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# Golfdom

05.24

## TURF TECH AMPS UP

Spotlighting three  
new tech tools for  
superintendents,  
including the  
Firefly AMP  
fairway mower



### PLUS

IN MEMORIAM: JOE VARGAS, PH.D.

FRIENDLY FACES AT THE 2024 MASTERS

WELCOME TO THE TEAM, SCOTT HOLLISTER



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“Even though Scott will be serving *LM* full-time, it would be foolish for us not to utilize his experience, skills and network on the golf side.”

**SETH JONES**, Editor-in-Chief & Associate Publisher

eration from Scott ... we had our guy. Scott accepted the position of Editor-in-Chief of *Landscape Management* (I'll remain on the *LM* team as Editorial Director.)

Even though Scott will be serving *LM* full-time, it would be foolish for us not to utilize his experience, skills and network on the golf side. After all, he did spend 26 years working at GCSAA.

When the sad news broke that Dr. Joe Vargas passed away, I asked Scott if he could write a story for *Golfdom*, which he was happy to do. After so many years of knowing Scott as Mr. GCM, seeing his byline in this issue of *Golfdom* is somewhat surreal, but it's also so very, very welcomed. I know Scott is going to make my life easier and he is also going to make our brands so much stronger.

I also want to shout out the team who have kept the magazines and the websites on track these past few months while we were shorthanded, especially Rob DiFranco, managing editor, Pete Seltzer, art director, Sydney Fischer, digital media specialist, Joey Ciccolini, digital media content producer, Bill Roddy, group publisher and Craig MacGregor, publisher.

With the addition of The Hulkster — I mean, Hollister — it's the start of something new here at NCM. I don't know which of us is Hogan and which of us is Savage, but I am grateful to have a new tag team partner to make these magazines ... ooooo, yeah! 🍌

Email Jones at:  
[sjones@northcoastmedia.net](mailto:sjones@northcoastmedia.net).

## A new tag-team partner

I don't know if this is as big as when Hulk Hogan and Randy “Macho Man” Savage joined forces in 1987 on *Saturday Night's Main Event*, to create the Mega Powers, but to me, it sort of feels that way.

As you might know, for the last 13 years I've been Editor-in-Chief of *Golfdom*, a position I've embraced and enjoyed immensely. But what you might not know is that, over the last five years, I've served a dual role at North Coast Media (NCM), *Golfdom's* parent company. I've also worked as the Editor-in-Chief of our sister publication, *Landscape Management* (*LM*).

*LM* (**landscapemanagement.net**) covers the lawn care and landscape industry. It's a big market with a big audience — 60,000-plus print copies a month (for comparison, *Golfdom* prints 20,000-plus copies a month). It was a great promotion and opportunity for your pal Seth, and it also allowed me to meet some really fascinating people and travel the world — Puerto Rico and Italy among other stops for that magazine.

But over the last six



months, we've had some staff turnover, as happens in any industry. I knew I needed to hire one, maybe two people to help me and my team with the controlled chaos of publishing two monthly magazines. After rifling through the résumés handed to me by my human resources director, I asked myself, is the answer in here? I sat at my desk and wondered if there was someone who could come in and really make an impact on day one.

That's when I thought of my old co-worker and friend, Scott Hollister. Scott and I

were co-workers at GCSAA, on *Golf Course Management*, from 1999 until I left to take over *Golfdom* in 2012. We've remained close over the years, attending the same industry events, the occasional concert and ballgame and even being in the same fantasy basketball league over the years, arguing over pro basketball players.

So, by now, you know where this is going. I invited Scott to lunch just to ask him if he might consider an opportunity I had at NCM. After a few lunches, phone calls, cold Miller Lites and much consid-





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# Starter

NEWS, NOTES AND QUOTES



## //IN MEMORIAM

# INDUSTRY MOURNS LOSS OF VARGAS, LEGENDARY TURFGRASS RESEARCHER

BY SCOTT HOLLISTER

➔ If the true measure of a man is the legacy he leaves behind, the late Joseph Vargas, Ph.D., can rest easy.

Based on the countless tributes and eulogies that poured in following his death on April 18 following a long illness, Vargas' legacy — one that included over 50 years at Michigan State University as a professor of turfgrass pathology — was as immense as any the industry has ever seen.

"I don't know that there is anyone in this industry who didn't know Joe or at least know of Joe," says Kevin Frank, Ph.D., a professor and turfgrass Extension specialist who worked with Vargas at Michigan State for nearly a quarter of a century. "We were trying to figure out how many students he taught over his years, and you could easily come up with over 2,000 turf students ... he just impacted so many people for so long. He was literally an institution."

That impact as an influential figure in turfgrass education and research



Joe Vargas, Ph.D., won the USGA Green Section Award in 2007 and the Morley Award from the GCSAA in 1997.

extended into the world of golf course management, as well.

Adam Ikamas, CGCS, now the executive director of the Michigan GCSA, got a firsthand look at Vargas' support of superintendents during his days as a working superintendent.

"When I was in that role, I learned more and more about his impact on golf all over the world," Ikamas says.

But both Frank and Ikamas say that Vargas the person will be missed just as much as Vargas the turfgrass legend. His lust for life, his love of golf and his passion for Elvis Presley — and his impersonations of The King that he'd roll out at conferences from time to time — will be remembered as much as his many contributions to turfgrass.

"They don't make them like Joe Vargas anymore. It's just not possible," says Ikamas.

## //HOMECOMING

### LANDSCAPES UNLIMITED ADDS NEW VICE PRESIDENT

Golf course developer and construction company Landscapes Unlimited appointed Tim Hubbard as its new vice president. Hubbard will oversee irrigation and construction projects at golf courses, country clubs and resorts in the western half of the United States.

"Tim is extremely talented at promoting a family atmosphere, providing unwavering support to our high-performing field teams and showing our clients the meaning of excellence," said Brian Vitek, COO of Landscapes Unlimited.

After working at Landscapes Unlimited from 1993 to 2008, Hubbard moved to other industry opportunities, including his own irrigation and construction business.

"This homecoming to Landscapes Unlimited holds a special place in my heart," said Hubbard. "The difference lies in the personalization, not commoditization of each project, seamless communication between stakeholders and treatment of others' money like it's our very own."

## //BEST OF THE BEST

### BARRETT TAKES HOME ASIC AWARD

The American Society of Irrigation Consultants (ASIC) selected Jim Barrett, FASIC, as the recipient of its Roy Williams Memorial Award.

Roy Williams was one of the founding members of ASIC and an award is given in his name to recognize significant contributions to the irrigation industry.

Barrett has more than 50 years of experience in irrigation consulting. He established an independent irrigation consulting firm in 1985 after working with Robert Trent Jones, Sr., for thirteen years. At this time, the profession was in its infancy and a new concept for areas outside of the California market.

Barrett has more than 350 golf course irrigation systems to his credit and is also a member of and participates in ASABE, USGA and GCBAA. He was the lead author of Golf Course Irrigation Environmental Design and Management Practices and has presented multiple times at national and regional conferences, including GCSAA and ASIC.



## // MAKING THEIR VOICES HEARD

# GCSAA presents 3 Grassroots Ambassador awards



The GCSAA named Bryce Gibson, CGCS, golf course superintendent at Interlachen Country Club in Winter Park, Fla., Dustin Plemons, golf course superintendent at Cleveland Heights Golf Course in Lakeland, Fla., and Patrick Van Vleck, CGCS, golf course superintendent at Unicorn Golf Course in Stoneham, Mass., as Grassroots Ambassador Leadership Award winners.

Gibson, a 22-year member of GCSAA, has been a Grassroots Ambassador since the program's inception in 2014. He has been paired with three congressional representatives over the years, most recently with Rep. Cory Mills (R-Fla.)

Plemons, a 25-year GCSAA member, joined the program in 2020. He is paired with Rep. Scott Franklin (R-Fla.) A major focus has been emphasizing golf's stewardship concerning water use and quality in Florida.

"Advocacy is important, because if we don't stand up for the industry, who will? We need to be as loud as we can and get golf's story out there," he said.

