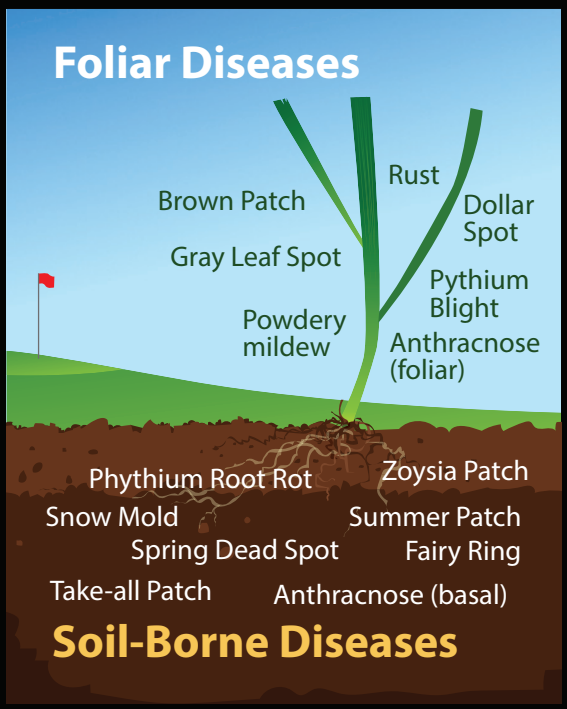

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Root Uptake	✓	✓	X
Translaminar	✓	✓	✓
Redistribution	✓	✓	X
Rainfastness	15 mins.	4 hr.	1 hr.
Plant Health Claims	✓	✓	✓
Xylem Mobile	✓	✓	✓
Granule form. Available	✓	✓	X
Preventative Control	✓	✓	✓
Curative Control	✓	✓	✓
Labeled Dollar Spot Control	✓	X	suppression
Labeled Pythium Root Dysfunction Control	✓	✓	✓
Labeled Pythium Root Rot Control	✓	✓	X
Labeled Pythium Blight Control	✓	✓	✓

Sources:

1) W. Barlett, D. et al. (2001). Understanding the Strobilurin Fungicides. The Royal Society of Chemistry, Pesticide Outlook—August 2001, p143-148.

2) Labels of Insignia 20DF, Heritage 50WG and Heritage TL; Collected from manufacturers' website in August, 2015.

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Super Science

// A WHIFF OF WEEVILS

SNIFFING OUT ANNUAL BLUEGRASS WEEVILS

By Ben McGraw, Ph.D.

The annual bluegrass weevil (ABW) is the most destructive insect pest of golf course turf in the mid-Atlantic and northeastern United States and eastern Canadian provinces. The insect is believed to be native to North America, yet damaging populations continue to spread outward annually from the New York metropolitan area, the site of its initial detection in the late 1950s.

Detecting ABW populations in unreported areas is essential to preventing unexpected turf loss, limiting its spread into new regions and in our understanding of the how this pest is evolving. However, using traditional sampling techniques (e.g. soil sampling, soap flushing) are not a practical approach in early detection, given the small size of the insect, its cryptic nature and the spatial scale of a golf course.

An adult beagle detects hidden samples of ABW in a controlled field trial at the Penn State turfgrass research center.

The Turfgrass Entomology Lab at Pennsylvania State University has been exploring the use of scent-detecting canines as a means to locate weevils. Canines have long been used in the location of specific odors, though only recently have efforts focused on insect pests. Dogs have the advantage of relying on olfaction rather than vision, so they are capable of searching large areas efficiently and have a greater probability for detecting low-density populations.

ABW adults were provided regularly throughout the season to canine handlers in order to train a four-year-old male beagle. Our first trial assessed the dog's ability to discriminate between ABW and non-target odors (Japanese beetle, *Poa annua* blanks) in fairway-height turf. The dog was led by its handler through different areas containing conical tubes housing the adult weevils. We assessed the dog for accuracy in alerting to ABW, as well as the total time spent searching. Results indicated that the dog was capable of discriminating between ABW and non-target odors (positive alerts exceeded 75 percent). After another month of imprinting, the dog assessed in a second controlled field trial in both rough- and fairway-height turf. The dog demonstrated improved success at locating the hidden weevils (88 percent) and was not affected by the height of the turf canopy.

Future studies will examine the ability of canines to detect different ABW life stages as well as the ability to locate adult populations in overwintering sites. It's our hope that the research will assist in our understanding population locations within a golf course, as well as within the greater region.

