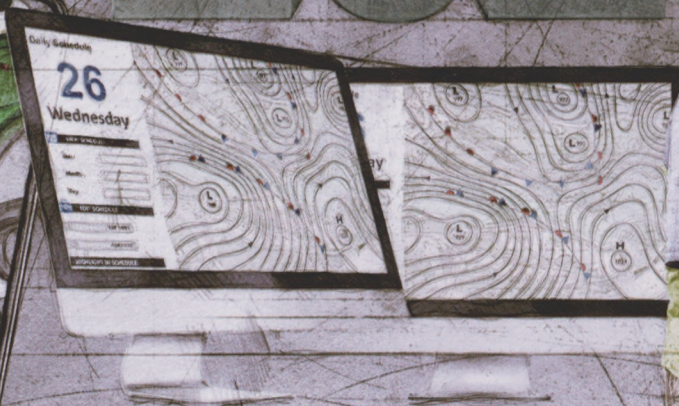


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GOLF COURSE INDUSTRY



TURF TECH INTO THE 2020S



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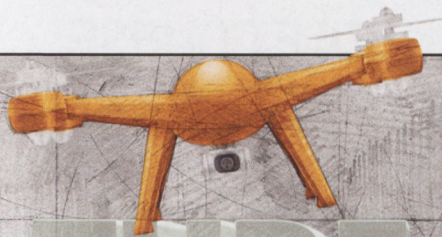
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A Deeper Respect



TURF TECH INTO THE 2020s



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THE ANSWER MIGHT NOT BE BIG

Location: Every trade show floor or lobby since 2017

Participants: A quartet of golf course superintendents

Superintendent A: How are things going at the course?

Superintendent B: Can't find labor. Nobody wants to work.

Superintendent C: Same thing for me. People are spending too much time on their phones these days.

Superintendent D: Yep. The robots can't get here fast enough.

Well, the robots were here on a few North American courses. Now, they are gone – at least temporarily. Cub Cadet's decision last month to halt production and eventual support of its RG3 autonomous greens mowers staggered an industry struggling to adapt to emerging technology.

Other manufacturers, most notably John Deere and Toro, are developing autonomous mowers. ETA is TBD. Even after arrival, adoption could be methodical. Initial cost and trust in autonomous technology are still gigantic barriers. Superintendents don't own the businesses they represent. Not only must they be convinced a new technology works, they must persuade owners, members, boards and general managers that entrenched operational models are worth altering.

Matt LaWell's cover story explores technology superintendents introduced at their respective courses in the 2010s and peeks ahead to the 2020s. As LaWell prepared to file his story, he received the news of Cub Cadet's withdraw from the autonomous golf mowing segment. LaWell accomplished what humans still do better than any machine: he quickly adapted and completed the job.

Soil moisture meters, drones and digital job boards yielded efficiencies as golf endured shrinking budgets caused by the Great Recession and a subsequent labor crunch following the economic recovery this past decade. GPS sprayers were introduced in the middle of the decade, but superintendents didn't begin pushing for them until the end of the decade. Manufacturers also made advances in mowing, irrigation and plant protection, although purchasing updated equipment, controllers and chemistries requires less of a mindset change than adding unfamiliar technology to an operation.

Where does this leave the industry in the next five years? Something already here could solve the dilemma posed in hallway conversations before reliable robots arrive.

People still want to work. They just want to work in different ways. They want flexibility and supplemental income. Some want to work 30 straight days. Others want to work between classes or another job. Some want the option of working in multiple industries.

A device you already have will connect you to these potential employees. You can grab a ride, get groceries delivered and score a date via a smartphone. Have you thought about using it to find employees to rake bunkers on member-guest weekend or help with in-house drainage projects?

Training, liability, payment, crew cohesion, tax structures and scheduling are among the hurdles with integrating the gig workforce into golf course maintenance. But once platforms emerge that connect employees seeking flexibility to green industry jobs, the possibilities for solving the dilemma posed in hallway conversations expand. Imagine the possibilities if 10 percent of the 24 million Americans who play golf express interest in flexible golf jobs, including maintenance. Few gig economy positions offer a perk comparable to golf privileges.

The robots aren't here – yet. The people are here and millions are adjusting to new ways of finding work for adaptable bosses. Fortunately, smartphones are also here. The industry hasn't come close to using such small devices to their full potential. **GCI**



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GOLF COURSE INDUSTRY

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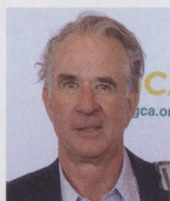
NOTEBOOK



Tartan Talks No. 44

A powerful story about Pete Dye's impact on a determined and talented architect is the subject of a second straight Tartan Talks episode.

Bobby Weed joined the podcast between educational sessions at the Golf Industry Show, where Dye's life and career were honored as part of the ASGCA Winter Meeting. Weed first met Dye at Amelia Island (Florida) Plantation in the mid-1970s and the duo's relationship spanned more than 40 years.



▲ Weed

"I think what drew me to Pete was his unending work ethic and his desire and enthusiasm for building golf courses," says Weed, a longtime GCSAA and ASGCA member. "He liked anybody and everybody who worked hard and had an interest and passion for the game. Being around him was very infectious. It drove you to new levels."

Weed established his own design firm in 1994 and parlayed his experiences with Dye into numerous solo assignments throughout the Southeast, including the new GROVE XXIII, a South Florida private club whose majority partner is basketball great Michael Jordan. Lessons absorbed from Dye still influence nearly every design and personnel management decision Weed makes. "There was never a golf hole that he didn't think could be improved upon," Weed says.

The podcast with Weed follows last month's conversation with Brian Curley, who worked with Dye on multiple West Coast projects. Enter bit.ly/BobbyWeed into your web browser to hear Weed speak about Dye.



Seeking an outstanding student scholar

Golf Course Industry and our parent company, GIE Media, are again supporting a scholarship for an outstanding student focused on leading the golf industry.

GIE Media is awarding the \$2,500 Stanley Zontek Memorial Scholarship, an unrestricted grant that supports a turf student with a passion for the game. Selection criteria include academic performance, advisor/superintendent recommendations and an essay about why the student is passionate about a career as a superintendent.

The award honors Stanley J. Zontek, the former director of the USGA Green Section's Mid-Atlantic Region. Zontek died after suffering a heart attack at age 63 in 2012.

Enter <http://bit.ly/Zontek2020> into your web browser for an application form. The deadline to apply is Monday, April 13.

INDUSTRY buzz

The **USGA** announced it will fund 73 research grants totaling nearly \$2 million in 2020 to help courses improve the golfer experience while reducing the consumption of key resources. The **USGA Turfgrass and Environmental Research Program**, one of several continuous efforts led by the Green Section, which was founded in 1920, has invested more than \$41 million into programs to enhance course conditions and help superintendents.

Princeville Makai Golf Club, located on the North Shore of Kauai in Hawai'i, ended the distribution of single-use plastic water bottles at the grill and on beverage carts. Officials estimate that the club and guests were using approximately 100,000 plastic bottles each year.

The **Musser International Turfgrass Foundation** selected **Garett C. Heineck** as its 2020 Award of Excellence recipient. Heineck earned his doctorate from the University of Minnesota and wrote his dissertation about methods for perennial ryegrass breeding. The award is given to outstanding doctorate candidates in the final phase of their graduate studies who demonstrate overall excellence throughout their doctoral program in turfgrass research.

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SPREAD THE GOODNESS OF GOLF

Hardy Greaves, the boy who learned about life through golf in the 2000 movie *The Legend of Bagger Vance*, had an early appreciation for the game.

"You really love this game, don't you," local golfing legend Rannulph Junuh (Matt Damon) asks Hardy.

"It's the greatest game there is," Hardy (J. Michael Moncrief) shoots back.

"You really think so?"

"Ask anybody. It's fun. It's hard and you stand out there on that green, green grass, and it's just you and the ball and there ain't nobody to beat up on but yourself," Hardy says, adding for proof the example of a club member whose incurable golf swing has broken his toe three times, but who keeps coming back for more. "It's the only game I know that you can call a penalty on yourself, if you're honest, which most people are. There just ain't no other game like it."

Tens of millions of golfers have a similar love affair with a simple game. But not enough of us take the time to say so and explain to others why we feel as we do, how golf teaches valuable lessons, and why it's important to our local communities and planet. And that's a shame because the game and business to which so many devote so much of their time needs our voices and our support.

Beyond the dedicated work being performed by superintendents, golf professionals and managers, and beyond the enthusiastic embrace of the more than 24 million Americans, golfers need to remember that golf and golf courses add so much to lives which are great and small, influential and not, privileged and not.



HENRY DELOZIER is a principal in the Global Golf Advisors consultancy. He is currently Chairman of the Board of Directors of Audubon International.

Golf courses serve as critically important open spaces and environmentally safe havens. They also provide water retention and flood-control solutions for many communities. And by employing so many people, they bring economic vitality.

Here are three ways to support golf and expand its impact for generations to come:

1. PROMOTE THE GAME AND THE VIRTUES IT BRINGS TO

LIFE. Steadfastness. Work ethic. Capability for facing adversity. Jubilation shared with others. The game is a tireless teacher to those who will learn. It is often a superintendent or golf professional who wields the influence that encourages beginners and engages longtime golfers. Their job descriptions should include a role as storyteller, reliving great moments from their time around the game. Talk to your co-workers and staff members and make sure they know historical and environmental characteristics of your course and the wildlife that your golfers might spot during a round.

2. MAKE YOUR COURSE A LEARNING LABORATORY.

Conduct field days when you and your staff provide seminars and discussion groups regarding best practices for irrigation, fertility, water consumption and arboreal care. Make your teaching efforts more than "how to repair a ball mark" and let golfers enjoy the wonders of course care and upkeep.

And don't limit your time and knowledge to your adult

golfers. Invite local youth to learn about the course and the efforts you're making toward sustainability. Help them understand that the world would be a better place if more people were as diligent as superintendents in matters of pesticide use, water-taking practices and land conservation.

3. TAKE GOLF TO HEART.

Golf is a heartfelt endeavor. Those attracted to it share an uncommon devotion to the game itself. Golf is a healthy game, as well. Fresh air and a practically unmatched opportunity to get steps in for the day, not to mention beautiful landscapes, sunrises and sunsets, along with special moments with friends and family.

Edwin Roald, a member of the European Institute of Golf Course Architects, cites seven important health benefits of golf participation: heart health, brain stimulation, weight loss, stress reduction, increased longevity, low frequency of sport-induced injury, and a good night's sleep.

The smart millennials at NextGenGolf call out five factors arising from golf participation: good for your body, good for your mind, helps to make new friends and business connections, ability to play the game into old age, and the opportunity to experience and protect nature.

There are so many reasons to make golf more a part of your life and to spread the good word. Young Hardy Greaves sure knew what he was talking about. **GCI**



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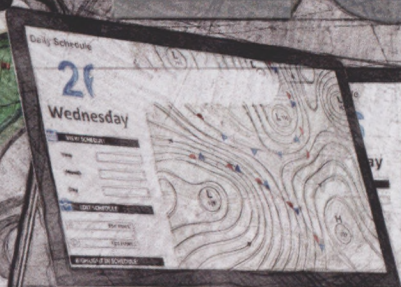
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TURF TECH INTO THE 2020S



OUT GOES A DECADE OF DISRUPTION. IN COMES A DECADE WHERE LOOMING ADVANCES COULD FORCE MAINTENANCE OPERATIONS TO ADVANCE EVEN FASTER.

By **Matt LaWell**

What technology has altered the art and science of golf course maintenance more than any other during the last decade?

Ask that question 10 years ago and plenty of responses would have probably focused on flip phones. Ask it 20 years ago and more superintendents than not would have said computers, definitely computers. Ask it 50 years ago and triplex mowers would have received plenty of love. A century ago, mowers in general. Four centuries or so ago, the humble, hungry sheep.

Life feels faster than ever, though, and 2010 almost feels like some ancient memory — commemorated forever with little more than pixelated snapshots captured on those beloved flip phones.