Van Vleck, a 21-year GCSAA member, became an ambassador in 2019 and is paired with Rep. Katherine Clark (D-Mass.) He has shared how the facility is focused on lessening its carbon footprint, caring for pollinators, growing more native plants on-site and creating spaces for wildlife.

## X #TurfPostoftheMonth

Follow us @Golfdom

**Kevin W. Frank**  
@MSUTurf

Professor and turfgrass Extension specialist at Michigan State University

Still processing the passing of Dr. Joe Vargas today. Joe was a mentor, colleague, and friend. Cheers Joe — you definitely did it your way!

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Kevin W. Frank  
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Still processing the passing of Dr. Joe Vargas today. Joe was a mentor, colleague, and friend. Cheers Joe - you definitely did it your way!



## Ask Thad

BY THAD THOMPSON

Superintendent  
Terry Hills GC, Batavia, N.Y.



### What's your favorite part of opening the golf course every spring?

Bringing on a limited staff early in the season gives me the opportunity to do numerous jobs that I don't get to do as the superintendent throughout the golf season. Some tasks are physically easier than others while others require some heavy lifting.

I love getting back to the reason I fell in love with the golf course maintenance business in the first place: hard work and a daily sense of accomplishment.

I love being on a mower. It doesn't matter if it's greens, tees, fairways or rough. This is the time I get to think about life and about planning my day. I can literally look in front of me and see all I must do, but still get to glance behind me and see all that I've accomplished. It's the best metaphor for life I can possibly think of.

I still love cutting cups. Strategically laying out fair but challenging pin placements is a thinking person's job. I enjoy the challenge and the continuity that comes from setting up a golf course. I plan easy, hard and "middle of the green" pin placements that are designed to make a golfer think their way around the golf course, kind of like a pitcher throwing different pitches that a batter must anticipate.

This is why I get so pissed off when a golfer takes a divot on a green. It's disrespectful to the golf course and disrespectful to my daily planning.

My favorite part of the spring is when I get my full crew back. We have around 20 employees for our 27 holes. Returning crew members, new hires and full timers that have worked all winter intermingling, getting to know each other and working toward a common goal is truly inspirational.

We work together like a family and all that entails, good and bad. Communication, teamwork and clear goals keep the maintenance machine running as smooth as possible. Here's to the 2024 season, cheers!

Got a question for Thad? Tweet to @TerryHillsMaint and @Golfdom or email Thad at [thadthompson@terryhills.com](mailto:thadthompson@terryhills.com)



## Friends in High Places

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### Herm Edwards, Former NFL cornerback and coach

#### “YOU PLAY TO WIN THE GAME!”

What sports fan hasn't quoted Coach Herm Edwards? A cornerback in the NFL for 10 years, Edwards spent most of his career with the Philadelphia Eagles (1977-1985) as well as the Atlanta Falcons and Los Angeles Rams. Edwards earned second-team All-NFC honors in 1980, helping the Eagles reach Super Bowl XV.

Edwards went on to coach after his playing career ended, first at the collegiate level, then in the NFL. He served as head coach of the New York Jets (2001-2005) and the Kansas City Chiefs (2006-2008.) Edwards also worked as a studio analyst for ESPN. Most recently he was the head coach of Arizona State University (2018-2022).

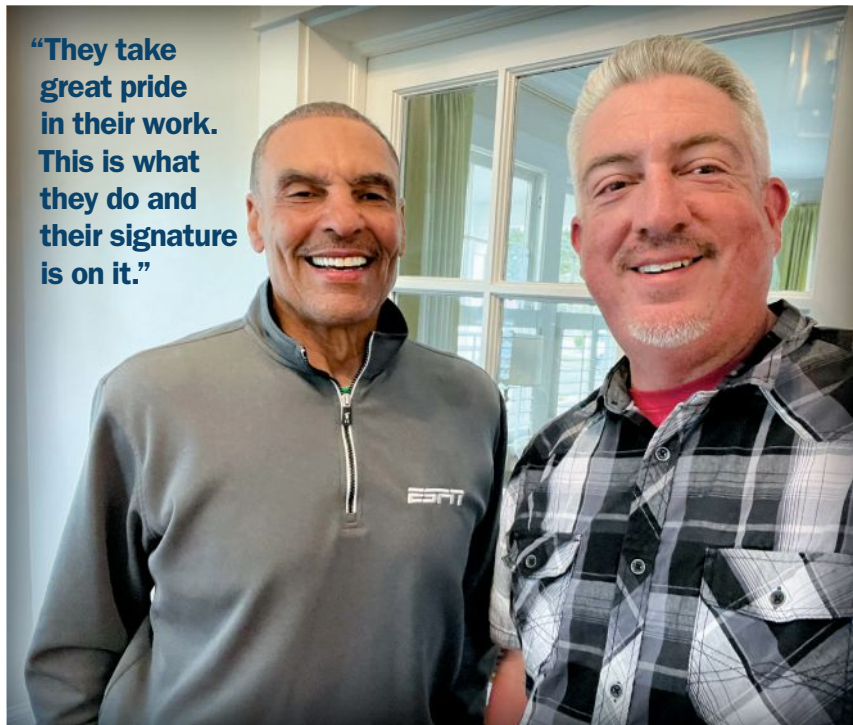
A motivational speaker, Edwards co-authored the book *You Play to Win the Game — Leadership Lessons for Success On and Off the Field*, the book title a call back to Edwards' famous press conference as head coach of the Jets when he incredulously repeated the line to a reporter.

— Seth Jones // Editor-in-Chief

“I'm pretty big into golf because I like the challenge of it. Am I any good at it? I'm OK. I mean, it's like anything else — If you don't practice, you're not going to be any good.

I enjoy going out playing. I love the scenery of a golf course. I think the way they're set up and you watch the guys that set the golf courses up where when you walk out there, there's certain places you can go and you go, 'Wow, this is pretty special.' And I think those guys — the superintendents of golf — the little things, the things that we take

“They take great pride in their work. This is what they do and their signature is on it.”



for granted ... when you see it, you go, 'Who did this? This doesn't just happen.' It doesn't. They didn't just water the grass! You're like, okay, there's certain things they do. They have a way of presenting a golf course.

When you play on a really good one — it could be a muni course, it could be a private course — but the way they present it, they take great pride in their work. They really do. This is what they do and their signature's on it.

I always say your name's on it, their name's on it. If I see them in their cart, or walking, I say, 'Man, you got a nice course here.' I tell them, you got a nice course.

But I'm also always messing with them. I'll say, 'Why you putting dirt

on the fairways, that's going to be there for a month!' They'll say, 'We're getting them ready!' and I say, 'OK!' But I always tell them, thank you.

They're hard-working guys. They start when it's dark. I mean, those trucks are cranking — they got lights on them trucks and it's dark out. Look at the Masters. People are leaving and them dudes are out there raking the traps, filling the divots, and the next day when people come back out, they say, 'Did they even play out here yesterday?' Yeah, they did — but guess who was out here working all night, getting it fixed up?

It's amazing what they do and what they mean to golf ... but they don't get enough credit.”

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# Golfdom Gallery

MASTERS  
EDITION



**1 BASF buddies** It's always good to see two Friends of Golfdom, Brian Thompson and Mark Semm, both from BASF, at Augusta National.

**2 Lone Star posse** Bryan Brown, Lake Kiowa (Texas) Golf Course; Chris Bruner, Hurricane Creek CC, Anna, Texas; Trevor Ogden, Squaw Valley GC, Glen Rose, Texas, and Michael Underwood, Hunter Industries made the journey from the Lone Star State to Augusta.



**3 Hello! We play to win the game!** Celebrity sighting! Jones (left) and Chris Fronczek, Nufarm (right), ran into longtime NFL player and coach, Herm Edwards, at the E-Z-Go party. To see our Friends in High Places interview with Edwards, turn to page 10.