Ben McGraw, Ph.D., is a turfgrass entomologist at Pennsylvania State University. Ben can be reached at bam53@psu.edu for more information.

PHOTO BY: BEN MCGRAW, PH.D.

NEWS UPDATES

AUBURN UNIVERSITY RELEASES BENTGRASS VARIETY 'AU VICTORY'

The first bentgrass released by Auburn University's turfgrass research team, AU Victory for putting greens, is developed to thrive in high humidity and heat.

Edzard van Santen, a professor in the department of crop, soil and environmental sciences who specializes in plant breeding and genetics, says that AU Victory is a survivor of collections made from putting greens during prolonged summer droughts. He describes his approach to developing AU Victory as part "tough love" and part "survival of the fittest."

"Bentgrass is desirable for golfers because it helps the ball run true and fast, but managing it can be a challenge," van Santen says. "The big difference we see in AU Victory compared to other bentgrass varieties is root mass. It has many more roots, and they are deeper than in other cultivars. That's the direct result of tough selection for drought resistance."

Other favorable characteristics of AU Victory include quick establishment, even at low seeding rates, and good color and turf quality during late-summer stress periods.

Van Santen says he and other researchers are already working on the second and third generations of AU Victory.

> "THE ADDITION OF ORGANIC MATTER TO SAND ROOT ZONES CAN DECREASE HYDRAULIC CONDUCTIVITY BY A FACTOR OF 10 TO 100."
>
> **Glen R. Obear**
>
> *(see full story on page 32)*

//A NEW LOOK

Sand greens and sodium

Understanding base cations and hydraulic conductivity of sand root zones

By Glen R. Obear and Douglas J. Soldat, Ph.D.

Irrigating turfgrass with water containing high concentrations of sodium can present significant agronomic challenges. Sodium promotes clay swelling and dispersion, resulting in a decrease in the hydraulic conductivity or rate of water flow through the soil.

However, our understanding of sodium hazard comes from research focused on soils with moderate-to-high clay content. Many modern putting greens are constructed with sand and contain less than 3 percent clay by weight. Therefore, the findings of previous sodium hazard studies may not apply to sand-based root zones with low clay content.

The percentage of sodium on soil cation exchange sites, referred to as the exchangeable sodium percentage (often abbreviated as ESP), provides a measure of sodium hazard in soil. The generally accepted exchangeable sodium percentage threshold of 15 for sodic soils may overestimate sodium hazard in sand-based putting greens.

Research provided and funded by USGA.

In a 1978 study, increasing exchangeable sodium percentage had no effect on a soil containing 2.9 percent clay. In another study, increasing exchangeable sodium percentage actually resulted in an increased hydraulic conductivity of a soil with 3.1 percent clay. The authors suggested that sodium initially caused the clay to disperse, and then the clay leached out of the profile as water continued to infiltrate. Yet another study concluded that the risk of effluent irrigation water with respect to hydraulic conductivity is low for sandy soils. While these studies have focused on sandy soils with relatively low clay content, the soils were likely not representative of putting green root zones. The fastest conductivity reported in the 1978 study was 1 inch per hour, which is still substantially slower than that of putting green root zones.

Sand putting green soils have low clay contents and are therefore unaffected by sodium.

PHOTO BY: GLEN OBEAR

While Mg^{2+} and Ca^{2+} traditionally have been lumped together as having a positive impact on soil structure and water infiltration, there is some evidence that Mg^{2+} may reduce hydraulic conductivity due to Mg^{2+} having a larger hydration shell than Ca^{2+}. Clay swelling and dispersion were found to decrease hydraulic conductivity in clay-rich soils with 90 percent exchangeable Mg^{2+}, but exchangeable Mg^{2+} is unlikely to reach such high levels in field soils. Since clay swelling and dispersion are likely not problematic in sand-based root zones with low clay content, Mg^{2+} would not be expected to negatively affect K_{sat} of sand-based putting green soils.

Proponents of the base cation saturation ratio (BCSR) suggest that maintaining a ratio of 65 percent calcium to 10 percent magnesium (exchangeable Ca:Mg ratio of 6.5:1) will provide benefits to soil physical properties, but a 2007 review concluded that these claims are unfounded. In fact, a 1986 study showed that hydraulic conductivity was unaffected by ratios of exchangeable Ca:Mg ranging from 0.5 to 2.5. No studies have examined how the exchangeable Ca:Mg ratio affects hydraulic conductivity in putting green root zones.