Most of those models are long gone, upgraded every couple years ever since. What else do you work with now that you could never bear to live without?

► Technology disrupted the industry in the 2010s by replacing feel with facts on playing surfaces.

ACCORDING TO ALMOST every superintendent and director who provided information and perspective for this story, soil moisture meters dominated the decade. Luke Bennett, the director of golf course maintenance and grounds at Kohala-naiki on the Big Island of Hawai'i, says they "have to be at the top of the list."

Early adopters might have used some variety of the tech before the turn of the last decade, but not enough for the devices to gain much market traction. "I have this great photo of one of my interns using one of the first moisture meters," says Dan Meersman, director of grounds at Philadelphia Cricket Club. "It actually had a dial on it, like the second hand on a clock. It just kind of went back and forth." That photo was snapped back in 2007 or 2008 — probably not on a flip phone.

Now, though, the latest generations of moisture meters provide data points, eliminate speculation, and help superintendents "communicate to committees, board members, general members in a way that's really understandable to them," says Tim Huber, director of agronomy at The Club at Carlton Woods in

The Woodlands, Texas, outside Houston. "Most of them are analytical by nature."

Huber had avoided moisture meters before he moved from Ohio to Texas, and even for years after settling into the Lone Star State. He questioned the accuracy of the GPS readings and wondered, "Is that really going to tell me what I

need? Am I going to have to learn the percentages? The threshold of the percentages? Am I going to have to get used to that?" He jokes that he reached his turning point after POGO "got access to Russian satellites and minimized their margin of error."

"What we're able to track and collect from those devices out in the field is amazing," says Bill Brown, who was a longtime superintendent and the founder of Turf Republic before becoming the director of brand development and distributor support at AQUA-AID Solutions. "It almost makes me wish I was still a superintendent — sometimes."

Digital jobs boards are high on the list, too, especially those from Advanced Scoreboards, which essentially established the market and received more mentions than any other company thanks to its taskTracker software. Plenty of superintendents still operate with a whiteboard, scribbling and erasing every day, because that works for them, but plenty of others have shifted gears and upgraded. Nelson Caron, director of golf course and grounds maintenance at The

Ford Plantation in Richmond Hill, Georgia, says the tech "dramatically changed the operation."

"Now we can populate years and years of data, and that is just so interesting," says Caron, who implemented the tech in late 2012 or early 2013. "You get in front of your board of directors and you get asked these granular questions about cost and you can demonstrate those with time and motion studies. People had been doing that in 2010 but it was all getting a couple guys in a room and crunching numbers. Now all this data is populated for you. Talk about a really incredible advancement. Really unbelievable."

Beyond producing reams of productivity data, Caron says the digital jobs boards allow him to work more effectively with visual learners on his crew and more quickly reach those on his crew who might not check email or even have an email account. "It's a big time-saver when you start looking at production rates."

"I like that I can see on a monthly, quarterly, yearly basis of where my labor is, how much I've spent on certain items, bunkers, greens, fairways," says Adam Mis, superin-



▼ All sorts of digital boards have popped up in maintenance facilities in recent years, allowing for far more efficiency.



tendent at Brookfield Country Club in Clarence, New York, just outside Buffalo. “And the more accurate we can be with those jobs boards, the more beneficial they will be, because you always have great plans in the morning, and by noon, the day has gone sideways.”

Even sideways days with the digital jobs boards are better than the 12- and 14-hour days Huber says he remembers working when he was an intern. “We would come in at the end of the day and we would have this sheet of paper,” he says. “We would fill out what we did all day and how many hours it took us, and then the poor office admin would track that at the end of the week.” Sounds rough. When, exactly, was that? “That was 2006.”

GPS sprayers started to spread their wings during the last decade — figuratively at most courses and quite literally near the east end of Lake Erie, where Mis added that tech to his arsenal in spring 2014 and then expanded outward a good, oh, 10 feet: A couple years after adding Ag Leader Technology from Agricultural Technology Solutions to a new Toro 1500, he extended his booms from 18 feet to 28 feet, adding 5 feet on either side and allowing his crew to cover Brookfield’s 29 fairway acres with far fewer passes.

Mis says that Ian Durgan, his longtime spray tech-turned-assistant, almost immediately trimmed about three acres and, more impressive, more than three hours during every

fairway spray, which works out to about 18 hours every season just on fairways. Factor in light applications on greens every week from early May to early November and as many as 20 applications on tees during the same stretch and a \$30,000 add-on paid for itself within two years.

“All of a sudden, you’re saving on chemicals, fertilizers, amendments, wetting agents, just because you know your spots. You mapped them out,” says Mis, who also modified the sprayer by adding custom rims on larger tires, which drops the pressure to about 8 psi and allows the truck to carry as much as 300 gallons per tank. “A lot of superintendents don’t want to be the guinea pig, but it’s been flawless.”

This season, Mis says he wants to add a 300-gallon mix tank that will allow his crew to prepare the next chemical application while Durgan or a new spray tech are out on the course. “If we can mix it while he’s out spraying, he comes in, turns it on, fills the tank, goes right back out, he’ll be done by 9 o’clock” — which would lop off another two hours. “Right now, sometimes it takes more time to fill the tank than it does to spray the fairways.”

TECHNOLOGY NEVER SLOWS down, a trend noted nearly 60 years ago by Gordon Moore, the Fairchild Semiconductor founder and former Intel CEO who observed that the number of components per integrated circuit doubled every couple



years. His law has spread to just about all technology — including on the course. So, what might be as disruptive during the 2020s as soil moisture meters, digital jobs boards and GPS sprayers were during the 2010s?

The overwhelming favorite is autonomous mowers.

Mis calls them “the future.” Caron and Meersman both call them “a big deal.” Huber says, “there is nothing could be more interesting right than that.”

But. There always seems to be a but.

Caron recently purchased a pair of Husqvarna Automower 550hs to mow near the clubhouse and a restaurant, but he acknowledges

▲ The biggest tech of the 2020s? Probably autonomous mowers — if the price is right.

“NOW WE CAN POPULATE YEARS AND YEARS OF DATA, AND THAT IS JUST SO INTERESTING. YOU GET IN FRONT OF YOUR BOARD OF DIRECTORS AND YOU GET ASKED THESE GRANULAR QUESTIONS ABOUT COST AND YOU CAN DEMONSTRATE THOSE WITH TIME AND MOTION STUDIES. TALK ABOUT A REALLY INCREDIBLE ADVANCEMENT.”

— NELSON CARON, THE FORD PLANTATION



CUB CADET HALTS AUTONOMOUS GOLF MOWING OPERATION

Cub Cadet is out of the autonomous mower market for golf, almost exactly five years after entering the robotic fray and just weeks after showcasing its technology at the Golf Industry Show.

Cub Cadet informed golf course superintendents Feb. 11 that it would eventually stop support of its RG3 autonomous turf mowers and rollers, according to three of the superintendents who used them. The company will work with current RG3 users on short- and longer-term solutions, according to Tony Whelan, the director of sales and marketing for Cub Cadet Golf & Sports Turf.

The reason, Whelan says, was multiple technical challenges that appeared during the last four months of field tests for the RGX that were “just going to take a really long time to address.” Cub Cadet informed customers and potential customers about that delay during GIS conversations before essentially shuttering the project. Cub Cadet will also shelve its RGX autonomous mower, which was introduced in December and was on display at GIS.

Whelan says Cub Cadet will “continue to seek solutions” for those challenges, “and we’ll keep the stakeholders involved as we go through it, but it’s going to be a while. With the knowledge of how long we believe it will take to address the technical challenges, we’re simply refocusing our efforts in other areas for the time being.”

There is never a good time for news like this, Whelan says, but Cub Cadet and its parent company, MTD Products, needed “to respond to customers who were considering using this for this season. We made the decision now to allow our customers to look for alternative solutions for this grow-in season. We kept dragging it out but that wasn’t helping anybody. This is very painful.”

The reactions among superintendents who have used RG3s for years and who have demoed and tested RGXs was similar. Brian Netzt of Presidio Golf Club in San Francisco, John Shaw of Valley Brook Country Club outside Pittsburgh, and Justin Daigle of Perry Park Country Club outside Denver all expressed disappointment and disbelief to *Golf Course Industry*.

“It’s really hard to explain to somebody who did utilize the technology all the different options for efficiency,” says Netzt, who turned to a quintet of RG3s to mow greens nine or 10 months out of the year, allowing his crew to hand-rake bunkers that are regularly scattered by Bay Area winds. “It’s just a severe blow.”

“I think the mowers are great. One of the best things to happen to the industry,” says Shaw, who was the second golf course superintendent to add RG3s, back in 2014, even before Cub Cadet sent out its first official news release about the tech. “I’m disappointed they’re not going to be available to me and I really hope somebody else picks up the line and runs with it. It feels like somebody died in my family.”

“I’m bummed because I love autonomy,” says Daigle, who delivered a GIS presentation about the technology in January. “I believe it’s a part of the future, I really, really do. This was a business decision, and it sucks. My biggest disappointment is that I am unlikely to ever have a better green surface than the one produced by the RG3. ... It rolled and mowed with no impact. No tire tracks, no footprints. When you were done mowing it, it was perfection. And I just don’t see an autonomous mower coming out without tires. Miracles happen, but it’s unlikely to ever come out again.” — Matt LaWell

that autonomous greens mowers are still “a little ways away.” Huber says, “you’re still so far out from actually implementing it in today’s golf because it’s expensive, the technology isn’t all inclusive — you probably still have to have somebody watching it — and it’s unproven.” And that was before Cub Cadet exited the autonomous mower sector for golf courses.

Brian Netzt, golf course superintendent at Presidio Golf Course in San Francisco, was among those who had not only added but fully integrated the Cub Cadet RG3, which mowed and rolled greens, into his operations. Like every other superintendent and director who worked closely with them, he loved them. “It was such a powerful tool for us in how we managed the golf course,” Netzt says. “Now to have to go back to almost like the cave man way, it’s going to cost us so much in lost time that we were doing other stuff with.”

And that recent Cub Cadet withdrawal could ripple throughout a sector of the industry: At least one superintendent interviewed for this story says he will likely avoid some other new technology — whether that means autonomous mowers or, say, robotic range pickers — because of potential blowback from members and committees.

Still, the technology is coming — whether it rolls out in 2020, or 2022, or beyond — and labor adjustments will follow.

“I would never want to replace (employees),” Huber says. “I would think it would bring the golf course to another level while being able to hire more skilled staff. I hire a lot of people who have never been on a golf course in their life. For a little more money, maybe you can bring that level up, bring the profession up, because you don’t need to worry about mowing the short turf, you can concentrate on the detail items. I believe my skilled labor knows the golf course back and forth, and when we put them on detail, the course

shines.”

“Our deal here is not to replace employees,” Caron echoes. “It’s to reallocate employees to other areas, or keep them in the same area and refine it. ... We’re going to have people who have been training in robotic management — not mechanics, but people making sure the robot is doing what it’s supposed to be doing — making adjustments, removing debris. Where else could we put the employees? Detail management, customer service, there are a lot of things golf courses do really poorly, or have done poorly in the past, and this is an opportunity to enhance.”

What else could follow? Drones were mentioned and are already in the sky above plenty of courses, though future regulations could



vis potential. Data collection and artificial intelligence will be more a part of the maintenance building than ever before, and big data will translate well from professional golfers to professional superintendents.

Other new positions will pop up with the same inspiration as robotic fleet management. Huber says “an autonomous bunker rake would be awesome.” Check Google. Not much out there about those yet. Dream big

▲ Adam Mis brings attention to Buffalo thanks to his custom GPS sprayer.

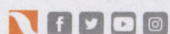
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— ADAM MIS, BROOKFIELD COUNTRY CLUB

and make it happen.

“Superintendents are a pretty ingenious group,” Caron says. “In 15, 20 years, all I know is there will be jobs listed on a jobs board that are not listed today. I know that for a fact.”