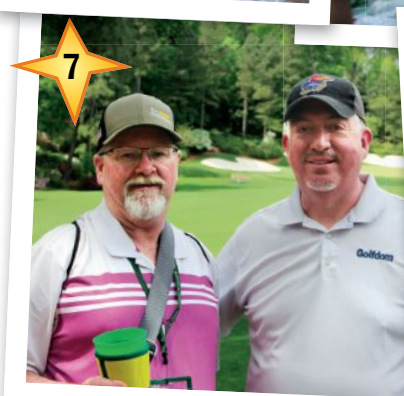


**4 Housemates of the year** Thanks to (left to right) Glen MacDonald, Cripple Creek Club, Bethany Beach, Del.; Pete Wendt, CGCS, Congressional CC, Bethesda, Ma.; Joe Kinlin, Bey Lea GC, Toms River, N.J.; Jeff Haas, E-Z-Go and Donovan Maguigan, Springdale GC, Princeton, N.J., for letting our EIC crash at their house.

**5 Hey, it's @TurfMonkeyBoy!** We learned that John Reilly, director of agronomy at Longboat Key (Fla.) Club, has some big plans in the works for 2024 that fit in with the theme of this issue. Stay tuned!



**6 Red Rock Rick's crew** From left to right are Brian Mohr, Spencer (Iowa) Municipal GC; Mark Clark, The Bluffs, Vermillion, S.D.; Chuck Mohr, retired; Bob Wethor, retired; Jim Walraven, CGCS, Meadowbrook GC, Rapid City, S.D.; and 'Red Rock Rick,' aka Richard A. Wit, CGCS, GC at Red Rock, Rapid City, S.D.



**7 Osley's first Masters** A longtime Colorado super who is now working as superintendent at St. Joseph Bay CC in Port St. Joe, Fla., Mike Osley, CGCS, finally made it to Augusta National, where he ran into Jones during a stroll along Amen Corner.

PHOTOS BY: GOLFDOM STAFF





**8 Bryson dropping bombs** We liked the look of Bryson DeChambeau early; but no one could keep up with Scottie Scheffler.



**9 Another sunny day at Augusta National** Enjoying the perfect weather are (left to right) Tom Defino, Genesis Turfgrass; Nick Lubold, Sunnybrook GC, Plymouth Meeting, Pa.; Derrick Wozniak, Radley Run CC, West Chester, Pa.; Paul Schultheis, Finch Turf; John Urbanski, Wilmington (Del.) CC and Fred Lupi.



**10 Who? Mike Jones!** Thanks to Mike Jones of BASF for catching this moment in time: *Golfdom's* Seth Jones with Erin Stevens, CGCS, MG, Coral Creek Club, Placida, Fla.; Andy Engelbrecht, BASF; and Mike Fasy, Plantation CC, Fort Myers, Fla., enjoying Amen Corner at the Masters. Check out this month's 19th Hole interview with Stevens on page 44.



**11 19th Hole reunion** MacDonald and Jones caught up a year after the latter interviewed the former for the 19th Hole in the April 2023 issue of *Golfdom*.

**12 The champ is here** Defending Masters champion Jon Rahm couldn't make it two green jackets in a row, falling to a tie for 45th place in 2024.

**13 Chicagoland supers** Connor Healy, Conway Farms, Lake Forest, Ill.; Greg Rounds, Rain Bird; Jeff Frentz, Lakeshore CC, Glencoe, Ill.; Scott Vincent, Onwentsia Club, Lake Forest, Ill. and Donald Cross, CGCS, Skokie CC, Glencoe, Ill., made their annual trek to the Masters.



PHOTOS BY: MIKE JONES (10) AND GOLFDOM STAFF



# Superintendent's "Foolproof" Solution for Pesky ABWs

**A**nual bluegrass weevils (ABW) have proven a persistent challenge for Mark Daniels, superintendent at Wannamoisett Country Club in Rumford, R.I. These tiny black beetles are difficult to spot and tough to control, leaving Daniels desperate to try anything to battle them.

"ABW pressure starts around springtime, so we begin applying adulticides in late April. And it seemed like we were always finding some stage of larvae out on the course creating damage," Daniels says. He recalls using multiple products from different companies and having to continuously reapply throughout the season.

Then he stumbled upon Quali-Pro's Suprado insecticide that specifically targets annual bluegrass weevils.

"Quali-Pro was looking for people to do a trial with ABW products ... I was a part of the trial team testing it out before it went to the market," Daniels says. "I started watching all the webinars they had on it, and Dr. (Ben) McGraw's presentations, and just kept following it."


When it came time to test it on the course, Daniels remembers noticing an immediate difference.

"We started using Suprado against the adults at the very beginning and were able to drop out the additional side applications. We did one application of Suprado and then we didn't need any larvicide for that generation anymore."

With the absence of ABWs and barely any course damage, Daniels quickly added Suprado to his lineup. "We did the exact same treatment again the second year and saw the same fantastic results. It's foolproof," he says.

Daniels utilizes a number of different Quali-Pro products, like Enclave fungicide, insecticides and their plant growth regulators.

"We started with a legacy product, Tebuconazole 3.6F, and it just kind of slowly morphed into using more and more Quali-Pro products every year until we got comfortable with them."

"Everyone I've heard of that uses Quali-Pro products has great results." 



Mark Daniels

**Suprado is my silver bullet. I recommend all supers try it out for themselves. It's a no-brainer to get rid of ABWs."**

## ABW BATTLE

**Battlefield:** Wannamoisett Country Club

**Location:** Rumford, R.I.

### War Story:

Mark Daniels, superintendent, has been battling ABWs with little luck for some time until he tested out Quali-Pro's Suprado, powered by novaluron, a couple years ago.

"Thanks to Suprado our entire treatment program has changed for the better. We don't need a lot of products anymore to battle ABWs. Suprado takes care of them for us. It's been a game-changer."

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"My experience with this technology is what led me down this slightly scary road of becoming one of the first technology consultants focused on the turfgrass industry, and why I'm writing this column for *Golfdom*."

**BENTON HODGES**, Owner, Mountain West Turf Technologies

## What's this guy's deal with technology?

I will never forget using a GPS sprayer on a greens spray application for the first time. The boundary control, overlap prevention and a visual map of where I had sprayed felt like I had stepped into a golf course from "*The Jetsons*." As both the manager directly responsible for the spray program and the operator driving the sprayer, my stress level on application days decreased while the quality of spray increased.

And while there were hiccups with implementation like any piece of equipment or technology, after a few applications, we had our system dialed in. Using indicator dye on our greens spray left my boss nearly speechless when he saw the accuracy evidenced by a perfect outline.

My anxiety following important applications began to reach more reasonable levels. I no longer woke up in a cold sweat wondering if I skipped that final pass on the 13th fairway, or if that corner on the third green was going to be OK after overlapping a bit to avoid a bunker.

We are all aware of the financial benefits of GPS spraying, like product savings due to increased efficiency. However, where this technol-

ogy stuck out to me was the ability to make a major part of my job less taxing and the trickle-down effect that had on my mental health.

My experience with this technology is what led me down this slightly scary road of becoming one of the first technology consultants focused on the turfgrass industry, and why I'm writing this column for *Golfdom*.

I believe strongly that technology can be used in turfgrass management to not only improve conditions, save money, solve labor issues and more, but also to increase the quality of lives of superintendents, assistants and crew members by providing the breathing room so many of the people in this industry desperately need.

### Turfgrass management in 2050

We're quickly approaching 2025, which makes for an easy excuse to look ahead to the next quarter of a century in 2050 while also reflecting on the progression since 2000. In this column, I hope to make technology more approachable by painting a broader picture of technology by talking about the past, present and the future.

While some technologies do not make sense for full-scale integration for most golf courses, many are viable options for a wide range of properties for different uses in 2024. They will only continue to grow in accessibility and affordability. I predict golf courses that are thriving in 2050 will be the same op-


erations that began to incorporate technology now or in the next few years.