Sand-based putting green root zones often are amended to increase nutrient and water holding capacity, and these amendments affect hydraulic conductivity depending on their incorporation rates and physical properties. The characteristics of different soil amendments could influence how sodium or magnesium affects hydraulic conductivity for a given root zone mix. In the presence of sodium, clays with 2:1 minerals such as montmorillonite are more prone to swelling and dispersion than 1:1 clays like kaolinite, which do not shrink or swell. Some sand root zones are amended with calcined clay (e.g., Profile), which is

Turfgrass cover can be reduced by high salinity, but if the soils are sand based, sodium will not cause infiltration problems.

physically stable and not susceptible to swelling or dispersion. Because this amendment doesn't readily disperse, the hydraulic conductivity of sand root zones amended with calcined clay should be unaffected by sodium and magnesium.

Sand root zones also are amended with organic materials such as sphagnum peat and peat humus. Organic matter dispersion could result in pore clogging and reduced infiltration rates. Organic matter also can enhance clay dispersion in sodic soils. However, it's unclear whether sodium or magnesium will reduce hydraulic conductivity of sand amended with peat materials, especially at relevant incorporation rates (10 percent to 20 percent by volume).

The objective of this research was to study the effects of sodium and magnesium on hydraulic conductivity of sandy soils. Specifically, this study was designed to evaluate how exchangeable Na^+, exchangeable Ca:Mg ratio, soil clay content and soil amendments used for construction affect the hydraulic conductivity of sand-based putting green root zones.

PHOTO BY: BRIAN WHITLARK, USGA GREEN SECTION

TABLE 1

Characteristics of blended sand root zones

Root zone description	Blend ratio	Bulk density	Estimated CEC	Clay content
	by volume	g cm^{-3}	cmolc $kg\ soil^{-1}$	percent by weight
Non-amended sand †	1:0	1.71	1.5	0.5
Sand/sphagnum peat ‡	4:1	1.48	2.5	0.7
Sand/Profile §	4:1	1.51	2.3	0.7
Sand/loam #	4:1	1.71	3.0	4.8

† Waupaca Sand and Gravel, Waupaca, Wis.
‡ Sun Gro Horticulture, Agawam, Mass.
§ Profile Products, LLC, Buffalo Grove, Ill.
# Bt horizon of Dresden silt loam (fine-loamy over sandy or sandy skeletal, mixed, active, mesic Mollic Hapludalfs)

TABLE 2

Saturating solution mixtures of NaCl, $CaCl_2$, $MgCl_2$, and KCl

Treatment no. †	Na^+	Ca^{2+}	Mg^{2+}	K^+	SAR †
	$mmol_c\ L^{-1}$				
1	0	30	5	2	0
2	7	25	3	1	2
3	12	21	3	1	3
4	23	12	1	1	9
5	35	2	0	0	35
6	37	0	0	0	∞ ‡
7	185	0	0	0	∞
8	0	5	30	2	0

† Sodium adsorption ratio = $[Na^+] / ([Ca^{2+}]+[Mg^{2+}])/2)^{½}$; values in $mmol_c\ L^{-1}$
‡ Solution contains no Ca^{2+} or Mg^{2+}; SAR = ∞