Costs are still a deterrent for plenty of clubs — what Brown calls “the engine room” of the industry: “I rowed crew when I was in high school,” he says. “The front guy kept the pace, the back guy kept

direction, and everybody in the middle, that was the engine room, and their job was to pull as hard as they could. That’s what the mid-level clubs do for this \$86 billion industry. They’re the ones that keep it going. On Christmas Day, they’re the ones probably mowing greens so you can get a \$15 greens fee. We’ve got to bring the price of technology down so these guys can keep this industry growing for us.

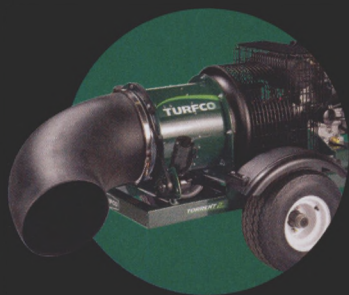
“The only problem with all this

technology is still that the people who need it — autonomous mowers, or GPS sprayers, or sensors, or moisture meters, or whatever — still can’t afford it. I’m hoping technology comes down to where everybody can afford it.”

Until then, anybody know the market price these days for some good sheep? **GCI**

Matt LaWell is Golf Course Industry’s managing editor.

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Spectrum® Technologies understands the increasing demand for higher quality playing and aesthetic conditions, as well as the difficulties of balancing the need to conserve resources and protect our environment. Managing to that level of precision is a significant endeavor that continues to grow the need for measurement and monitoring technology, and it drives our desire to develop more measurement information technology.

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Adjuvants include any substance added to the spray tank that modifies the pesticide performance, physical properties and spray mixture.

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Spray application is perhaps the weakest link in the chain of events a pesticide follows through its selection and use process.

Multiple researchers have concluded that as much as 30% – 50% loss of the effectiveness of a pesticide depends on the effectiveness of the spray application.



PH SENSITIVITY

The water used to fill spray tanks has a dramatic impact on the stability of chemicals and the length of time the materials will remain effective in solution. A reaction called alkaline hydrolysis takes place when high pH water literally rips the chemistry apart. Many pesticides will break down very quickly when spray tank water is above a pH of 7. In some cases the effectiveness of the chemistry can be rendered ineffective in less time than it takes to conduct the spray application. Maintaining favourable spray tank pH will also improve the mixing of products in the spray tank. Ideal spray tank pH is 5.0-6.0.



DEPOSITION

Water is naturally a poor carrier of pesticides that need to coat the leaf surface. The formation of water droplets on the leaf reduces the amount of chemistry that can penetrate the waxy cuticle of the leaf. Deposition aids reduce the surface tension of water, enabling the chemicals to evenly coat the leaf surface, leading to exponentially better uptake.



RAINFASTNESS

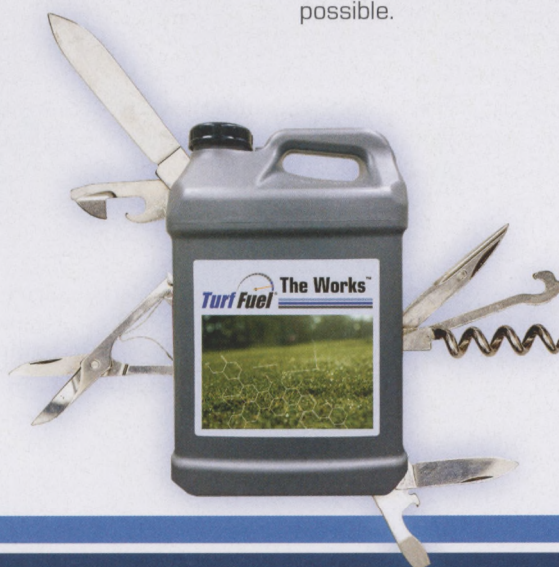
Rainfall, Irrigation and dew impact the activity of the active ingredient because of dilution, redistribution and removal. Often, efficacy and longevity is reduced because of these factors. This results in non control, the need for higher rates, and more frequent applications. Adjuvants known as stickers ensure that chemistry stays where it is applied as long as possible.



PENETRATION






The ability of an active ingredient to penetrate the leaf surface plays an important role in their systemic activity. The cuticle of the plant leaf is naturally designed to resist the entry of foreign material. Foliar penetrants modify the chemical and physical properties of the plant and chemistry to allow rapid uptake and movement of the chemistry.

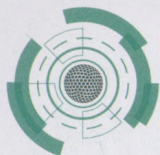
Azoxystrobin transcuticular penetration improved from 37% without penetrant to 92% with penetrant. Vladimíra Zelená and Karel Veverka (2010, July 15). *Plant Protect Science*. Effect of Surfactants and Liquid Fertilizers on Transcuticular Penetration of Fungicides



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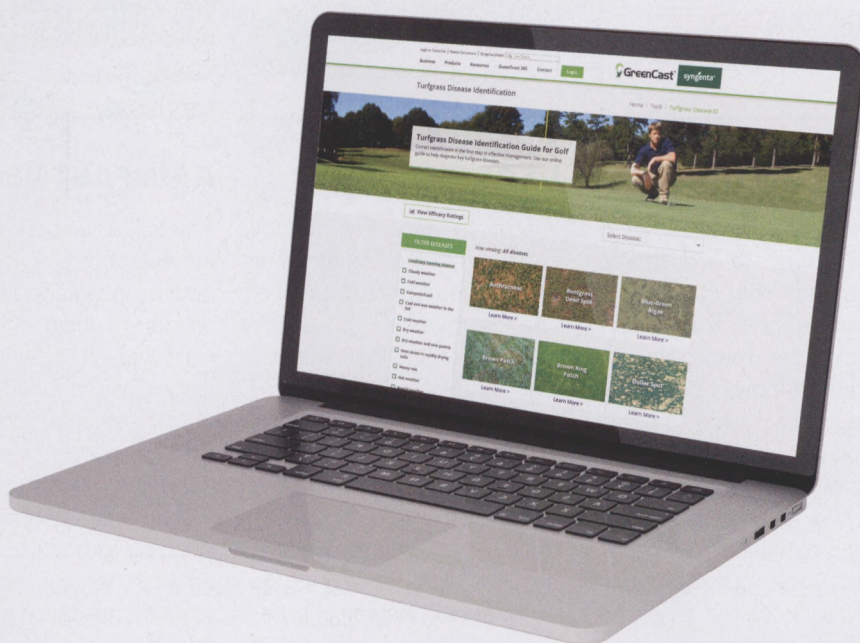


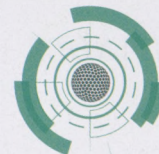
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NanoOxygen Systems brings advanced nanobubble oxygen and air encapsulation to the golf industry. Utilizing state-of-the-art membrane technology, NanoOxygen Systems infuses water with trillions of microscopic oxygen bubbles to address both lake water algae management and turf oxygen demands.

Nanobubbles – very tiny bubbles that are formed when air or oxygen is sheared into a water stream. The bubbles are less than 200 nanometers in size (about 500 times smaller than the smallest bubble rising from the bottom of a frosty mug of beer or 400 times smaller than a human hair) and can't be seen by the human eye. These small bubbles have no buoyancy, allowing them to remain in the water column and fully infuse it with oxygen from top to bottom.

ALGAE MANAGEMENT

For lake management of algae and water quality, air nanobubbles are introduced into the water column and perform two primary functions – (1) oxidizing the algae

to reduce its population and (2) provide dissolved oxygen (DO) resulting in an increase of beneficial aerobic bacterial populations which consume free nutrients (algae food). This two-punch approach clears the lake of algae and, more importantly, creates an environment for the lake to become sustainably healthy to avoid future algae blooms. This avoids costly chemical treatments, noxious odors, removes the “muck” from the lake bottom, and provides a healthier, algae-free water source for golf course irrigation.

PGA Championship golf courses have benefited from NanoOxygen Systems technology. Nanobubbles, in conjunction with our full line of biological enhancement tools, Byo-Gon PX-109 biostimulant and PondClear bacterial blends, have demonstrated proven success. In the summer of 2019, with less than two months to prepare for one of golf's greatest tournaments, we were able to successfully eliminate a major algae bloom in a 20+ acre lake. We can install fixed or portable systems that make it easy to add nanobubble

technology to any lake or pond with algae problems.

IRRIGATION WATER MANAGEMENT

NanoOxygen Systems offers the only complete nanobubble system available for adding high levels of dissolved oxygen directly into irrigation and spray tank mix water. Using over 95% concentrated oxygen, the system infuses water with high DO levels that deliver this oxygen to the soil reliability all year round. Recent upgrades to our nanobubble generation technology provide “bolt on” application to your existing irrigation pump discharge or tank fill system – allowing for single pass increases in dissolved oxygen that enhance soil health.

Plants absorb water through root systems and healthy root systems with a reliable oxygen supply absorb more potassium, nitrogen and phosphorus for plant nutrition. Additionally, higher DO levels in the root zone, caused by the size and high negative surface charge of nanobubble oxygen, result in higher root mass & stronger roots, enhance microbial degradation of thatch, and contribute to improved turf health. This prevents black layer and plant diseases, such as Pythium, that grow when there is an absence of oxygen and plant roots become anaerobic.

Nanobubble water infiltrates soil more rapidly than untreated water, behaving much like a wetting agent. This results in less run off and more water retained in the root zone. Improved infiltration of irrigation water also means more oxygen supplied to roots deep in the soil, allowing them to push through compacted soil and reducing the need for mechanical aeration.

Using NanoOxygen Systems, irrigation nanobubble oxygen systems deployed at two Australian bent grass golf courses have shown excellent results. Both courses report reduced fertilizer and fungicide use, greatly improved root mass (even in hot summer conditions) and full satisfaction with the nanobubble systems that have improved the quality of their most important input – water.

Contact **NanoOxygen Systems** today to discuss how this game changing nanobubble technology can improve your golf course.



Take CAUTION

Tips and tricks to help turn your chemical storage facility into a clean and organized space that would make any inspector proud.

By Matt LaWell

Travel to enough different golf courses and odds are good you will spot some curiosities that raise your eyebrows, wrinkle your nose, perhaps even spark you to turn around and run as fast and as far as you can. Take Gary Ryan, for instance. "I've been in the business for about 25 years now," he says. "I've seen some pretty scary things. I've seen some places that I didn't even want to walk into."



Gary Ryan

Ryan is the head of grounds management at the Bayer Education and Research Facility in Clayton, North Carolina. He is also about as close to a walking, talking course safety guidebook as you will ever

find. If you have a question about chemicals — about storing or handling them, about mixing or applying them, about anything about them, really — Ryan is as great a source as you can find.

Start with the basics. "You have to have trained personnel and the safety measures in place before we even talk about doing any kind of handling, any kind of spraying or anything else," he says. "If you don't have that basic knowledge, then it's not even worth going forward. You have to have your core setup, you have to have your pesticide licenses in place." And that includes

more than just your licensed spray technicians. "The inclusion of your handlers is very important — they need to know the safety procedures, when something becomes a safety issue or an emergency, who to contact, how to move forward. Those handlers are "usually the more responsible employees," he says. "They need to get more education, they need to stay up to date."

People are and will always be the most important part of the process. Proper storage is almost as high on the list. Ryan recommends a separate facility for storage and mixing — and preferably well away from the maintenance facility. "Even the bare basic model is probably going to give you better protection than your maintenance facility because it's separate from the building where you're functioning on a day-to-day basis," he says. "Depending on what you've got as far as a pesticide storage building — and I know it's all based on budget and what your course can and can't do, and obviously not everybody can have a Cadillac, some of us drive a Chevy — if you can manage what you have, that's the most important part."

If circumstances keep you from a separate storage and mixing location, "make sure you take all precautions and follow all guidelines," Ryan says. "You have to kind of segregate it from the rest of your building." Ryan says he thinks proper safety precautions are overlooked in situations like that, especially for mixing areas. "We carry portable bottles of eye wash at all times. You know as well as I do that when you're mixing a product, the point of mixture is where the product is at its highest concentration. You're coming in direct contact with it, there are contact issues, there are ventilation issues, all that."