### That's cool, but turf tech ain't for me

If you are old school and feel like the new school isn't for you, ask your assistant, AIT or intern if they would take on the task. Many parts of technology that might intimidate superintendents such as phone apps, dashboards and user interfaces come naturally to the younger (not wiser) generation. Leaning into their strengths will create a sense of ownership and build trust between directors/superintendents and their assistants. Teamwork makes the dream work — robots, sensors and computers are now part of the team.

Attracting labor is an issue in the turfgrass industry, especially assistants and interns. With the golf boom after COVID, there has been a small resurgence in enrollment in turf schools, and this younger generation is already making decisions based on technology use at courses.

I'll leave you with a thought experiment. Would you get more applicants by posting:

- a) "2025 Turf Interns" or
- b) "2025 Turf Technology Interns" 

Hodges started his career in the turfgrass industry as a researcher at Mississippi State University followed by nearly a decade at high-end golf clubs as an assistant superintendent in the Mountain West. He now focuses his efforts on helping golf courses leverage technology-driven solutions while maintaining a people-first mindset. Find him on X at @BPHTurf or LinkedIn.





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# The next *BLG* thing

BY MIKE ZAWACKI

**G**olf course superintendents must manage an always-evolving landscape of challenges. The good news is that advancements in irrigation technology, data management, autonomy and artificial intelligence are revolutionizing turf management.

These innovations aren't just bells and

whistles. They're powerful tools that optimize resource use, minimize environmental impact and proactively mitigate pest and disease outbreaks while empowering superintendents to become more effective stewards of the game.

Here are three cutting-edge turf management technologies to get acquainted with. They address difficult turf challenges while improving a course's long-term health, sustainability and playability.

## NanoOxygen Systems

Nicholas Dolimpio had a major turf problem. His course's roots were so shallow that the turf slid off the greens.

"We never were able to grow roots," explains Dolimpio, the director of golf course maintenance and grounds at Lake Nona Golf and Country Club in Orlando. "So, when we'd roll the greens, the turf would slide over the cup. It was bad."

As the home course for nearly 30 pro



Robotic mowers — like the AMP Fairway Mower from Firefly Automatrix (pictured) — could soon be a permanent fixture on golf courses nationwide.



## Three high-tech tools address turf management challenges and could be game-changers for your golf course

golfers, Dolimpio faces immense pressure to maintain elite playing conditions at the 18-hole championship Tom Fazio course. As a band-aid, he would fertilize and manage greens by overseeding them.

“(The roots) would go down (further into the soil) and just die,” he says. “We created a detriment every year when we overseeded. We’d put seed down and a ton of water down right after the wet season when the bermuda didn’t need to search for water, so it wasn’t trying to push roots.”

Dolimpio had long suspected the well water he used to irrigate the golf course was the culprit, so he tested it.

“The baseline is 4 parts per million (ppm) dissolved oxygen. It’s what is required to sustain life,” he says. “When we pulled water from our well, it was 3 ppm.”

In comparison, rainwater is between 7 and 8 ppm, which accounts for the sudden green flush commonly seen in turf after a rainstorm. This deficit prevents beneficial aerobic microbes from surviving, and harmful anaerobic bacteria run wild in the oxygen-depleted soil. This is a surefire formula for poor-quality, unhealthy turf.

Dolimpio was familiar with Ron Pote and NanoOxygen Systems, which engineers both portable and permanent water improvement systems and specializes in installing and controlling oxygen-rich ultra fine bubbles in irrigation water.

According to Pote, ultra fine bubbles are microscopic gas bubbles less than 200 nanometers in size. For reference, a strand of human hair is about 80,000 nanometers wide. Unlike larger bubbles that float to

the surface and release gas, ultra fine bubbles are non-buoyant and stay suspended in water. This allows them to deliver oxygen throughout the water column.

These bubbles can be made from air or directly from oxygen, nitrogen or carbon dioxide and have applications in various industries, like golf turf, Pote says. In turf, ultra fine bubbles increase oxygen levels in the soil, which benefits plant root growth, improves access to nutrition and contributes to better overall health. Pote prefers the standard term “ultra fine bubbles” to correctly describe the bubbles in this process, although “nanobubbles” is the term most often used in casual conversation.

“We can take basic groundwater or well water, which has nearly zero dissolved oxygen, and raise it to 15 to 20 ppm, which is two times the amount found in rainwater. That’s the magic” Pote says.

### Seeing is believing

Since using the NanoOxygen System to enrich and treat his irrigation water, Dolimpio has witnessed the ultra fine bubble’s magic firsthand on his course.

Dolimpio references the rainwater green-up when describing the ultra fine bubbles’ impact on Lake Nona’s turf. However, he adds that he doesn’t observe this occurrence anymore.

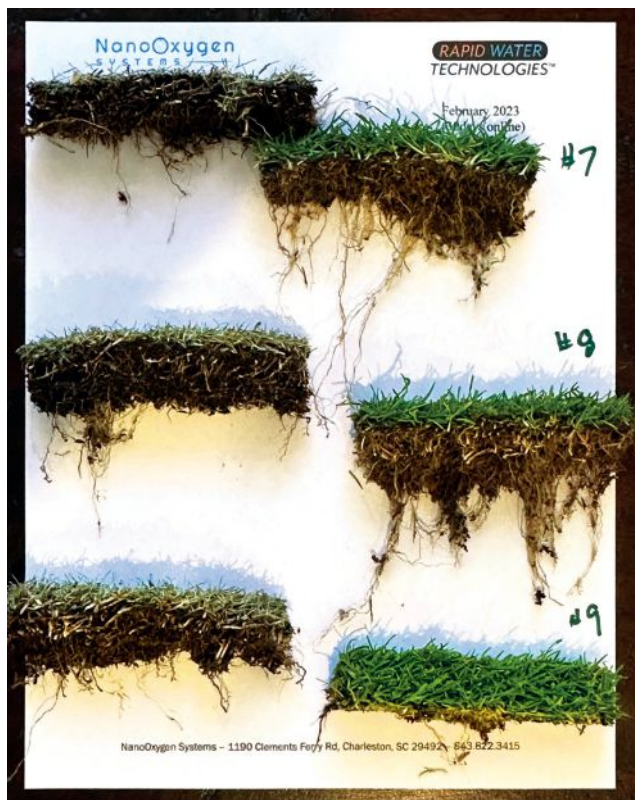
“You always used to see a little green up after it rains,” he explains. “We don’t see that anymore because our water has more dissolved oxygen than rainwater. We don’t notice the green up because (the turf) is always green.”

Dolimpio says Lake Nona’s turf has rebounded and playing conditions have improved exponentially. For example, when the El Nino conditions cleared out this spring, and the Orlando region began experiencing warmer, dry afternoons, Dolimpio didn’t irrigate as frequently to keep the turf looking healthy. In the spring, he attempted to let the ryegrass they’d overseeded die back to encourage the bermuda roots to dive deep to pull water.

“We’ve been able to firm up the golf course far beyond what we’ve ever been able to do before,” he explains. “It’s pretty amazing. And even in the spots where we’ve had complete wilt of the overseed in the past, the bermuda is not batting an eye. It’s pulling water from where it should be, and that’s all due to the roots doing what they’re supposed to, which is driving deep. Now they’re not being killed by anaerobic bacteria and (oxygen-depleted) conditions.

“In the past, with a fully overseeded golf course, if we’re not cognizant about taking care of the bermuda (when the ryegrass dies off) and getting it set in, then our rough is essentially dirt,” Dolimpio continues. “Today, we’re probably 50/50 bermuda to ryegrass when typically, this time of year, we’d still be at 20/80 ryegrass to bermuda. So, (the NanoOxygen System) helps us get back to a better golf course quicker. Our main goal is to get a better product for the summer, and I believe this system is helping us get (the course) on that track.”

*Continued on page 20*



Ultra fine bubbles helped save Nicholas Dolimpio's greens at Lake Nona G&CC, by promoting root growth.

*Continued from page 19*

In addition, introducing ultra fine bubbles directly into the soil profile reduces dependence on heavy synthetic fertilizers, a stark contrast to past practices that relied on them to achieve and sustain a vibrant green color.