METHODS

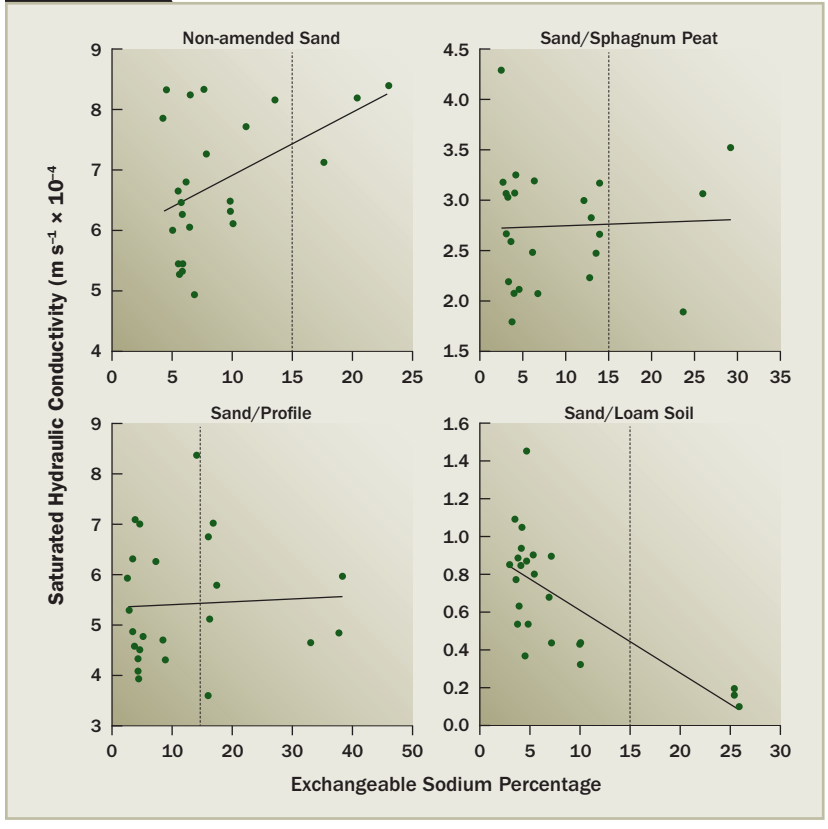
Calcareous sand (Waupaca Sand and Gravel, Waupaca, Wis.) was blended with three different amendments (Table 1) in a double-barrel rotating mixer and packed into metal sleeves (7.6 cm in diameter, 7.6 cm in height). A non-amended sand also was included in the experiment. The clay content of root zone mixtures was measured using the hydrometer method. The packed metal sleeves were placed in 12-L plastic tubs and allowed to equilibrate for 48 hours in a range of solutions of differing ratios of sodium chloride, calcium chloride, magnesium chloride and potassium chloride (Table 2). Solution treatments 1 through 7 were designed to increase sodium saturation. Treatment 8 was designed to increase exchangeable Mg^{2+} relative to Ca^{2+}. Each root zone mixture and saturating solution treatment combination was replicated three times.

After equilibration in the appropriate

Continued on page 34

Salt buildup at the soil surface. The salt only accumulates where turf is sparse and algae are the dominant surface cover.

FIGURE 1



EXCHANGEABLE SODIUM PERCENTAGE EFFECTS Saturated hydraulic conductivity of four root zones as affected by increasing exchangeable sodium percentage. Dotted lines indicate the generally accepted exchangeable sodium percentage threshold of 15 for soil sodicity problems. Dots are the saturated hydraulic conductivity from each replicate of all of the eight treatments for each root zone mix.

Continued from page 33

solutions, the soil columns were rinsed with two pore volumes of deionized water, and hydraulic conductivity was measured by the automated falling head permeameter method. Following the measurement of hydraulic conductivity, soils were oven dried at 105 degrees C, homogenized, and then analyzed for base cation content by a pH 8.5 ammonium acetate extraction. Cation exchange capacity values were estimated by summation of base cations. A generalized linear model was used to determine whether exchangeable sodium percentage or the exchangeable Ca:Mg ratio had a significant effect on hydraulic conductivity for each root zone mixture.

RESULTS AND DISCUSSION

Saturating the sand columns in the different solutions described in Table 2 created a range of exchangeable sodium percentage in each soil. Sodium only affected the saturated hydraulic conductivity of the non-amended sand and sand/loam root zones, despite exchangeable sodium percentages above the generally accepted threshold of 15 percent (Figure 1). Neither the sand/sphagnum peat nor the sand/Profile blends were affected by increasing exchangeable sodium percentage. The sand/sphagnum peat and sand/Profile root zones met the USGA particle size recommendations for putting green construction and contained only 0.7 percent clay. The findings from this study suggest that sodium will not negatively affect putting green soils with low clay content, including those constructed to USGA recommendations.

The hydraulic conductivity of the non-amended sand actually increased as exchangeable sodium increased. Increasing the exchangeable sodium percentage may have initially dispersed the small amount of clay (0.5 percent) that was present, allowing the clay to easily migrate through the soil and leach out with the drainage water. Other

PHOTO BY: GLEN OBEAR

authors have reported similar findings and have suggested that plugging of pores in sandy soils is unlikely in soils with low clay content.

The hydraulic conductivity of the sand/loam soil blend decreased with increasing exchangeable sodium percentage, which agrees with our general understanding of sodium behavior in soils. This soil contained 4.8 percent clay and did not meet USGA particle size recommendations. This treatment was included in the study as a positive control. The fact that we observed a decrease in hydraulic conductivity with increasing exchangeable sodium shows that our method of soaking the soils in different solutions and measuring hydraulic conductivity was working correctly. The findings from this positive control also strengthen our conclusions. Under identical experimental conditions, we observed that increasing exchangeable sodium does not reduce hydraulic conductivity in soils with low clay content.