No matter where you keep your chemicals, keeping the space in order is key. Leaks and spills can mix and cause chemical reactions and personal protective equipment can become contaminated — especially if you keep disposable and reusable PPE in close contact. There is also the matter of just being

able to find what you need when you need it. And there are inspections to consider. "Just keep the place cleaned up," he says. "When you do your inventory, it'll make it a little easier." ●





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IT'S THE SCIENCE

The last few months, I've heard from many superintendents — and seen for myself — some unusual situations while in the field. Whenever I encounter something odd on the course, I call the preeminent weed and turf scientist (and my good friend) Dr. Fred Yelverton of NC State University for the facts. I wanted to understand why we're seeing greater occurrences of certain weeds — goosegrass, kyllinga and dove weed, among them — in northern climates where we haven't seen these species in the past.

What he said comes down to this: Whether or not you believe in global warming, what's happening is due to climate trends. And like it or not they are part of the new reality we must face as superintendents.

I'll let Dr. Yelverton explain.

EXPLAIN THE DIFFERENCE BETWEEN CLIMATE AND WEATHER.

Climate is long-term trends: Climate or climate change is a long-range review of what is happening — a development over many years. Many climate scientists talk about 30-year or greater trends. Weather is day to day.

Another way to say it, climate is a long-term trend and weather is short-term. Weather is what we face today or in the next 10 days. Unfortunately, weather is what the golfer sees and criticizes us for. Superintendents need to have a good source of both current and historical weather data to plan for and make good agronomic decisions. Look at average temperatures in your region over a 30-year period. It will show you the climate trend we are facing. And it is warming. In North Carolina, in the past 30 years, we have had five

years as the hottest on record (since 1900). During that same period, no years have been the coldest. This is climate.

It's easy to access historical data accurate for your specific area. NOAA (National Oceanic and Atmospheric Administration) has millions of data points to reference and review.

Research shows there is a definite warming of this planet. Not to sound dismissive, but one's feeling on this topic is irrelevant. It is happening. And we are seeing other evidence in the natural world and on the golf course.

DOES THAT EXPLAIN WHY NORTHERN AREAS ARE SEEING MORE WEEDS?

I work closely with the climate scientists at NC State, who have scientifically documented long-term warming trends. That means warmer weather in cooler regions, which reflects a general warming trend of our planet's climate. Many weeds once confined to Florida are now in North Carolina, Virginia and even as far north as New England. The march north continues.

WHAT ARE SOME EXAMPLES?

In North Carolina, we're seeing nighttime temperatures increasing and remaining warmer longer, allowing weed seeds to adapt. Cooler nighttime temperatures would have promoted cool-season turf recovery and limited weed growth; this is no longer the case.

After years of review, NC State's climatologists have found that minimal nighttime

temperatures have increased in the past five years from 71 to 73 degrees. In turf management, higher nighttime temperatures do not allow cool-season turf time to recover and grow. Voids left in the turf allow weed seed to germinate as bentgrass declines.

This is the reason more southern clubs have switched from creeping bentgrass to ultradwarf Bermudagrasses. It has nothing to do with easier maintenance practices! With the air temps so warm at night, the mandatory recovery period required for bentgrass is not happening.

Back in the mid-'90s, North Carolina was an 80 percent creeping bentgrass state on greens. Now we are about 40 percent. Some of the change can be attributed to improved Bermudagrass cultivars. But all our superintendents will tell you it's harder to grow bentgrass now than it used to be — due, I think, to the gradual increase in nighttime temperatures.

WHAT CAN WE DO ABOUT THIS?

Because superintendents are noticing these weeds after they germinate, the usual treatment plans are not effective and need to be amended:

- Pay attention to soil temperatures at 2-inch depth. (A 24-hour mean soil temperature of 55 degrees for several days is the critical soil temperature for crabgrass germination. 60 degrees is needed for goosegrass.)

continues on page 48



TIM MORAGHAN, principal, ASPIRE Golf (tmoraghan@aspire-golf.com). Follow Tim's blog, Golf Course Confidential at www.aspire-golf.com/buzz.html or on Twitter @TimMoraghan



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FROM DUMPSTER TO ALL-STAR

TIM BUSEK nearly drank himself into oblivion until finding sobriety and good work — and even better people — on the golf course.

STORY AND PHOTOS BY TRENT BOUTS

To suggest Tim Busek clawed his way to the top from the bottom of the barrel would be inaccurate. It wasn't a barrel. It was a Dumpster. And Busek found himself in it, down amongst the detritus, trying to fix a jammed lid.

He was a man immersed in his own metaphor.

"In that moment, I knew that obviously something was not working, and it wasn't just the Dumpster," he says. "It was my life."

Taking care of that Dumpster and landscaping at an apartment complex was how Busek was getting by, after "basically being asked to leave" Columbus State University six months earlier. With five drinking-related arrests to that point and not yet 21, he'd spent 10 days in jail and performed 200 hours of community service.

"I was one of those guys in an orange vest you see picking up trash on the side of the road," he says.

Last fall, Tim Busek joined a select group when he became president of the Georgia GCSA. Since 2005, he has been golf course superintendent at

The Manor Golf and Country Club, a Tom Watson-designed course, in a subdivision in Milton, outside Atlanta, where homes sell for as much as \$4 million. When ClubCorp took on The Manor with the purchase of Sequoia Golf in 2014, he became a regional superintendent responsible for five courses.

ClubCorp regards him as an "all-star," presenting him an award with that very title in 2018. "Tim Busek ... continues to deliver to our members some of the best golf course conditions in the Atlanta market," a company statement read. "He is an inspirational and humble leader to his team and encourages them to exceed expectations daily."

Busek's first step toward those heights was to climb out of that Dumpster, go to the house he shared with a "bunch of professional partiers," empty all he owned out of a single chest of drawers into his truck and drive to his parents' home in Marietta.





A man with short brown hair, wearing an orange polo shirt and dark shorts, is crouching in front of a brick wall. On the wall is a large sign that reads "THE MANOR GOLF & COUNTRY CLUB". The sign is made of wood and has the words in gold lettering. There are some plants and flowers in front of the wall.

THE MANOR GOLF & COUNTRY CLUB

"The worst experiences of your life, whether that's getting arrested, being in an orange jumpsuit, picking up trash on the side of the road, going to the funeral of a friend who overdosed, those are the greatest assets that I have. Those were things that had to happen for me to get where I am today."

—TIM BUSEK

"I didn't tell them I was coming or anything," he says. "When my dad came home, he asked what was going on. I told him and he walked upstairs and came right back downstairs with the want ads and said, 'You've got 24 hours to find a job or I'll find one for you.' I think he was serious. He worked at a trucking company. So, I was going be loading or unloading trucks and I didn't really want to do that."

The next day, Busek interviewed for a laborer's position with Kurt Russell, then assistant superintendent to Mark Esoda, CGCS, at Atlanta Country Club. "I was pruning bushes and laying pine straw," Busek says. "The bottom of the ladder."

It was just as well he was on the bottom rung and didn't have far to fall because Busek was still drinking. When he was arrested, yet again, he finally took the biggest step, not just of his career, but of his life. He enrolled in a treatment program.

"At that point I started taking it seriously in an effort to turn my life around," he says. "The first thing I had to do was stop taking advice from

myself and start listening to other people. People with addictions and mental illness, they are in the same boat because your brain is wired to tell you that you are OK, that you can do this. It's just a repetitive pattern. I would try and fix myself every day but end up in the same condition. I had to fire myself as my chief information officer."

Today, Busek says without hesitation: "I am a recovering alcoholic, with 21 years of recovery." Remarkably, he also makes that statement without regret. "The worst experiences of your life, whether that's getting arrested, being in an orange jumpsuit, picking up trash on the side of the road, going to the funeral of a friend who overdosed, those are the greatest assets that I have," he says. "Those were things that had to happen for me to get where I am today."

That funeral was for a college roommate. Another died in a drunk-driving accident. Busek's first wife, who he met in the treatment program, and the mother of his son, Jacob, 19, and daughter, Jillian, 13, relapsed several times. Eventually,

she died of a drug overdose. They divorced some years earlier but with shared custody of his children suddenly becoming full-time, Busek considered resigning the seat on the Georgia GCSA board he'd been elected to just months before.

By now though, Busek was remarried and his new wife, Ginger, was emphatic. "Immediately, she said, 'No. Don't do that. We got this,'" Busek recalls. She was one more in a long and still growing line of people he says have had his back, including some who had it before he had his own.

"I had a very tumultuous relationship with my parents," Busek says. "To be honest, the only reason I went to college was to get away from parents who were 'horrible' for loving me and caring about me and not wanting me to carry on with the lifestyle that I had."

He spent two years at Winthrop University in South Carolina on a baseball scholarship but was drinking daily. "I thought to myself that if I changed colleges, I'd change my behavior," he says. "That certainly

wasn't the case." There was no change despite the move partly because Busek was still chained to one of the catalysts for his drinking in the first place.

"I was horribly shy," he says. "And overcoming that shyness, speaking in front of others, introducing myself to others, doing all those kinds of things sober, was extremely difficult."

In time, Esoda's emphasis on being involved in the Georgia GCSA was instrumental in Busek building confidence. "Mark allowing me to go to pretty much any meeting or seminar I wanted to attend and introducing me to people was huge," he says. "Not just professionally, but personally. I learned so many valuable lessons from Mark. I owe him. Such a good guide and leader and mentor to me. I could write a whole book on things I learned from him that helped me turn my life around."

Esoda, a Georgia Golf Hall of Famer, was Georgia GCSA president at the time, deeply vested in a career Busek never knew existed. After all, he was a catcher, not a golfer. In the handful of times he'd swung a club up to that point, he admits he was one those guys who thinks golf courses "magically grow and mow themselves."

As the appeal of the job took hold, so did sobriety. Busek had moved from landscaping to the golf course maintenance crew and "just really fell in love" with every aspect of his role. "It didn't matter what they asked me to do," he says. "I loved going to work."

Early in his third year, he was promoted to spray technician and Busek was as shocked as he was thrilled.

"I couldn't believe someone was giving me the key to the chemical room, and going to trust me with this job," he says. That someone did was a catalyst for Busek to discover a new level of belief in himself.

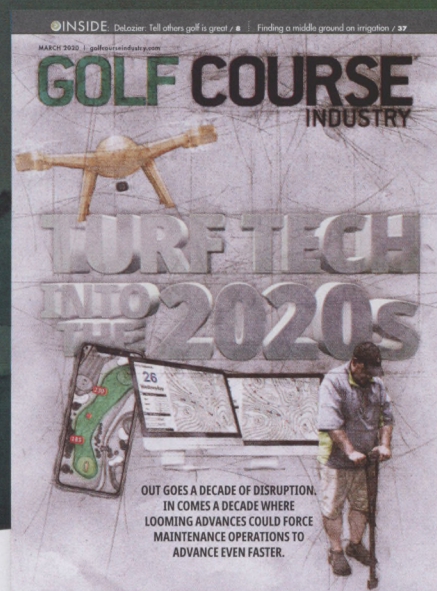
And the someone who did could hardly have been more impressed. "He was one of those guys as a spray tech who took control of his position," Esoda says. "He made sure equipment was taken care of, made sure he had the right stuff in inventory, he took control of his budget. He took ownership of the position and that's rare. He was the same as the irrigation guy. There is only one way to do it and that is dig the hole. People look for opportunities not to dig the hole. Tim was like, 'I gotta dig the hole.' And he would."

Even as Busek grew in the job, occasional doubt crept in, doubt that he could go no further without a formal turfgrass education. But Esoda always checked him. "He would always challenge me and say, 'Well, go get one,'" Busek says. "Or, 'Who says you can't become a superintendent because you don't have an education? Show me where it says that.'"

As Busek went to more meetings, met more people, took more seminars, those doubts were swept away by determination. When he became superintendent at The Manor there were still nine holes to grow in. The golf course and the superintendent were both new to it all when the economy tanked a couple of years later. What was a \$1.6 million budget and a staff of 20 dwindled to \$600,000 and eight.