"This is going to allow us to move to a much more organic route," Dolimpio says. "In the past, that didn't give us the results we were looking for because the soil wasn't healthy and lacked the (beneficial) microorganisms to break that fertilizer down."

NanoOxygen System has also integrated an ozone injection system, which is controlled by monitoring the water's oxidation-reduction potential (ORP). This method is commonly employed to gauge disinfection effectiveness, and in this application, Pote says the small amount of ozone sufficiently eradicates turf pathogens like pythium, water molds and cyanobacteria.

Lastly, NanoOxygen Systems provides courses using an active online monitoring system. Pote says this continuously checks water quality and provides superintendents instantaneous feedback via cellular and cloud-based systems.

On the horizon, Pote anticipates adding carbon dioxide with oxygen and ozone to produce carbonic nano bubble acid to reduce irrigation water pH to optimal growth levels. He also wants to include more automation to optimize system performance and

develop a modular system that can be placed near a shoreline or at the irrigation pump and set to operate independently.

Pote has become somewhat of an ultra fine bubble evangelist, preaching the benefits of oxygenated water to turf managers. He believes a lot of education still needs to be done to bring the industry up to speed about the positive impact of ultra fine bubbles on turf and soil health.

"I think we're opening people's eyes to at least monitor the dissolved oxygen in their water," Pote says. "And if it's not high enough, now you can do something about it."

## Firefly Automatrix AMP Fairway Mower

Meet your new mowing technician. They show up for work every day and never complain. They maintain an impeccable edge line while flawlessly executing complex striping patterns for less than \$20 per acre. They just need the occasional jolt of power and an escort to the next fairway — at least for now.

This spring, Salt Lake City-based Firefly Automatrix began delivery on its AMP fairway mower. Once programmed, this fully automated, full-sized electric fairway mower requires little supervision.

While initially conceived as a harvester for the sod industry, it didn't take long for Firefly engineers to see the potential as an autonomous electric mower for golf course fairways and sports fields. Three years ago, Firefly engineers began working on a dedicated mowing machine that utilizes battery power, programmable autonomous operating software and servo-electric actuation in lieu of hydraulics, which makes it more efficient, faster, and smoother to deliver a quality cut.

"We did a lot of research on what equipment was available in the golf mowing industry, and we saw some pretty significant opportunities to improve that equipment in terms of not only efficiency but durability, noise and (operational) pollution and operating without (petroleum-based) fuel and hydraulics," says Mark LeBlanc, senior design engineer and product manager.

In a nutshell, here's how Firefly's technology works. During the initial deployment stage, a Firefly tech assists in setting up a machine, which is equipped with a stand-on platform to operate it manually.

With the assistance of a tablet app, the operator surveys the area to be mowed, driving the perimeter of a fairway while the mower's onboard GPS logs where the edges of those fairways exist. At the same time, other obstacles — bunkers and ponds — are identified as exclusion zones. Once compiled, the mower is ready to operate independently, only requiring a human's assistance to drive it to the next fairway.

LeBlanc is working on software upgrades that will allow the AMP — provided there are no obstacles — to transport itself to the next fairway.

*Continued on page 22*





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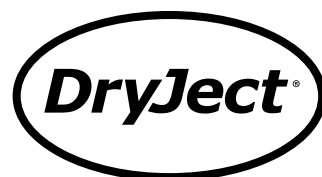
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Continued from page 20

Once a fairway is programmed into the system, the AMP can mow various paths while maintaining a precise line within 3 cm and a max overlap of 3 inches.

“We’ve got a lot of functionality built into (the software) that allows a superintendent to plan different pattern types, change the mow angles, choose the number of cleanup passes, and how much overlap you want,” LeBlanc says. “We’re going to keep introducing features, like 50/50 patterns, to give superintendents more functionality on how they want their course mowed.”

An added feature is that the AMP still functions manually if the GPS goes down.

“We designed it to be easy to move on,” LeBlanc says. “Even with the stand-on platform, it’s comfortable to ride and easy to turn and maintain straight lines. That’s a pretty big differentiator.”

The AMP unit costs around \$160,000, but, LeBlanc explains, it gives superintendents a compelling value proposition over traditional fairway mowers. The run time on a charge enables 10-12 hours of mowing, making a 100-inch cut, which converts to 20-25 acres of turf or around 6 acres per hour — depending on the grade

and how the mower was programmed to cut.

LeBlanc estimates that the AMP capital expenditures are around \$4.98 per acre compared to a traditional 100-inch fairway mower to mow a single acre of grass, considering that Firefly built the AMP to be a 10,000-hour machine. Running on electricity, energy costs are around \$.53 an acre, and labor costs about \$1.04 an acre. Finally, maintenance costs are estimated at \$.19 an acre.

## Putting it to work

Jeff Miller, director of agronomy at San Diego’s The Santaluz Club, an 18-hole championship Rees Jones-designed golf course, has long believed in the potential of autonomous mowing equipment on golf courses. An early adopter of autonomous rough mowers, when he heard about Firefly’s AMP, he knew he needed to demo it.

Miller had been disappointed by other autonomous mowers, which featured technology built upon existing platforms. Firefly designed the AMP from the ground up, resulting in the mower’s weight being more evenly distributed and balanced.

In addition to zero hydraulics and near-silent running, the

*Continued on page 24*

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# GAME-CHANGING TECH

Continued from page 22

AMP was all-wheel drive. Each wheel features its own dedicated motor that can be controlled digitally, providing impressive traction and maneuverability.

"When we did our demo, it was pouring rain, and there was standing water (on the course)," he recalls. "The AMP handled the slopes and the terrain like a champ. I was pretty surprised by the ability to make softer turns and whip around the course with so much control in those conditions."

It wasn't long before Miller had three AMPs on order.

"I'm definitely going to be more efficient," he says. "I have days where we don't have any dew, and it's really hard to see lines, especially if there's not a lot of growth. It's going to be the same cut in the direction I want, which is very beneficial."

## TerraRad Tech's turfRad

Superintendent Matthew Gourlay has experienced both sides of the industry's water dilemma firsthand.

Gourlay's previous course, the public 27-hole Colbert Hills Golf Course in Manhattan, Kan., had to pay for its water, so efficient

and responsible water use was paramount.

In his current role managing turf at Hillcrest Country Club in Boise, Idaho, he focuses on maintaining course conditions that meet his membership's expectations and delivering a high-quality playing experience.

"The courses couldn't have been more different," he says.

In both cases, Gourlay relied on Zurich, Switzerland-based TerraRad Tech's turfRad soil moisture sensing system. This system is designed to help golf course superintendents optimize their irrigation use. It takes detailed soil moisture measurements and creates high-resolution maps that guide turf managers in adjusting for even watering, reducing waste and improving course conditions.

"At (Colbert Hills), our goal was to figure out how much moisture was on the fairways and how far we could potentially push them compared to just visually looking at them and doing some random soil sensor measurements," Gourlay says. "And then at (Hillcrest), we are looking for firm and fast conditions. (Players) feel the golf course played soft, and I was seeking a communication tool to show them that it may not be because of moisture. Instead, it could be

Continued on page 26



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# GAME-CHANGING TECH

Continued from page 24

because of organic matter or maybe other underlying soil issues.”

While the turfRad technology is complex, its application is relatively simple. An L-band microwave radiometry sensor is mounted to the back of a fairway unit. Every time that unit mows, it collects moisture data from throughout the golf course. Along with integrated GPS, the sensor collects roughly 10,000 soil moisture measurements during 20 minutes of mowing. A high-res moisture map and statistics on individual irrigation heads are generated for the superintendent, which allows them to dial down and analyze an area about 1.5 yards by 4 inches deep.

“Many superintendents have stuck a time domain reflectometry probe in at one point and measured maybe one foot or a yard over and see a variability of up to 10 to 12 percent within that small scale,” says Derek Houtz, TerraRad Tech CEO, an aerospace engineer with a background in microwave remote sensing and environmental monitoring. “But by taking this larger soil volume with our remote sensor, you smooth out those small-scale variabilities to give you a better view of what can really be controlled by an irrigation head.”