The vast majority of sodium hazard studies are focused on short time scales. In putting greens, it's unclear how long-term factors such as organic matter accumulation would affect clay dispersion and leaching over a timescale of months to years. The addition of organic matter to sand root zones can decrease hydraulic conductivity by a factor of 10 to 100. On the other hand, clay dispersion and leaching during heavy rainfall events could result in a decrease in soil clay content over time, potentially increasing hydraulic conductivity. However, this effect will likely be masked by the decrease in hydraulic conductivity that occurs as surface organic matter accumulates over time.

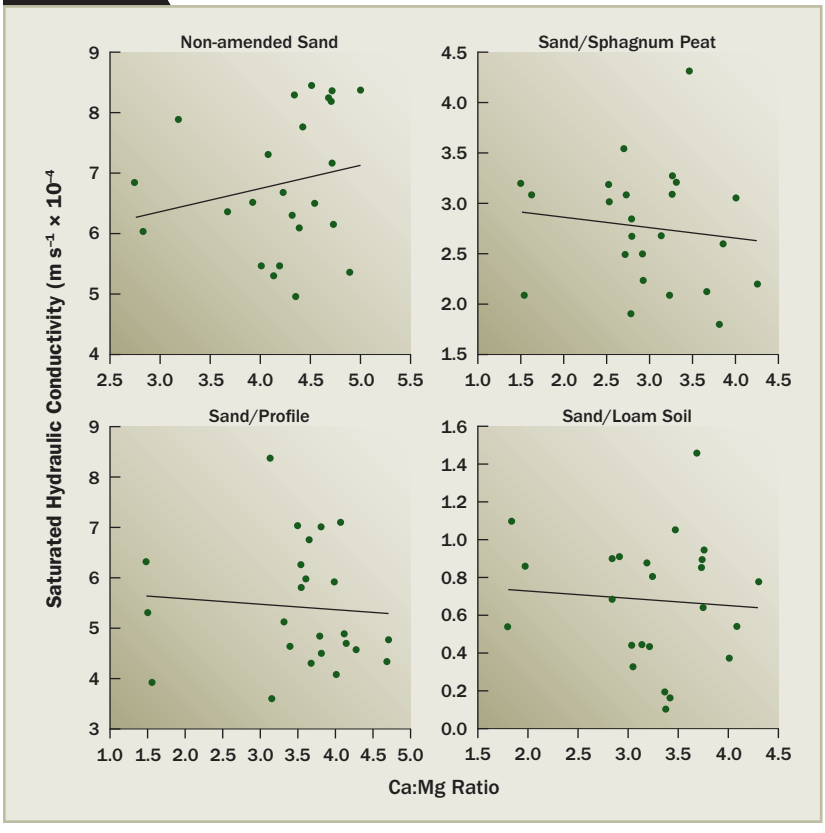
Saturating the soils in the different solutions described in Table 2 created exchangeable Ca:Mg ratios ranging from 1.5 to 5.0, but the Ca:Mg ratio had no effect on hydraulic conductivity for any of the four soil blends (Figure 2, page 36). Our findings are consistent with researchers who concluded that there is no scientific evidence to support the claims that maintaining specific exchangeable Ca:Mg ratios will improve soil physical properties, including hydraulic conductivity.

CONCLUSIONS

Interpretations of water quality parameters often do not take soil properties into account. As such, recommendations for the hazard level of certain water quality parameters may under- or overestimate risk. Linking soil

Continued on page 36

FIGURE 2



EXCHANGEABLE CA:MG RATIO EFFECTS Saturated hydraulic conductivity of four root zones as affected by the exchangeable Ca:Mg ratio. Dots are the saturated hydraulic conductivity from each replicate of all of the eight treatments for each root zone mix.

Continued from page 35

properties to water quality parameters allows more accurate recommendations for the end-user, potentially saving time, money and valuable resources.