But as green as he may have been professionally,

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PEOPLE

Busek was in a good place to deal with the stress that kind of contraction can induce. He still attends weekly meetings with his program. He has a sponsor and is in daily communication with other alcoholics.

"So long as I stay in the program and keep my connection with my higher power, as things happen through the day, my instinct is to make wise decisions," he says. "For lack of a better term, I have created a kind of scale for what really is a big deal. If it isn't a death, serious injury, loss of a job or divorce, it's just really not that big of a deal. Whatever other challenges we face in a day ... if I stay focused and grounded, I can come up with a solution to get through. I'm always going to try and find the bright side in whatever the situation is."

In that vein, Busek remembers the Great Recession as a valuable, positive, experience. Golfers' expectations didn't change because he had fewer resources. To bridge that gap, Busek drew on a mantra he heard time and again from Esoda.

"One of Mark's biggest things was, 'You've got to find a way!' And, really, for me professionally, as hard as the work was, it was a tremendous lesson in what you can and cannot do," he says. "I got to a point where I was not afraid to take calculated risks and try different things to maximize the staff that we had in the time that we had to do things."

Many coaches preach to athletes that they can "only control the controllables." And while Busek did all he could to "control" the golf course, he was constantly vulnerable to events away from it. "We had quite a wild ride," he says. "In my 14 years here, I've had 11 general managers and ClubCorp is our seventh owner or management group. We went through a period there where I didn't know if my key was going to unlock the gate to get to the maintenance building."

Through it all, and without exception, Busek says he received as much support as his employers at the time could provide. The same has been true of members and residents at The Manor, he says. "In the most challenging times to the best of times, I cannot say

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enough about the level of support from the community and the membership. Superintendents don't always get that. I am blessed beyond belief."

He also enjoys a strong relationship with The Manor's head golf pro, Chris Marotto. The two have worked together eight years and, as many Georgia GCSA members can attest, they share the same bad taste in golf attire, often teaming up at association events in garb that would make John Daly shudder.

That professional support has been buttressed by some of the most critical backing a superintendent can have — that of his or her family.

In Busek's case, that included his parents. "Fortunately, after a few years of sobriety I was able to have the type of relationship with my parents, before they passed away, that I always wished for," he says. "They instilled in me all the characteristics I needed to be successful, I was just too stupid to follow their advice until I was sober." In time, his family also came to include stepsons, Walt Morris, a sophomore at Mississippi State, and Mack Morris, a senior at Cartersville High.

"This career is a huge time consumer. We work when other people are not working, like weekends, holidays," Busek says. "I have had tremendous support from all of the kids and Ginger, not just to pursue my job at The Manor, but also my involvement with the Georgia GCSA board."

Esoda, now golf operations manager for the City of Loveland in Colorado, has enjoyed watching Busek grow in his career and life. "I have huge respect for the young man and what he's been able to over-

come. Some of it he brought on himself, but he was able to pull himself out," Esoda says. "He was one young man who took advantage of a second opportunity. I'm proud of the fact he wants to be in a leadership position because that's also rare."

That is not to suggest Esoda takes any credit. More than once, he's answered calls from fellow superintendents wanting to give Busek's former boss a verbal pat on the back. Each time, Esoda told them what he recently told longtime colleague Jim Dusch from Hawks Ridge Golf Club in Ball Ground, Georgia. Dusch was impressed by Busek's performance at the Georgia GCSA's three-day end-of-year celebration and business meeting and texted Esoda to say so.

"Jim said he'd watched Tim and that he was well-trained. I said, 'I didn't train him. He's just that guy. That's just Tim.' He's the guy," Esoda says. "He's the guy who read trade rags during lunch while the other guys were talking sports. And he would have a real, grown-up, adult conversation about agronomics. He's a very real guy, very honest. There's not much fluff to Tim. The Georgia association is in fabulous hands because Tim won't drop the ball. He just won't."

Busek's rise is the kind of inspirational journey they make movies about. The rest of us wouldn't wish some of his travails on our worst enemies. But Busek says, "When I look back, I wouldn't change a single thing." **GCI**

Trent Bouts is a Greer, South Carolina-based writer and frequent Golf Course Industry contributor.

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BECOMING FLUENT IN GOLF TALK

At most golf courses I see, the superintendent suffers from a language deficit. Folks trained in turf look to talk about what it takes to grow quality grass. Listen in at any turf conference or when superintendents gather at a golf championship to help out the host site and they sit around talking about the tools of the trade – aerification, interseeding, bunker liners, pre-emergents and the latest in robotic mowers.

This is their comfort zone. The world they know best, where their personalities are most in tune with the people they seem at ease with the best – their colleagues. There are exceptions, of course, but more so than anyone in the golf business superintendents seem to shy away from engaging their clients and prefer the solitude of the golf course, their office or the maintenance yard.

To their detriment, I think.

Superintendents would do themselves favor and improve their career trajectory if they learned to speak the parlance of everyday golfers and translated their expertise into language most golfers understand: golf talk. Specifically, improvement and enjoyment.

Case in point: bunker sand. One of the prevalent complaints is bunker sand and its playability. Too much sand. Not enough sand. Too firm. Too soft. How much would golfers benefit if they knew about the relationship between sand particles structure – shape, hardness, porosity – and the need for more (or less) bounce on your wedge? It would go a long way toward smoothing relations with the golf shop as the golfer might be alerted to the need for more diverse or site-specific equipment. Soft bunkers play better with more bounce. Firm bunkers take a sand wedge with less.

The same for topdressing, whether of fairways, greens or ap-

proaches. The more that superintendents could show players how to interpret prevailing conditions the better those golfers could adjust to a proper approach shot. It amazes me how few golfers bother to notice that the last 10 to 20 yards into a green are being walk-mowed, topdressed and kept firm. If they did, they'd be more prone to play low-flighted approaches in. If golfers appreciated more the need to occasionally punch fairways or greens to improve agronomics and firm up the surface, the more they'd appreciate the overall health of the golf course and the occasional need to put up with temporary inconvenience.

For too long the model of superintendent communication with their client base consisted of those monthly columns in the club newsletter. Those days are over. Social media provides a powerful forum for superintendents to get their message out, though one fraught with all the perils normally attending any unfiltered platform. Use it carefully, staying on topic, avoiding politics and religion, and always being careful before pressing “send.”

More helpful and more targeted are internal emails that go out to a self-selected cohort of golfers. The key is to use such a communication circle to build up core support.

Think and act strategically. You don't need to reach everyone. I've seen private clubs where the superintendent sends out a detailed weekly notice that goes to a few key people. It helps create a solid

base of support that can carry the weight of club politics.

Superintendents would also help themselves if they made themselves more available to golfers. The golf pro has an inherent advantage. They get to intercept golfers every round. Superintendents don't generally have that immediate access to golfers. When was the last time a player came to the machine shop to check out the blade grinder or chat about new turf types? Greenkeepers must go out and find the golfers – which means hanging out on the first tee on a Saturday morning or chatting up golfers on the course. That's another reason why superintendents should spend time on the grounds walking around, rather than just riding. It puts you in better touch with players in all sorts of different positions without making it look like an official visit.

The real problem superintendents have is that the people they work for have little sense for or appreciation of the work and how it makes the game better. I'm not talking about generalizations like “the good of the game.” I'm talking about their golf game: how they score, play and enjoy the game.

No one is asking superintendents to become best-selling authors or social media influencers. It suffices to spend some modest time investing in a basic act of reaching out, communicating on local ground in a language that bridges a pretty basic divide. It can only help make the job easier, longer and more rewarding. **GC**



BRADLEY S. KLEIN, PH.D. (political science), former PGA Tour caddie, is a veteran golf journalist, book author (“*Discovering Donald Ross*,” among others) and golf course consultant. Follow him on Twitter (@BradleySKlein).

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NEW APPROACH TO OLD DISEASES

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The Club at Carlton Woods will be working Zio Fungicide into its *Pythium* control program on its Nicklaus Course.

New approach to old diseases:

A YEAR WITH ZIO

PART 1: THE WHY

Editor's note: Golf Course Industry is partnering SePRO to tell the story of Zio Fungicide's implementation into disease control programs. The three-part series will explore the reasons superintendents are turning to Zio, how they are using it and what are the results during the most trying moments of the 2020 season.

By Guy Cipriano

Superintendents resort to what works. Again. And again. And a few more times after that. Incentives to alter a successful program on short-cut playing surfaces are often avoided, overlooked or ignored. When a new product reaches the market, superintendents demonstrate unyielding patience. Keep using what makes turf tidy. Let a more daring colleague try the new stuff.

Tim Huber and Kevin Banks are among the superintendents performing colleagues a service on the disease management front this season. The pair of turf leaders are implementing SePRO's Zio Fungicide into agronomic programs for contrasting reasons.

Huber is the director of agronomy at The Club at Carlton Woods, a renowned 36-hole private club in The Woodlands Texas, a growing community north of Houston. Banks is the su-

perintendent at the Vineyard Golf Club, one of four golf courses in the breezy seascape Massachusetts community of Martha's Vineyard.

Huber and Banks have never met. Like many in their chosen field, they are curious about how superintendents elsewhere manage a crew, disease, customer expectations and myriad other daily dilemmas. When told a superintendent in Martha's Vineyard is also participating in this story, Huber enthusiastically said, "there's somebody who needs more tools."

A traditional pesticide has never been applied on the Vineyard's turf. The private club exists because its founders agreed to a local ordinance restricting pesticide use on new development. Fascination and skepticism greeted the course's 2002 opening. Would a membership adopt long-term support for a course with potential turf blemishes because of an unproven, all-organic management approach?

The club's first superintendent, Jeff Carlson, magnificently ushered the Vineyard Golf Club through its first 13 years. For his closing act, Carlson helped Banks adjust to his first season as superintendent in 2016. Banks can somewhat relate to Huber. It wasn't too long ago he worked at a course with access to conventional products. "We still want to produce a really good product," Banks says, "even with our limitations."

The availability of Zio, which is currently registered in 47 states, including Massachusetts, excites Banks. SePRO hand-selected Zio from a library of 60,000-plus microbes to protect turf from multiple diseases, including brown patch, *Pythium* and anthracnose. Zio is an Organic Materials Review Institute-listed product, making it certified for organic use.

The Vineyard underwent a Gil Hanse-led renovation that concluded in 2015, Carlson's final season as superintendent. Carlson offered guidance as Banks and his team worked vigorously to maintain the vitality of new sod in 2016. The staff attempts to promote bentgrass greens, but the spread of *Poa annua* is inevitable. A diligent thatch

removal program since the renovation has helped the greens endure a pair of tricky summers without access to fungicides developed to help turf withstand humidity-induced pressures. The pre-Zio treatment program included a tank mix of an OMRI-listed plant protectant, seaweed, ferrous sulfate and manganese sulfate.

"We're excited about Zio," Banks says. "Our product list is so short. When you see a product like Zio come out on the market and you see the preliminary research and meet the team from SePRO and really talk about it, it's great for us."

While Banks plans to use Zio at the Vineyard out of necessity, Huber is exploring it out of curiosity. Huber and his team have their pick of nearly every product registered for use on golf turf. But if there's a potentially better way of solving a problem — in this case controlling disease — Huber feels it's his duty to work it into at least part of The Club at Carlton Woods' extensive program.

"We have the resources and we have the facilities, and if I'm not trying new things, then I feel like I'm letting my membership down and I'm letting my peers down," he says. "The membership expects me to be on the cutting edge of what's coming out, because if I'm not in tune with what's on the market, how can I really decide what's best for the golf course? I get asked all the time, 'Have I heard of this or have I heard of that?' I always feel terrible if I say, 'No, I haven't heard of that.' I like to at least know what's out there. And if I can get hands-on experience with it, then, by all means, we will try it."

Huber learned of Zio in a discussion with a SePRO representative at a turf event last year in San Antonio. The concept of building beneficial bacteria in the soil while offering protection against root diseases on 20-year-old TifEagle Bermudagrass greens on the club's Nicklaus Course intrigued him. The combination of a heavy or-



Kevin Banks



Tim Huber

ganic layer associated with aging greens and frequent, intense winter rains makes *Pythium* control a challenge on the Nicklaus Course. Multiple fungicides are used in the winter rotation and preventative sprays typically occur from September through late March. Huber plans to work Zio into the rotation as early as the later stages of this spring.