“The actionable info allows supers to dial in individual run times based on a day’s readings,” says TerraRad Tech CEO Derek Houtz.

TurfRad gives supers the ability to optimally place water and adjust irrigation run times to create uniform conditions, says Houtz.

The newfound knowledge will be instrumental at Hillcrest, allowing Gourlay to provide members with a clearer picture of root-zone moisture levels and their implications.

“Instead of dealing with feelings, we have hard numbers, which give us a starting point to understand soil moisture and the potential moisture content that is out there,” he says. **G**

Mike Zawacki is a Cleveland-based writer who has covered various aspects of the turf, golf, landscape and agricultural industries over the last 20 years.

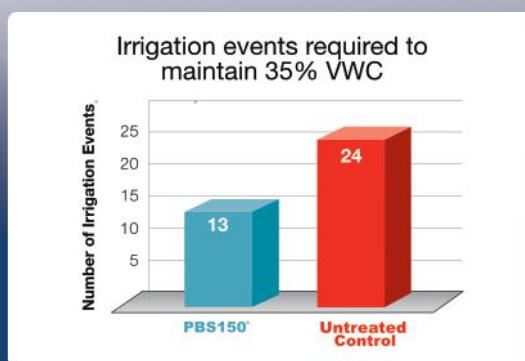
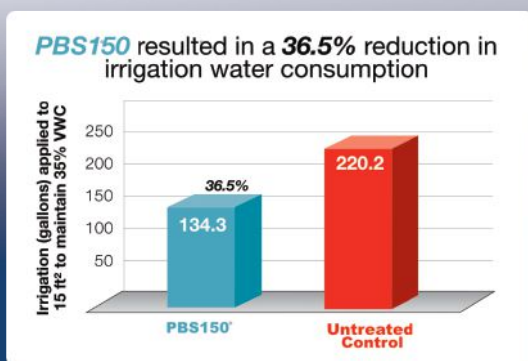
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*Craig Henderson  
Spring Meadows Country Club Superintendent*



“ At Bull’s Bridge Golf Club in South Kent, Connecticut, we selected to use Sand Guard liners for our Fazio designed bunker renovation project. We recently experienced an extreme 6.4 inches of rain overnight, and Sand Guard performed as advertised.

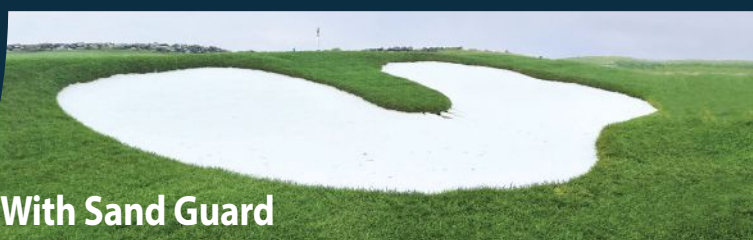
Little to no maintenance was required after the storm, night and day compared to our existing bunkers.

We considered several liner options during the project planning process, and after this rain event, I’m sure glad that we selected Sand Guard to help protect the Club’s new investment from the challenges of severe weather. ”

*Stephen Hicks  
Golf Course Superintendent*



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# Debating the future of battery power

Superintendents share their thoughts on the current state of battery-powered equipment



Does your course use battery-powered equipment? Do you see a future where your entire stable of equipment runs off battery power? Or, will battery-powered tools remain on the sidelines, behind gas-powered equipment?

We asked and these five agronomists answered, giving their perspectives on the present and future of battery-powered equipment on the golf course.

## Eric McPherson, CGCS

Director of Green and Grounds

Omaha (Neb.) CC

“We would love to (use battery-powered equipment), but we have an old electrical system in our shop and just don’t have the capacity for that right now. If and when we’re able to get that corrected, I’ll be interested in doing demos of just about anything. I think we’d mainly be interested in handheld tools such as string trimmers and backpack blowers and then some of the smaller autonomous mowers for rough mowing. The idea of using the mowers in more out-of-the-way rough areas and the consistency they can produce just fascinates me.”



Eric McPherson

## Jim Myers, CGCS

Golf Course Superintendent

Columbia Edgewater CC, Portland, Ore.

“We do use a bit of battery-operated tools, when applicable. We use handheld blowers, chainsaws, hedge pruners, lights for lighting up bunkers during the LPGA event we host, a pole saw and weed eaters.

The team uses all of them for different reasons, but one main reason is we had a homeowner complaint about noise, so we did a decibel study to understand noise decibels in distance from the homeowner’s house. We now use a handheld blower in that area



Handheld battery-powered tools give superintendents a lightweight and quieter option for various jobs on their courses.

before 8 a.m., and our greensmower can switch to battery mode to transport when it passes by the house before 8 a.m. or if we need to complete a task in the area of the homes.

Also, we use mini battery-operated chainsaws to cut small branches of trees because they’re lightweight, much like our hedge trimmer.



Jim Myers

I will say that the industry and technology aren’t totally there yet to go fully battery-operated. The battery-operated backpack blowers are not strong enough to handle the process of blowing cores or heavy sand during aerification or heavy clippings after cutting thick rough after a televised event. Fall leaf cleanup is a real challenge with battery-operated backpack blowers, but I’m sure time and technology will change at some point.”

## Erin Stevens, CGCS, MG

Director of Agronomy

Coral Creek Club, Placida, Fla.

“I think (electric power) has its place everywhere. I use battery-powered equipment around the clubhouse and pro shop areas,

*Continued on page 30*



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# BATTERY-POWERED EQUIPMENT GUIDE



Continued from page 28

especially where we do not want to have a high impact of noise or disturb the membership experience. But with that said, I haven't fully gone battery powered. We're pretty remote. We have no noise ordinances, and we get a lot more out of our gas-powered equipment. I have blowers, hedge trimmers and things of that nature that are battery-powered and they are useful depending on the area. If there's something that we have to do midday, then it's like, 'OK, let's opt for the battery.'



Erin Stevens

## Bubba Wright

Director of Agronomy

Big Cedar Lodge, Ridgedale, Mo.

"For us, you have to have a common sense approach, so we're certainly going to dip our toes into battery power as soon as we see that it's efficient enough to meet the expectations of our ownership group and our guests. We do have some battery-powered equipment, but until it performs in an area that is equal to or better than gas-powered equipment, we haven't quite dipped our toes in it that much."



Bubba Wright

## Shaun Marcellus

Superintendent

Wanumetonomy G&CC, Middletown, R.I.

"I'm not a believer in it. I've done some research on just where they get the lithium batteries and, I understand trying to be green and safe in the environment, but with where the lithium comes from and how it's mined, to me it doesn't make any sense.

It's almost like you're more polluting the environment, getting




Larger battery-powered machines, such as mowers, have become more commonplace on golf courses around the country of late.

that battery. I haven't seen any real data that says this is safer or this and that because I want to know what happens when the battery's done.



Shaun Marcellus

For (superintendents) I know there are battery-powered triplexes and things like that, which are fine if you're in a community where you've got to be quiet, and you mow for three hours, get the job done and off you go. But everything comes at a cost. At some point, you have to figure out how to dispose of these (batteries), and I don't think anybody knows. They want to say that we're trying to be environmentally friendly, but they don't have the answer for that yet." 

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## Battery-powered success story?

Has your course successfully integrated battery-powered equipment? If so, we want to hear about it. Email *Golfdom* Editor-in-Chief Seth Jones ([sjones@northcoastmedia.net](mailto:sjones@northcoastmedia.net)) or Managing Editor Rob DiFranco ([rdifranco@northcoastmedia.net](mailto:rdifranco@northcoastmedia.net)) with your story and you might be featured in an upcoming issue of *Golfdom*.

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# Super Science

## // THE RIGHT STUFF

### THE RIGHT WAY TO IRRIGATE FOR HEALTHY AND PLAYABLE FAIRWAYS

By Mike Kenna

**R**esearchers at the University of Minnesota are evaluating various measurement methods and devices that can quantify the physiological and physical responses of golf course fairways under dry-down conditions. It will determine their practical applicability for superintendents in field settings.