The results of this research suggest that evaluations of the sodium hazard of irrigation waters need to account for clay content in the soil. In the case of sand-based putting green root zones, which often have very low clay content, increasing exchangeable sodium percentage well above the standard sodicity threshold of 15 percent had no effect on hydraulic conductivity. The findings from this study suggest that the application of soil amendments for remediation of sodic soils (e.g., gypsum) would be warranted only for sodic soils with higher clay content, and will not provide significant benefits to drainage of sand-based putting greens. Finally, our findings suggest that the exchangeable Ca:Mg ratio has no effect on hydraulic conductivity in sand putting green root zones.

Acknowledgments

Another description of this study was published in the journal Soil Science *(2014; 179:376-382). This research was funded by the United States Golf Association and the Wisconsin Turfgrass Association. We would like to thank Rob Johnson from Waupaca Sand and Gravel for donating the soils and amendments used in this study. We also thank Norm Hummel, Ph.D., for donating physical analyses of the soils in this study.*

Glen Obear is a Ph.D. candidate at the University of Nebraska-Lincoln, and Doug Soldat, Ph.D., is a turfgrass scientist at the University of Wisconsin-Madison. Glen can be reached at glenobear@gmail.com for more information.

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Ad Index

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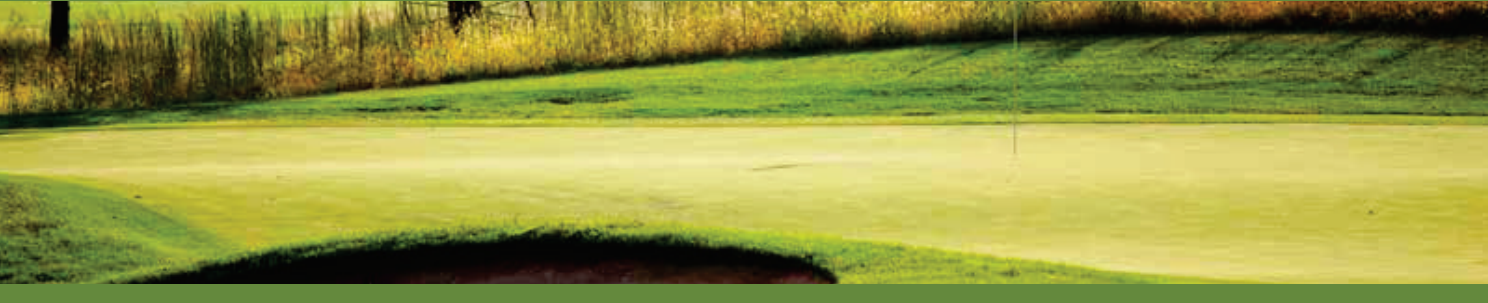

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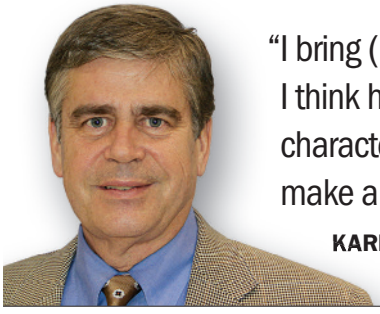

"I bring (Keith Happ) up because I think he represented the characteristics and qualities that make a good USGA agronomist."

KARL DANNEBERGER, PH.D., *Science Editor*

A call to duty

In 1920, Inverness Country Club, Toledo, Ohio, played host to the U.S. Open. At the time, the greens chairman complained about — or maybe brought to light — the lack of an impartial source of agronomic information for maintaining a golf course. Later that year, the USGA founded its Green Section. Since then, the USGA has funded more than $40 million in research grants to improve golf course turf.

In 1953, the Green Section implemented its on-course agronomic consulting service. Fred Grau, Alexander Radko, Marvin Ferguson, Ph.D., James Moncrief and William Bengeyfield are just a few of the names associated with the first generation of Green Section agronomists. I'm fortunate enough to have met many of these legends.

The USGA agronomists that I consider my contemporaries include Jim Snow, Stan Zontek, Pat O'Brien, David Oatis, Bob Brame, Bob Vavrek, Larry Gilhuly, Michael Kenna and James Moore, just to name a few. These individuals share the USGA Green Section commitment to providing golf clubs and superintendents with an informed opinion based on unbiased research.

Twenty-some years ago I was at a meeting in Scotland where Jim Snow was speaking to greenkeepers. At that time, the attitude toward American golf course management among this audience was not good. The view was that golf maintenance should follow the philosophy of links-style golf. Jim was being aggressively challenged on how American courses were being managed. Jim's ability to clearly state how and why American golf courses are what they are was something to behold. Jim exhibited the personal qualities expected of a USGA agronomist.