"You obviously have to see results, but I'm definitely willing to give it a try because these root diseases are very, very difficult to control," he says. "Once you have them, it's nearly impossible to do anything about it other than prevent further spread. You end up getting into these situations that are really tough to get out of, so preventative is the only way, in my opinion, to get through it. If Zio gives us that little bump in control, or a little bit of an advantage, I'd love to give it a try."

Huber admits he's in a fortuitous position to try an OMRI-listed product such as Zio because Carlton Woods has two distinct courses: the Fazio Course opened in 2005, four years after the Nicklaus Course debuted. The successful integration of Zio into a program at a facility such as The Club at Carlton Woods could lead to other superintendents rethinking their disease control philosophies.

"Who wouldn't spray non-chemical products?" Huber says. "If you can do it and it works, then everybody would prefer that. It's interesting, it's new. There's some data at the university level. But it's only as good as seeing it in the field and superintendents are the people who are going to put it to the test. They will know if it works or if it

MEANWHILE, IN KANSAS CITY

Two straight seasons of pushing root *Pythium* followed by nettlesome nematodes infecting 50-year-old bentgrass greens flustered Bill Irving throughout his first two years as superintendent at Wolf Creek, a private club in suburban Kansas City.

Knowing a third straight year of *Pythium*-related problems could threaten the health of greens resting on a floodplain, Irving worked with the University of Missouri's Dr. Lee Miller and other confidants to revamp his agronomic program. Resorting to drill-and-fill as a semi-annual aeration practice and expanding the spray program yielded immediate results. The greens at Wolf Creek withstood a stifling and damp 2018. Irving received further confirmation of the program's vitality during a depressingly damp 2019.

"We chose to look at every effort of controlling *Pythium* we could, because there are some nematodes in our neck of the woods that are much more difficult to control, specifically the lance nematodes," Irving says. "We decided if we could limit the damage of root *Pythium*, that gave the lance nematodes less ease of infecting greens."

Irving rotates chemistry classes, with applications on nearly three acres of greens beginning every other week in late April or early May. As the 2020 golf season approaches, Irving expresses another concern. "You ultimately kind of run out of chemistries that are labeled for root *Pythium*," he says. "And some chemistries are stronger than others."

Irving will further expand Wolf Creek's *Pythium* control program from six to seven products by adding Zio Fungicide into the 2020 rotation. A staunch supporter of industry initiatives and collaboration, Irving purchased a 20-pound case of Zio donated by SePRO during the 2020 Golf Industry Show silent auction. Proceeds from the auction support the GCSAA's Environmental Institute for Golf. Previous success with SePRO's line of plant growth regulators and aquatic solutions piqued Irving's interest in Zio. Irving also has a solid relationship with SePRO technical sales specialist Clint Formby. "My line of thinking is, 'How can we add Zio in, not necessarily in place of something, but as a rotational product?'" Irving says.

Wolf Creek will become one of the first courses in the Midwest to use Zio, placing Irving in what he calls "uncharted waters" as an early adopter of a new solution. "It's been on my radar," he says. "When I saw an opening for it in the silent auction, I was like, 'This is the perfect opportunity.'"



Bill Irving

doesn't work. I'm looking forward to seeing what it does."

The past two summers, which included numerous dew point readings approaching Houston-like levels, have demonstrated an increase in turf stresses at the Vineyard, raising the urgency for a product such

as Zio. The club's decision to invest in turf fans is one step to improving growing environments; Zio represents the next step in limiting disease outbreaks. Of the diseases Zio is labeled to control, brown patch causes the most problems at the Vineyard. Any sod used to replace weakened turf undergoes a one-year acclimation period under the organic treatment program on an expansive nursery green with the same mowing heights as regulation greens.

Banks anticipates the 2020 spray program to begin in April, with the frequency ramping up to week-

ly applications by mid-May. Zio will be applied beginning in May on all 18 regulation greens and the practice putting green. Three practice chipping greens will be maintained without Zio. Banks learned of Zio during a 2018 conversation with a local distributor representative. Two years later, he's eager to see how it performs.

"Zio can be huge to our future success and current success," Banks says. "I have been here long enough to know how the greens react in severe weather and different moisture thresholds. If we see a dramatic drop in brown patch or anthracnose, I'm going to have a really good idea of how it's working, because the only thing different this year is Zio on a weekly program."

Martha's Vineyard represents a haven for East Coast residents seeking summer escapes from the demands of living and working within congested population centers. Members view a few hours meandering the Vineyard as an enhancement to that escape. High private club expectations are tempered a bit when members learn how an all-organic program affects the course. Despite the restrictions, Banks strives to produce outstanding playing conditions. He's no different than Huber or thousands of other superintendents.

"I tell our team we're constantly making the impossible possible," he says. "We have a staff that's not only good, but they're committed to making this work. My entire career, even when I was an assistant, I was forcing myself to learn the classifications of pesticides because when it was time to move on, I wanted to be ready to make an immediate impact on whatever superintendent job I landed. When I came here, I saw that you really have to think outside the box. My day to day is similar to other superintendents. It's just almost to a different extreme. Our perfection is different ... but at the same time, it's the same as everybody else's."

ZIO FUNGICIDE AT A GLANCE

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Irrigation system upgrades ... it doesn't have to be all or nothing

Can't afford a complete overhaul? **Ian Williams** shares where to look for deficiencies and how to find a solution within your course's budget.

Why does golf course irrigation have a negative tone to it – almost as bad as a four-letter word in some circles? By weight, a turfgrass plant is more than 90 percent water. Water is essential to all life, turfgrass certainly no exception. Depending on your geographic location, irrigation is more critical in some regions than others, but we cannot deny the importance of a reliable, efficient irrigation system when our livelihood relies on maintaining healthy turf, day after day.

Why then is golf course irrigation as popular as a root canal? Is it the expense? The fact that it is primarily invisible? Misinformation or lack of

understanding?

Comparatively speaking, golf course improvements can range in price. New bunker sand and drainage \$150,000 to \$350,000; and rebuilding greens \$250,000 to \$500,000 on average. What do all of these have in common? Unlike the irrigation system, they are all highly visible and can be immediately appreciated by a member or daily-fee customer. The reward for hitting that clean shot out of new bunker sand or sinking a 10-foot putt on new greens is immediate. Everyone benefits. When was the last time you saw a golfer jump up and down with joy because you have new sprinklers around your greens? It doesn't happen. No, irrigation

system upgrades and replacements are a different animal and should be approached as such.

Today's irrigation systems can range from \$750,000 to \$3 million-plus for 18 holes and, in extreme cases, exceed \$5 million. That kind of money will get you a lot of new bunkers and then some.

But how can you determine if a complete replacement is necessary? Rather than a complete replacement, there are many circumstances in which upgrades to the irrigation system can be money well-spent and lengthen the lifespan of the system.

Start with a thorough evaluation. This can be accomplished on your own, but you will get far greater results by contracting with an irri-

gation consulting service. Suppliers may offer a similar service, but you will not receive the same amount of detail and you are better off avoiding that route. There is a lack of credibility when a complimentary system evaluation provided by a supplier is presented to an owner or the green committee. An independent consultant's evaluation is much more affordable than you think. And avoid hiring a consultant that is just providing a cookie-cutter form letter where they substitute photos from the last golf course they evaluated with photos from your course.

Here are a few main items to look for in a system evaluation:

PUMPING SYSTEM AND WATER SUPPLY.

A very important piece to any irrigation system is the quality and quantity of the water supply. Understand what is available today and years into the future. As water demands continue to rise, it may be worthwhile to investigate receiving effluent water or capturing more

runoff water to be used for irrigation. Determine the age, condition and life expectancy of the pumping system.

Pump station technology has come a long way in the past few years. It's not that the technology is new, it's the fact that it is finally being applied to pre-packaged pump stations for golf courses. Your golf course can benefit from the efficiency and intelligent monitoring capabilities available in today's pump station controls. Remote connectivity with the pump station is much more reliable and affordable today.

If your golf course is supplied by a municipal water source, you may have a booster pump and backflow equipment. This equipment should also be evaluated, including the incoming pressure and flow from the municipal source. Over the years, changes may have occurred that you were not aware of.

HYDRAULIC NETWORK. What is the age and condition of the pipe and fittings? What type and material

are the fittings that were installed? There can be lots of variability here, ranging from coated steel fittings to galvanized and even asbestos cement pipe on older systems.

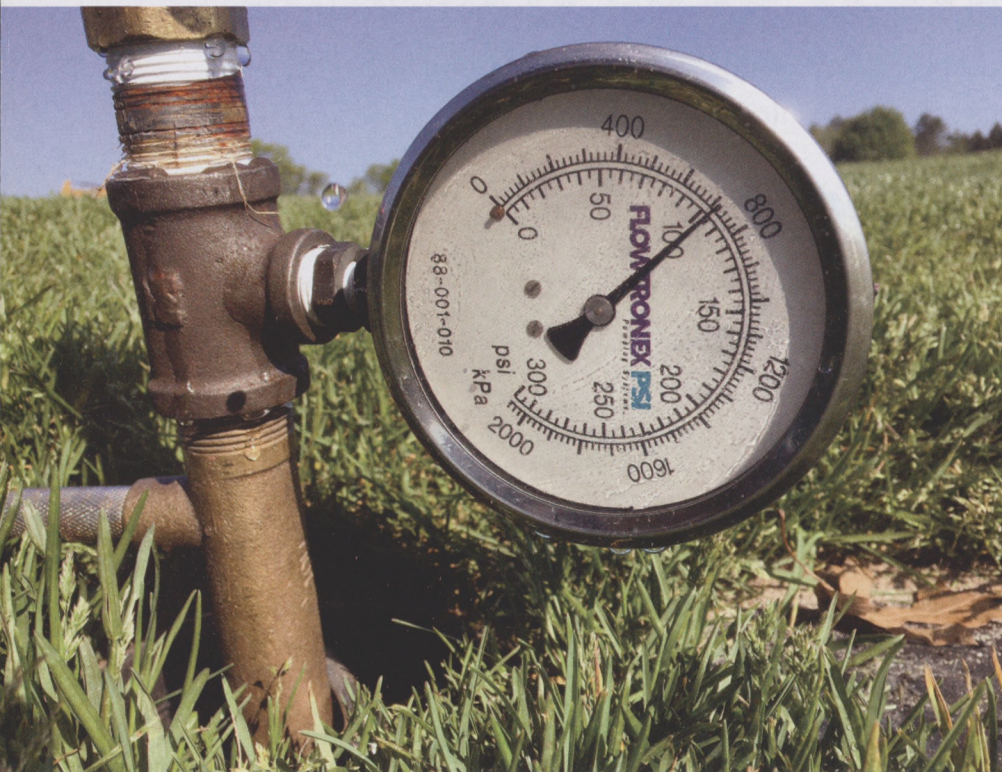
Understanding pipe size, the velocity of water through the system and both dynamic and static pressure at critical points will tell you a lot. So many times, the first thing I hear is, "I have poor pressure over here and I can only run two sprinklers" or "I can only water this area when there are no sprinklers running on the rest of the course!" Well, that could be a pipe size issue or something more serious causing inadequate pressure.

Common with older systems is undersized pipe or lack of looped main line pipe to meet today's conditioning demands. Are you documenting repairs you and your staff have made to the system over the years? Repeated equipment failures and their locations can tell you a lot about the system. Maybe you inherited a poor installation or maybe you are seeing premature failures of different components or fittings. Documenting the repairs will help you quantify the amount of time and material costs you and your staff have invested in keeping the existing system operating.

DISTRIBUTION SYSTEM. Obviously, the sprinklers are an incredibly important part of the irrigation system. And golf courses can have a range of different types from valve in head to spray heads to short radius block rotors. Quality of uniformity is directly linked to spacing in the field for that specific nozzle and pressure. An important evaluation piece to an evaluation is understanding the sprinkler spacing and performance for all areas on your course.