The study also seeks to identify the optimal Plant Available Water Limit (PAWL) values that enhance turf health and playability while efficiently managing water usage on creeping bentgrass and Kentucky bluegrass fairways, specifically in cool, humid climates. Additionally, it will explore how the choice of PAWL values impacts the long-term vitality of these turfgrasses and provide insights into sustainable management practices.

Researchers collected a second year of data from Kentucky bluegrass 'Shamrock' and creeping bentgrass 'Pennncross' maintained as individual fairway plots. Before initiation of treatments, plots received 0.5 lbs. of nitrogen and potassium per 1000 sq. ft. (2.4 g N m<sup>-2</sup> and 2.4 g K<sub>2</sub>O m<sup>-2</sup>) on April 26, 2023.

The study involved irrigation treatments based on five soil water threshold levels of 15, 30, 45, 60 and 75 percent of the Volumetric Water Content (VWC). Researchers applied these treatments in a randomized complete block design across three replications of each cultivar, starting with uniform irrigation of 1 inch (2.5 cm) on June 25, 2023, achieving near-field capacity rootzone conditions.

From June 26 to Sept. 30, 2023, they monitored VWC every 15 minutes using soil moisture sensors, and manually irrigated plots with 0.25 inches (0.65 cm) of water whenever soil moisture fell below their specific threshold (Figure 1).

As expected, plots irrigated at higher moisture thresholds required significantly more water but maintained notably softer and more vibrant green conditions. Interestingly, a moisture threshold of 45 percent managed to achieve similar levels of surface firmness and green canopy cover compared to the 60 and 75 percent treatments without a statistically significant reduction in water usage. Despite this, the



Creeping bentgrass and Kentucky bluegrass fairway turf plots were maintained at different soil moisture thresholds (15, 30, 45, 60 or 75 percent plant available water) on Aug. 3 at the University of Minnesota, St. Paul, Minn.

## NEWS UPDATES

### FMC TO SPONSOR NATIONAL GOLF DAY DELEGATION DINNER

The American Golf Industry Coalition is again hosting the annual National Golf Day event in Washington, D.C., May 8-10, 2024.

As a GCSAA partner, FMC will sponsor the invitation-only GCSAA Delegation Dinner on May 9 from 6 - 8 p.m.


"We are very proud to sponsor this GCSAA dinner during National Golf Day," said Dan Carrothers, FMC Global Specialty Solutions director. "Our Give Back to Local Chapters program has raised and donated nearly \$225,000, which gives back to local GCSAA chapters to invest in member education and to support local initiatives."

National Golf Day program kicks off with a Keynote Briefing Session and Congressional Reception on Wednesday, May 8, followed by the opportunity to meet with members of Congress in more than 250 legislative visits on, May 9.

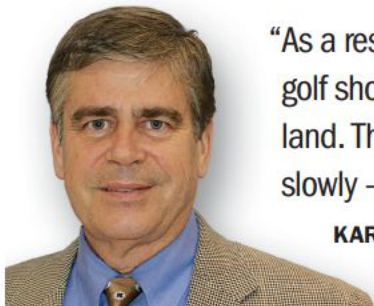
The event concludes with the Community Service Project (CSP) on May 10, where attendees can undertake various beautification projects on the National Mall. New in 2024 is a satellite project held at Langston Golf Course as part of the CSP

45 percent threshold resulted in a practical water savings of 25 percent compared to the 75 percent threshold.

They also observed varying effects of irrigation thresholds on canopy NDVI (Normalized Difference Vegetation Index), where it significantly declined at the 15 percent threshold, significantly increased at the 45, 60 and 75 percent thresholds, and remained unchanged at the 30 percent threshold.

The interaction between time and irrigation threshold on NDVI changes was significant, indicating that the impact of irrigation on turf health and appearance varies over time and is influenced by the specific water threshold applied. 





“As a result, the global perception was that golf should/could only be played on links land. That perception changed — albeit slowly — once golf arrived in the U.S.”

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

## Back to the basics of turf management

Visiting golf courses in Scotland, one can't help but wonder what it was like to be a greenskeeper on those courses during golf's early days when golf was centered on Links Land. This land — situated along the coastal areas or river estuaries — was characterized as not being suitable for agricultural use. The soil is predominantly sand, which is drought-prone and lacks nutrients.

Maybe this deep predominantly sand soil wasn't good for agriculture, but it was suitable for “wispy” grasses to predominate. Golf balls of the day — the feathery for example — could be struck with a degree of consistency on the turf surface.

Golf courses designed and built inland from the links, even by just a few miles failed miserably. The opposite of links-type soils, these inland soils were high in clay, poorly drained and relatively rich in nutrients. During wet periods, the grass became thick and lush.

That, combined with poor soil drainage, made golf practically impossible to play with the equipment of the day. For hundreds of years, golf was restricted to links-type golf courses due to their unique conditions.

Golf was a passenger on the rapid expansion of the British Empire especially during the Victorian Era. The British — primarily soldiers — tended to lay out golf courses in these far-off parts of the world on land that had the char-

acteristics of the links. As a result, the global perception was that golf should/could only be played on links land. That perception changed — albeit slowly — once golf arrived in the U.S.

### COUNTING SHEEP

As part of my lectures on the management of golf course turf, I try to intertwine the history of golf with how we manage turf currently. I try to start rather basic looking for principles of how greenskeepers managed links turf in the 1700s and 1800s.

Initially, it's a rather cursory look — you mow the turf and maybe throw down some sand from the dunes as topdressing. It seems pretty straightforward — and not very exciting.

Once the students stop laughing, I ask them to visualize and place themselves as members of a greens committee at that time. Seeing the world through another person's eyes is a powerful teaching tool.

Mowing is a topic that I'd expect to

come up for discussion at early greens committee meetings. The mowers of choice for a links golf course during these early times were sheep. Sitting in a room with the greenskeeper and golf professional what questions would you expect would be raised by the committee regarding their mowing units?

I would envision my greens committee asking questions like, “How many sheep do we need?”, “Do the sheep's teeth get dull?” “Can we sharpen their teeth? And, if yes, how?” and “When do we need to replace the sheep?”

I'm not a veterinarian, nor a sheep expert, but I've found out that sheep from 1 to 4 years of age have a healthy mouth with permanent incisors with little wear or damage. After 4 years of wear, it's not uncommon for the sheep to start breaking or losing teeth. In our hypothetical, grazing on sandy soils would result in a faster rate of wear.

Normally, sheep will graze a pasture to a height of 2 to 3 inches depending on the grass species before they are rotated off. Sheep can graze much shorter than this height if allowed to, but at low heights dig up or tug out the turf by its roots.

From the above, you might realize how similar the basic questions about sheep grazing on turf apply — to some degree — to current principles of mowing. Understanding principles behind the mowing basics like the height of cut, adaptability of turfgrass species, impact of topdressing on cutting units and mower maintenance gives you the ability to adapt to change.

Whether it's mowing or a different golf course management practice, thoroughly knowing the principles behind them allows you to explain, adjust and adapt to future tech advancements. ©

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



## //WATER WARRIORS

# Investigating irrigation requirements for cool-season fairway species

By Jada Powlen, Ph.D., and Cale Bigelow, Ph.D.

**I**n the cool-humid and arid regions of the U.S., improved creeping bentgrass cultivars are preferred for golf course fairways due to their resilience to low mowing and rapid recovery, challenging the historical use of Kentucky bluegrass and perennial ryegrass.

New Kentucky bluegrass and turf-type tall fescue varieties now offer similar low-mowing tolerance. Yet, creeping bentgrass remains popular, with growing interest in alternatives like fine fescues and colonial bentgrass for improved playability and disease resistance (4, 8, 13, 18 and 25).

Supplemental irrigation, essential for maintaining fairway quality, especially during dry spells, has seen a push towards conservation through various strategies. However, the overall irrigated fairway area remains unchanged, underscoring

## PHOTO



Researchers at Purdue University evaluated the irrigation requirements of six cool-season turfgrass species and ten cultivars utilizing two distinct irrigation methods: 80 percent evapotranspiration (ET<sub>0</sub>) replacement and a green cover threshold (GCT) strategy.