What are those personal qualities? How can I describe them?

The last week of October, USGA agronomist Keith Happ passed away at much too young an age. I bring Keith up not because he was a good friend — which he was — or because he was a former student — which he was. I bring him up because he represented the characteristics and qualities that make a good USGA agronomist.

Keith had been a superintendent in the Cleveland area before attending The Ohio State University. He had achieved CGCS status and served on several local and national boards. By any measure, Keith was a successful superintendent.

However, with the encouragement of his wife, Keith gave up all that to pursue a college degree. He moved to Columbus with his wife and 18-month-old son. His class load was grueling. His schedule exceeded 30 credit hours a quarter. Even with a schedule like this, he found time to be a husband and father, work 40 hours a week and mentor students. Keith was a leader among students, even if they weren't turfgrass majors. He counseled them about résumés, interview preparation, what to look for in jobs and almost anything else that a college student worries about.

Keith graduated in six quarters — 18 months — which was something unheard of, with a GPA of 3.97 out of 4.0. He was one of only four students recognized at spring commencement by the university's president for outstanding undergraduate accomplishments. Upon graduation, Keith applied for an agronomist position with the USGA, which is the reason I believe he came back to school. Keith finished second. Keith had told me that if the interview didn't work out he would accept my offer to graduate school.

A few months after starting graduate school, Keith told me that Jim Snow and Stan Zontek had called and offered him a USGA position, but he was going to turn it down. I asked him why, given being a USGA agronomist was his dream job. "I promised you I would complete this project," he said.

I told Keith to take the position.

Keith represented the qualities found in a USGA agronomist — intelligence, dedication, focus, honesty and a sense of duty. As the holiday season approaches and we count our blessings, one of those blessings for the golf industry is the USGA Green Section.

Karl Danneberger, Ph.D., *Golfdom*'s science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.

Discussing bunker liners

Jim Moore is director of education for the USGA Green Section. He has more than 30 years of experience in golf course maintenance and construction, and during his career with the USGA he has visited hundreds of golf courses in the United States and internationally. Jim can be reached at jmoore@usga.org for more information.

Q What is the function of an ideal bunker liner?

The No. 1 function of all bunker liners is to protect sand from contamination by soil beneath and soil on the faces of bunkers. An effective bunker liner prevents soil from eroding and contaminating the sand. By keeping the soil in place, the sand remains clean and water moves rapidly through non-contaminated sand, reducing washouts. The liner also protects soil from clogging the drainage system beneath the bunker.

It's important to recognize that no bunker liner completely eliminates washouts. The liners may reduce the severity and extent of washouts, but there will be washouts to fix if a severe storm occurs.

Q In what situations would you recommend bunker liners to a superintendent?

Superintendents should consider bunker liners when:

1. Design of the bunker and the area surrounding the bunker requires the bunker to take in a large quantity of water.

2. Protection of the investment in bunker sand is desired. Bunker sand can range from $30 to more than $100 per ton delivered, depending on the source, quality and transportation of the sand. The lifespan of bunker sand can be as short as months to a few years if severe storms occur shortly after the sand is installed.

> "It's important to recognize that no bunker liner completely eliminates washouts."

3. Bunkers are prone to erosion. Spend the money on a quality liner and a professional installation on bunkers prone to erosion. It may not be necessary to install a liner in every bunker on the golf course.

4. The frequency and severity of storms in the superintendent's geographic region is high. If severe storms and/or abundant rainfall are common, a bunker liner makes sense to prevent sand from becoming contaminated.

Q When are bunker liners not needed?

Situations where the expense of bunker liners may be difficult to justify include:

1. Golf courses with flat-bottomed bunkers and slight or no slope on the bunker faces. Little movement of the sand occurs in these bunkers, which reduces the risk of contamination.

2. Arid climates with infrequent intense storms.

3. Depending on the tolerance of the bunker liner to machine raking. If your golf course depends heavily on machine raking of bunkers, investigate thoroughly how the liner will stand up to potential damage from the machine. All liners tolerate hand raking.

4. They provide no benefit. A bunker liner will not prevent contamination from dust and debris blown into the bunker. If part-circle irrigation heads surrounding the green are adjusted so they start and end their pass over a bunker, washouts and contamination still are a problem.

Q How should a superintendent decide which bunker liner to purchase?