Perform a water distribution audit with the assistance of a certified golf auditor. An audit or "catch can test" should be performed in several areas throughout the course. Select areas that are indicative of what you

▼ A comprehensive irrigation system evaluation will help you prioritize your investment in upgrades.





can expect on the rest of the course. The audit will produce several key data points that will give you real insight into how the sprinklers are performing including distribution uniformity as a percentage. Distribution uniformity, low quarter, is a factor of the average volume of the lowest 25 percent of the catch cans divided by the average volume of all the catch cans in the area being au-

ditied. A distribution uniformity less than 55 percent is not ideal and can be addressed even without changing the spacing. For comparison, mid-80s and higher is achievable with golf sprinklers and large spacing.

ELECTRICAL/CONTROL SYSTEM.

Whether you have a satellite system or a two-wire system, the integrity of the conductors and splices is also

important to reliable operation. Understanding the material of the insulators and integrity of the splices can determine life expectancy. And I can't overemphasize the importance of documenting repairs – even wire repairs due to events like lightning or tree roots compromising a wire splice. Is the system properly grounded? I can't tell you how many times I have come across earth grounds that failed years ago or are insufficient for the components they are meant to protect. Is there a central control computer? What features does it have? What features is it lacking?

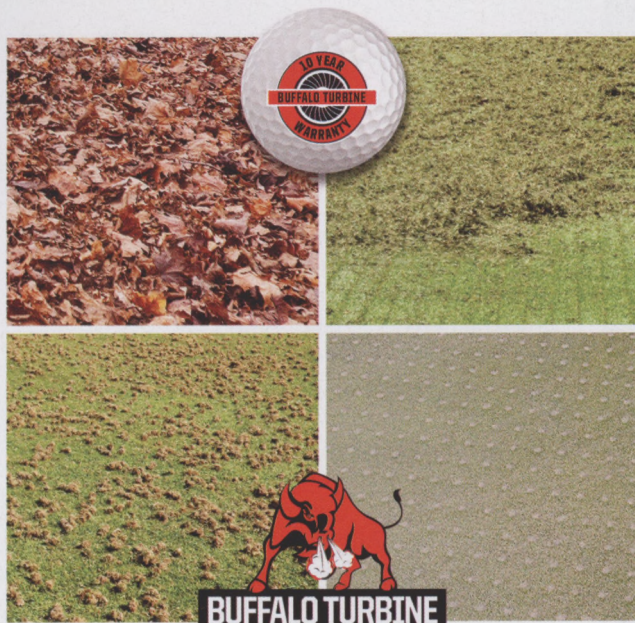
A thorough irrigation system evaluation never fails to expose deficiencies that you may not have been aware of and offer an explanation to persistent problems. The evaluation will also tell you what is salvageable if anything and you can determine life expectancy of the different components. Whether self-performing an evaluation or working with an irrigation consulting service, the evaluation process is an optimum time to prioritize your irrigation system needs with your maintenance practices and operating budget. Odds are if you are investing time and resources into a system evaluation, the system has been underperforming for years and the number of repairs continues to rise.

After prioritizing your needs, you can determine what upgrades will get you more bang for your buck. Some upgrades can be recycled if you do replace the entire system in the future. If a complete replacement is out of reach, there are improvements you can make that your golf course will benefit from and are affordable. Here are some ideas for cost-effective upgrades that will extend the life of your system.

1. SPRINKLERS. Did you know that a sprinkler more than 3 percent out of level has a 10 to 15 percent reduction in distribution uniformity? Three percent doesn't sound like a lot,

◀ Recurring main line pipe and fitting failures can be a sign of more serious issues with the system.

◀ Earth grounding equipment is important to the longevity of the electrical components. When repaired, failed earth ground equipment will pay for itself in protecting electrical equipment.



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▲ There are multiple inexpensive and accurate methods to determine if your sprinkler heads are level.

but unlevel sprinklers can have an overwhelming effect on uniformity. Over time, sprinklers may settle or even sink with years of heavy topdressing. Leveling sprinklers is not as monumental a task as it sounds. You can prioritize your areas and work through the project systematically.

With any upgrade or replacement for that matter, I would recommend a thorough cost analysis prior to making an investment. You may find it is more cost-effective to hire a qualified contractor for the project rather than tie-up your staff.

Replace or correct nozzles. Nozzles wear over time, some more than others depending on your water quality. A nozzle change can improve uniformity as well. Here's a tip: make sure the new nozzle is most suited for your spacing. There is software available that will determine the best nozzle and case pressure for your spacing. Do the nozzles in the sprinklers match the nozzles in the central control database? A database with as little as 5 percent of the nozzle flow incorrect can have an impact on your water window and pressure experienced while watering. A thorough inventory of the sprinkler

nozzles and case pressure can be used to correct the database information. If your spacing is optimal, and when I say optimal, I mean uniform and equidistant for the area, you might consider an entire sprinkler change out.

Many other factors play in this decision. What is the life expectancy of the lateral lines and fittings? Are the lines sized adequately to irrigate within your desired water window? What size main line and sub-main line is feeding the laterals.

2. HYDRAULIC SYSTEM.

Now this can be a big area. If you are experiencing main-line pipe and fitting failures at regular intervals, there may be more serious and extensive issues with the system. Managing water hammer or surge pressure is key with any irrigation design. Golf course systems are unique in that wide swings in flow are common and frequent, surges cannot be prevented but rather are calculated in the design and managed by main line routing, pipe size, air relief valves and central control in more modern systems.

Depending on the age, size and life expectancy of your main lines, your system

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may be a candidate for a new system while reusing the PVC main lines. PVC has a life expectancy of 50-plus years with a good installation and design, so it's the fittings and valves that may become the weak link.

Soil type and water quality also play a part in the life span of fittings.

If your PVC main lines are gasket joined, of adequate size, have been reliable and are less than 20 years old, the potential

is there to utilize the existing mainline or at least a portion in the design of a new system. With careful investigation, the main lines may be able to be re-utilized and new lateral pipes, sprinklers and the control system can be replaced. The result is a new system in terms of reliability and improved efficiency at one-third the price of a complete replacement. With HDPE systems becoming more prevalent in golf applications, I expect to see more HDPE pipes re-utilized and the sprinklers and controls being updated.

3. CONTROL/ELECTRICAL SYSTEM. Your course may still have a normally open system, commonly referred to as a "hydraulic tube system." These systems are difficult to maintain and repair parts are almost non-existent. If this sounds familiar, you may already be looking at control system upgrades. Make sure you consider a two-wire system upgrade and not just satellites. In both cases, you must install new wire to replace the older hydraulic tubes, so it is worth comparing pros and cons of both.

Lastly, if you are without central control, there are several options to get into a low-cost central control from the manufacturers. Adding flow managed central control will help extend the life of your system even with older pipe by controlling the velocity of water in the system and better controlling surge pressures throughout the system. Again, this is another piece of equipment that could remain or be updated inexpensively to the latest software if you were to replace the entire system down the road. There are also a host of features available from most manufacturers that increase irrigation efficiency by making intelligent decisions during irrigation and giving the user more control over the system.

By prioritizing your needs and understanding the current system and life span, there are many affordable upgrades that can be made to an irrigation system that will extend the usefulness and improve efficiency. OK, now the hard part: How can I get my club to invest in these upgrades? GCI

Ian Williams, CID, is a partner with Don Mahaffey at the irrigation design and consulting firm Green Irrigation Solutions.



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Globetrotting consulting agronomist **Terry Buchen** visits many golf courses annually with his digital camera in hand. He shares helpful ideas relating to maintenance equipment from the golf course superintendents he visits — as well as a few ideas of his own — with timely photos and captions that explore the changing world of golf course management.

HOMEMADE DECORATIVE SIGNS & POSTS

Every golfer who scores a hole-in-one at the 36-hole Giants Ridge Golf & Ski Resort in Biwabik, Minnesota, receives a commemorative plaque crafted by the golf maintenance staff. Additionally, on-course signage such as golf cart directional signs and posts, tee signs, 150-yard posts, tee markers and information signs are also made on the Digital Wood Carver, acquired from Avon, Indiana (\$3,500) and located in the maintenance building. Cedar is used exclusively that has two to three coats of PPG Proluxe Log & Sidings Wood Finish Transparent (Waterproof) Stain and the letters and numbers use three coats of an oil-based paint. The bits on the wood carver machine are changed after approximately every four signs are built. It takes about three to four hours labor time per sign or post on the wood carver machine, six to eight hours total, and the average total cost is about \$50 each. Joe Marafiot, the Legends Course superintendent, Geoff Baril, assistant superintendent, and Jeff Simondet, the Quarry Course superintendent, are a formidable team who have a great working relationship.



TRACTOR BRUSH GUARD

This unique idea is designed to protect the John Deere tractor's grill and headlights from damage when mowing thick brush, branches and native grass areas. Sixteen feet of No. 14 gauge 1-inch by 1-inch square and round tubing (\$18.32), expanded steel mesh (\$9.54), scrap metal for bracing and reinforcement, one can white primer (\$6.69), two coats of John Deere Green paint (\$14.58) and a 4½-inch flap disc (\$3.99) are used. The brush guard is mounted to the existing holes in the frame and bolted to the weight tray brackets with six bolts with no modification to the tractor. To remove the weight trays, the brush guard must be removed, as this ensures the tractor weights cannot fall off when mowing rough terrain. It took about five hours to design, fabricate and mount. Shane Pokorney, equipment manager, conceived and built it. Matthew Gourlay, CGCS, MG, is the director of golf course operations at the Colbert Hills Golf Course in Manhattan, Kansas. **GCI**



Terry Buchen, CGCS, MG, is president of Golf Agronomy International. He's a 51-year, life member of the GCSAA. He can be reached at 757-561-7777 or terrybuchen@earthlink.net.

NASTY TRANSITION

SHIFTING TO ULTRADWARF BERMUDAGRASSES CAN PRODUCE UNINTENDED CONSEQUENCES.
GET TO KNOW MORE ABOUT TAKE-ALL ROOT ROT.

By Matt LaWell

Within the lifetimes of most golf course superintendents working today, the disease Bermudagrass decline was relegated to parts of Florida and other Gulf states, where thunderstorms rumble through seemingly more summer afternoons than not and spark peak humidity. Over time, the disease shifted, migrated and received a new name. What was once Bermudagrass decline developed into the far more ominously named take-all root rot.

"This happens in diseases," says Dr. Jim Kerns, an associate professor in the Department of Entomology and Plant Pathology at NC State University, "You get a name change and then it becomes, for lack of a better term 'sexy' again and scary, so people get alarmed with it. Take-all root rot is nothing new. It's been around a long time. It's just that people forget that when we change grasses in this industry, you can select for new pathogens or a new symptomology of an existing disease as the industry evolves and changes."

The migration north and west out of the Sunshine State occurred in concert with so many courses transitioning to ultradwarf Bermudagrasses, Kerns says, adding that, "It's just becoming more prevalent because we're planting more Bermudagrass putting greens in areas of

the country that we never used to." Because of that, it developed into more of a problem about a dozen years ago, and today, "It is, in our lab, by far the biggest disease issue we see in ultradwarf Bermudagrasses," Kerns adds.

Early visual symptoms of take-all root rot include thinner turf strands and chlorotic patches, along with patches of diseased warm-season turf, which can lead to infected root systems that rot to brown or black. Kerns says researchers are "... getting a much better handle on it, and I think we already have pretty good management strategies for it, where it's not as detrimental as it was four, five years ago." But if your turf is warm-season, what can you do to prevent the disease?

Different studies have yielded different results, but more recent research indicated that earlier applications



▲ Maxtima treated on left. Non-treated control on right.



are more effective. Kerns worked on one study last fall in which a variety of products, including Maxtima fungicide from BASF, were applied Aug. 28 and provided “fantastic control.” Applying the same products one month later didn’t provide the same control until January. The driving theory in that study posited that superintendents should target soil temperatures around 80 degrees rather than 70 degrees.

“What’s nice about this disease,” Kerns says, “is if you do miss August, you still get control — it just takes a while because Bermudagrass growth is slowing at that time. We’ve made it our mission to try to get people to start thinking about applications in July and August to really combat this disease.”

Superintendents should dive into their soil pH too, because take-all root rot tends to be more severe when that number ticks above 7 — and even more severe when there is also a high water pH. “There’s not much you can do in a lot of cases about that,” Kerns says, “but be cognizant that it may take an extra application

than maybe your friend who has a pH around 6.” Supplemental manganese has also proved effective, Kerns says, referencing the research of Dr. Phil F. Harmon at the University of Florida.

Perhaps the easiest solution for effective applications that yield weeks of control at a time is to remember to irrigate. “I cannot stress enough that the organism is attacking the stolons and rhizomes in the primary roots that are a quarter-inch to a half-inch deep below the canopy,” Kerns says. “So, if you don’t irrigate in with an eighth of an inch of water immediately after application, you won’t be able to get the fungicide to where it needs to be.”

And how often do superintendents not irrigate those fungicides? “It’s more than I’d like to admit, still about 20 to 30 percent of the people I talk to, but it’s getting better and better,” Kerns says. Even just a handful of years ago, the figure was “way higher.”

“Watering in fungicides, we never used to do that, so it is changing,” Kerns says. “I don’t think superinten-

dents are doing it maliciously or just saying no. They put out a fungicide on a certain date and not considering a target, if that makes sense. What I advocate is when you develop your program, always know what your target is so you know whether to water it in.”

Kerns doesn’t want to trivialize take-all root rot, “because someone reading this could be struggling with

it,” he says, but he stresses that recent research and support from chemical companies has helped to keep it from becoming as devastating as Pythium root rot or nematodes. Spot the visual symptoms, know your soil pH, target the proper soil temp and remember to irrigate in your fungicide and odds are good your course will still have putting greens rather than putting blacks.

Keep up on the latest research too, because, as Kerns says, “One of the things that makes this disease a mystery is that we still really haven’t figured out the cause of it yet. We’re close, but there’s still more to be done.”

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continued from page 24

- Know what types of weeds you have so proper treatments are prescribed.
- The pre-emergent philosophy may have to change and, along with it, no more one-and-done scenarios. You likely will have to split the rates of the chemicals and make multiple applications to have an impact.

ANYTHING ELSE?

I can't stress enough the importance of making sure you know exactly what weed you are treating. Take a picture of the invasive weed and send it to your weed scientist for verification of the species. In New Jersey, for example, Dr. Matt Elmore at Rutgers University will identify the weed and assist the superintendent in creating the most effective treatment plan for the specific species.

Wrong treatments or over-treating runs the risk of damaging your primary turf species. For example, the treatment for eradicating goosegrass is similar to methods for treating annual bluegrass — degree days, soil temperatures, plant color and proper pre- and post-herbicide applications. Extra caution is required as you head down these new paths. Use your trouble spots for growth or *Poa* invasion (shade, wet, compact and trafficked) as a test for the course.

WHAT HURTS MY PRE-EMERGENT REGIME?

Timing of applications, incorrect soil temperatures and avoiding split applications. As climate warms and more rain is experienced, pre-emergents dissipate more quickly and more weeds will emerge. Then

this turns into a post-emergent issue, as well.

ARE THERE OTHER AREAS ON THE COURSE I SHOULD PLAY ATTENTION TO?

Native areas. These are often called low-maintenance areas (I don't think they're low-maintenance), but due to turf density, the weeds sneak in. Goosegrass — like annual bluegrass — is a prolific seed producer and, if left untouched, will produce seeds and make the problem worse. Application timing is essential for success.

WHAT ARE YOUR THOUGHTS ABOUT POACURE, NOW THAT IT'S LABELED FOR USE IN THE UNITED STATES?

As much as everyone wants it to be, it is NOT the silver bullet for annual bluegrass control. If you are using PoaCure, be accurate on your *Poa* percentage estimates. If you have more *Poa* than you think you do, you will lose more grass (*Poa*). Accurate *Poa* percentages are key to know prior to applications.

OUR JOB DEPENDS ON KNOWLEDGE AND SCIENCE. WITH SO MUCH INFORMATION LITERALLY AT OUR FINGERTIPS, HOW CAN WE KNOW WHAT IS CORRECT?

Science is based on facts, and facts come from sound data and careful research. How we explain what happens in the natural world is based on science. It's a scientific process to explain what goes on in the natural world and answers are based on facts, not beliefs. It seems these days people treat science as some kind of belief system. It is not. Facts are facts, whether you choose to believe them or not.

So all the chatter, information and "beliefs" found on social media don't necessarily mean it's the truth or fact. Be very careful. Confirmation bias is a term used in statistics and it is poison to understanding facts. Confirmation bias means you have a set of beliefs and you seek facts to confirm your bias. That is not the way the scientific process works. In science, you approach a topic with no preconceived ideas and you see where the data lead you.

You have to look at data that is accurate and from a reputable source. Interpret the data and draw a conclusion based on scientific fact. Do not follow opinion and innuendo. Trust your judgment, find the best possible sources and resources, and rely on data and research — not instinct, and be very careful on social media.

When relaying information to members and golfers, you can't have an opinion. Your opinion on the matter is irrelevant. Facts are facts.

WHAT ABOUT THE ROUNDUP CONTROVERSY?

It goes back to science. The science says it is not a problem. I am neither a toxicologist nor an epidemiologist, but I do respect what these scientists say. There will always be some disagreement in the scientific community but we look very closely at "scientific consensus." What do most scientists who specialize in that area have to say about a topic?

Every major regulatory agency in the world has said that RoundUp is a low-risk product. The group that declared glyphosate a "probable carcinogen" (the International Agency for Research on Cancer) is not

a regulatory agency. They didn't even do a complete risk assessment. Worldwide official regulatory agencies have supported RoundUp. The EPA registration for glyphosate is guided by federal law and it's reviewed regularly. And there is no evidence linking the product to non-Hodgkin lymphoma.

In these types of discussions that get emotional or humanized, don't get involved and hurt your credibility. Stick with the science, the facts and stay out of the political realm. Science is not a belief system.

HOW IS THIS GOING TO BENEFIT THE SUPERINTENDENT?

Your members and customers think you are objective and understand science. For example, when asked current industry-related questions, have the FACTS lined up to reinforce your scientific viewpoint and avoid hyperbole. That is being a supporter of science and is being professional.

CONCLUSION

You will be best served to follow the science, as Dr. Yelverton said. You need to get the science right in order to give the green committee an intelligent response and lay out the program. Talk about scientific consensus. Professional people will respect you even if they disagree (generally).

- Avoid confirmation bias — things that support YOUR opinion.
- Fake news travels faster than the truth.
- Give science to skeptical audiences

As Mr. Spock said on *Star Trek*, "Emotion has nothing to do with it. If you don't have feelings, you stick with the facts." **GCI**

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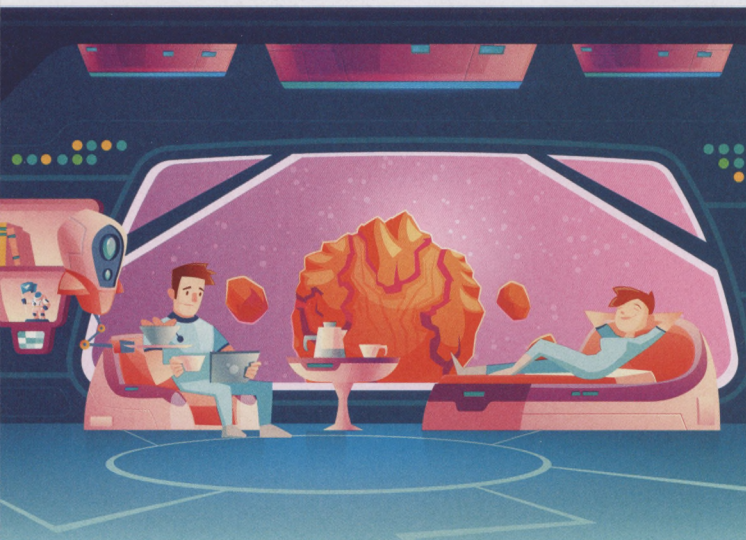
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MEET GEORGE JETSON!

I don't know about the rest of you, but I am still amazed at the mere concept we are living in the year 2020! Have you stopped to ponder the year 2050 is as near us as the year 1990? Exactly. I was born in 1968 and will be 52 later this year. When I was growing up in the early 1970s, my idea of 2020 was most likely formed by *The Jetsons*, with video phones, robot housekeepers like Rosie and flying cars that fit snugly in a briefcase.

OK, so maybe FaceTime is a real thing, and although I have never seen an actual robot butler or housekeeper, there are robots that clean floors. We'll get back to the flying car thing. I got my introduction to greenkeeping and this wonderful industry in 1988. Driving a Massey Ferguson tractor pulling a 5-gang mower was my first experience and I soon graduated to mowing fairways with a 7-gang Jacobsen F10.

Fast-forward more than 30 years and I've witnessed some remarkable technological advances. The Toro 648 aerator is probably the first big improvement that comes to my mind. I still know some guys that rely on a small army of Ryan GA24s because they make a perfect hole, but the speed and efficiency of the Toro 648 was a game-changer for most of us.

I could write an entire series of columns on the advances in irrigation technology, so I will simply say we've come a long way from control clocks to using smartphones and tablets as well as the precision of today's rotors and inserts vs. block systems, impact heads and other stories of the famed night waterman.

But I don't want to wax poetic about the old days. Let's look at the advances just in the last decade. I obtained my first TDR

in 2012; now I have four of them. Digital job boards are quite common in modern turf care facilities and operations, although I'm still an analog guy (fancy way of saying I still rely on the whiteboard).

Drones are flying over golf courses, capturing images and the data is then used to help golf course superintendents make decisions. And although most popular social media platforms have been around for more than 10 years, most superintendents have gravitated to them in the past decade to communicate to members and customers, as well as exchange ideas and information with fellow superintendents.

So, what's next? What do the next 10 years hold for the golf course maintenance industry? I recently had the opportunity to appear on The Fried Egg Podcast hosted by Andy Johnson during the Golf Industry Show. We were joined by Edric Funk of Toro and the three of us conversed about a variety of technology and innovation topics, the biggest being autonomous mowers.

Ironically, just a few weeks following that conversation, Cub Cadet surprisingly announced they were shelving their autonomous greens mowers for the time being. I believe I shared in our podcast conversation that I once told my greens chairman that although robotic mowers like the RG3 already exist, I felt it would take seeing them in the trade show floor booths of the big three manufacturers before we are truly on the doorstep of

that phase of the industry.

And 2020 did that as Toro and John Deere both exhibited autonomous technology at GIS. But will robots save our labor issues and become commonplace on our golf courses? I don't know, but I do expect we may see more of them in the next 10 years. Another thing I think we will see is an "old is new again" approach to solving our challenges.

I earlier shared my experience about using a 7-gang wide mower and I think we will continue to see innovation that harkens back to those days of large and efficient equipment. The newer large pieces will be strong, but lighter, thanks to modern materials. They will allow one operator to perform the job of two, alleviating some staffing issues.

My vision of the modern greenkeeping facility before we reach the end of these roaring '20s is a hybrid: The staff size is reduced and some autonomous mowers are included. Larger, faster equipment operated by a few individuals used in conjunction with robotic mowers will allow a team of 12 to perform the work once completed by 18 to 20.

The modern golf course superintendent and his or her core team of assistants and equipment managers will be tech savvy and monitor the operation with the touch of a button. And who knows? By then, the superintendent's cart might just fly. I just hope we're not all simultaneously crying out to our equipment managers to "Stop this crazy thing!" **GCI**



MATTHEW WHARTON, CGCS, MG, is the superintendent at Carolina Golf Club in Charlotte, North Carolina and past president of the Carolinas GCSA. Follow him on Twitter @CGCGreenkeeper.

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