To my knowledge there has been no side-by-side comparison of bunker liners in the field by an unbiased third party. The good news is that the marketplace is effective in weeding out inferior products. According to the feedback I receive from superintendents, the top three or four bunker liners perform well.

If you are considering installing bunker liners, visit golf courses in your location that are similar to your golf course and find out how its bunker liners have performed.

Q Is there anything else you would like to add about bunker liners?

For the greatest probability of success, have the bunker liner installed by an experienced, reputable and professional installer. Their experience is worth the expense.

No bunker liner will solve all problems associated with bunkers. Bunker sand quality always will be subjective, and golfers never will agree on the quality of sand in the bunkers.

Clark Throssell, Ph.D., loves to talk turf. Contact him at clarkthrossell@bresnan.net.

The 19th Hole

Chris Harriman

SUPERINTENDENT // Cattail Creek Country Club, Glenwood, Md.

What are you drinking? Something dark off the tap… an IPA.

You went to both Auburn and Penn State? I got my undergrad from Auburn, Masters from Penn State online. I was an assistant at Chevy Chase Club when I got my Masters; it was real continuing education. It was like, we should be reading this stuff anyway… I just had to pay for it and I got a degree for doing it. It was very worthwhile.

What made you choose Auburn? The weather was perfect and there were eight courses in town we could rotate around and play, and the No. 1 intramural sports program in the NCAA.

So you're an Auburn fan? I enjoy watching Auburn at all sports. And whomever I was in college with — Jason Campbell, Karlos Dansby — wherever those guys end up, I like seeing their teams win.

Did you ever end up at the same keg party as Jason Campbell? Sometimes you'd see them around. It wasn't like they were in class very much. They weren't exactly in the ag building.

Tell me something unique about Cattail Creek. We've got bentgrass fairways, but only 18 acres of it. Four inches below the surface is solid rock, everywhere. I don't know how they built it. They had a huge rock trencher to put the irrigation in. We'll never be redoing the irrigation system.

Favorite TV show growing up? We watched Seinfeld all the time; we were just quoting it yesterday, when Kramer is hitting golf balls into the ocean and one gets stuck in the whale's blowhole. "Well, is that a Titleist?"

You're the president of the Mid-Atlantic GCSA. How active is the group, and what's the hot topic among the guys? It's very busy; we've got a good group of core guys. It's hard to get everybody out because the hot topic is how to keep your golf course alive. Cool-season grass in the Mid-Atlantic; it's a tough go-around, no matter what the weather is.

Where is your Thanksgiving dinner? At our house because I like to cook everything. We do a nice juicy turkey, and the best thing is cooking the stuffing in the crockpot. Do it all beforehand and put it in the crockpot, you get to smell it all day, and you don't have to worry about it when things are coming to a head at the end.

Fill in the blank: It's a good day at the golf course when _____? When I have more golf balls in my bag when I end than what I started with. And not having my driver snapped in half — I've snapped a number of them. ***From swinging too hard or out of frustration?*** Both.

As interviewed by Seth Jones, Oct. 27, 2015.

MAIN PHOTO BY: SETH JONES / ISTOCK.COM (CROCKPOT, BEER, WHALE) / WIKI COMMONS

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The POGO system doesn't just record and present raw data. Because your time is limited, you really want an *analysis*—what does the data mean? What should you do?

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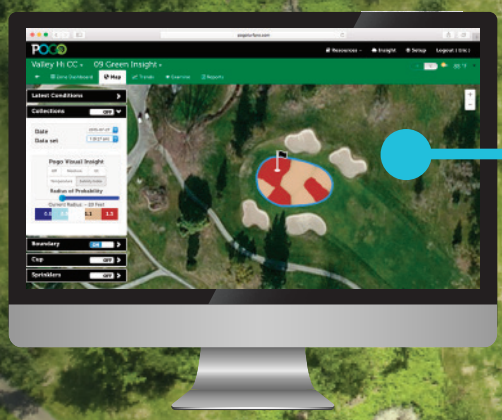
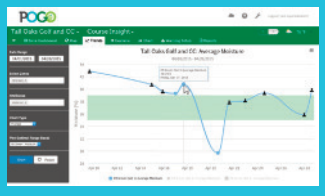
Turf conditions for entire areas, even interpolated between samples, are illustrated with color-coded areas on an aerial image of your property. See variations of moisture, salinity, canopy temperature and more across every zone of your property, and understand the effects of their interaction.



Real time visual analysis of salinity concentration

Visual Insight sees black layer forming before you do.



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