**TABLE 1**

Overview of the species, cultivars, and seeding rates used to determine the supplemental irrigation needs of various cool-season fairways species under two deficit irrigation strategies in West Lafayette, IN

Species	Cultivar	Provider	Seeding rate lb per 1,000 ft <sup>2</sup>
Creeping bentgrass	L93	Jacklin Seed	2.0
Colonial bentgrass	Puritan	Seed Research of Oregon	2.0
Kentucky bluegrass	Mallard <sup>a</sup>	Pennington	2.0
Kentucky bluegrass	Apollo H <sub>2</sub> O <sup>a</sup>	Proseeds	2.0
Kentucky bluegrass	Touché <sup>b</sup>	Seed Research of Oregon	2.0
Fine fescue	Seabreeze GT	Seed Research of Oregon	5.0
Fine fescue	CrChSH Blend <sup>c</sup>	Seed Research of Oregon	5.0
Tall fescue	Penn RK-4	Pennington	8.0
Tall fescue	Falcon IV	ProSeeds	8.0
Perennial ryegrass	Champion GQ blend	Seed Research of Oregon	6.0

<sup>a</sup> Compact-type Kentucky bluegrass classification.

<sup>b</sup> Mid-Atlantic-type Kentucky bluegrass classification.

<sup>c</sup> Blend components: 'Chantilly' and 'Ruddy' strong creeping red (*Festuca rubra* L. subsp. *rubra*), 'Longfellow 3' and 'Windward' Chewings fescue (*Festuca rubra* L. subsp. *commutata*), 'Quatro' sheep fescue (*Festuca ovina* L.), and 'Eureka II' and 'Spartan II' hard fescue (*Festuca brevipila* Tracey).

the need for more efficient irrigation schedules and the adoption of drought-resistant turf varieties (16 and 17).

The method for determining turfgrass irrigation needs has advanced, incorporating techniques like digital image analysis to monitor green cover under drought conditions (20 and 29), soil moisture sensors and employing strategies based on green cover thresholds (GCT) (17) or evapotranspiration rates, potentially offering significant savings (11, 19, 23, 27, 31 and 32).

Despite these advancements, data to support the efficacy of GCT-based irrigation are still limited. Weather station calculations using methods like the Penman-Monteith equation suggest that maintaining turf quality is feasible with up to 80 percent evapotranspiration (ET<sub>0</sub>) replacement for cool-season

Continued on page 36



Continued from page 35

species, indicating an opportunity for water savings without compromising turf quality (2, 6, 7, 9, 11, 14, 19, 22, 24, 26 and 33).

This evolution in irrigation strategy reflects an ongoing effort to balance the demands of golf course management with environmental sustainability, emphasizing the need for further

research to optimize water use in turfgrass management (3, 5, 10, 12, 21, 28, 30 and 34).

## ESTABLISHMENT AND EXPERIMENTAL PROCEDURES

A field study conducted at the William H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, Ind., focused on evaluating the irrigation requirements of six cool-season turfgrass species and ten cultivars (Table 1) utilizing two distinct irrigation methods: 80 percent ETo replacement and a GCT strategy.

The goal was to discover more water-efficient alternatives to widely-used creeping bentgrass for cool-season fairways, leveraging digital image analysis for irrigation management and examining the GCT approach's efficacy in preserving turf quality.

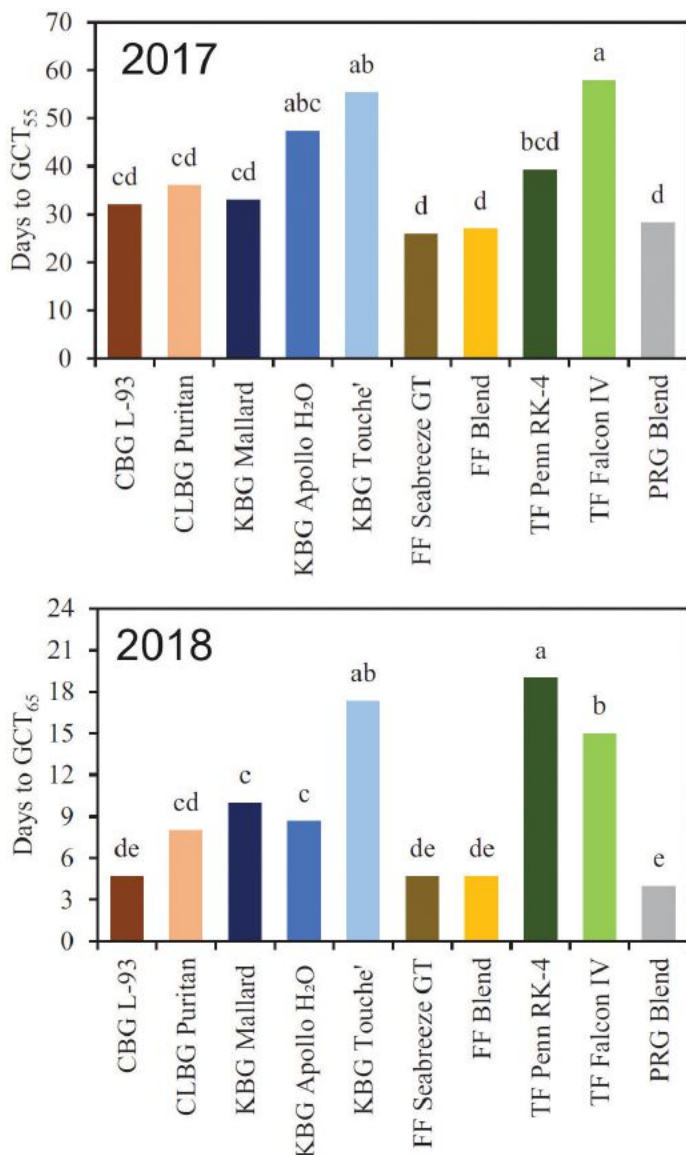
Initially, a 55 percent GCT was employed in 2017 and adjusted to 65 percent in 2018 to maintain turf quality. The GCT method demonstrates the potential for significant water savings and emphasizes the need for precise irrigation in sustainable turfgrass management.

The turf was carefully maintained at a 0.5-inch height, receiving mowing three times a week and regular applications of slow-release fertilizers and preventive fungicides to promote healthy growth and disease protection. Turf quality was evaluated bi-weekly on a 1 to 9 scale, with scores of 6 or above deemed acceptable for fairway turf.

To control moisture levels, the study utilized a fixed roof rain-out shelter, excluding natural rainfall and slightly reducing photosynthetically active radiation by about 11 percent, thus ensuring uniform experimental conditions. The shelter's plastic cover was replaced annually, allowing soil rehydration during the off-season.

This investigation provided insights into two irrigation strategies over two 60-day periods in consecutive years, with weather data, including the 80 percent ETo replacement level calculated using the FAO Penman-Monteith equation (1).

**FIGURE 1**



Number of days after study initiation for creeping bentgrass (CBG), colonial bentgrass (CLB), Kentucky bluegrass (KBG), fine leaf fescue (FF), tall fescue (TF), and perennial ryegrass (PRG) cultivars to reach the 55 percent green cover threshold (GCT<sub>55</sub>) in 2017 and the 65 percent green cover threshold (GCT<sub>65</sub>) in 2018. Means in the columns followed by the same letter are not significantly different according to Fisher's protected least significant difference test ( $P < 0.05$ ).



**“The method for determining turfgrass irrigation needs has advanced incorporating techniques like digital image analysis to monitor green cover thresholds.”**

Digital imaging captured three times weekly facilitated precise green cover analysis to determine irrigation applications that effectively maintain turf health (36).

Adjustments made in 2018 to the GCT and water volumes reflect the adaptive approach to achieving optimal turf health while conserving water, showcasing the balance between environmental sustainability and maintaining fairway standards.

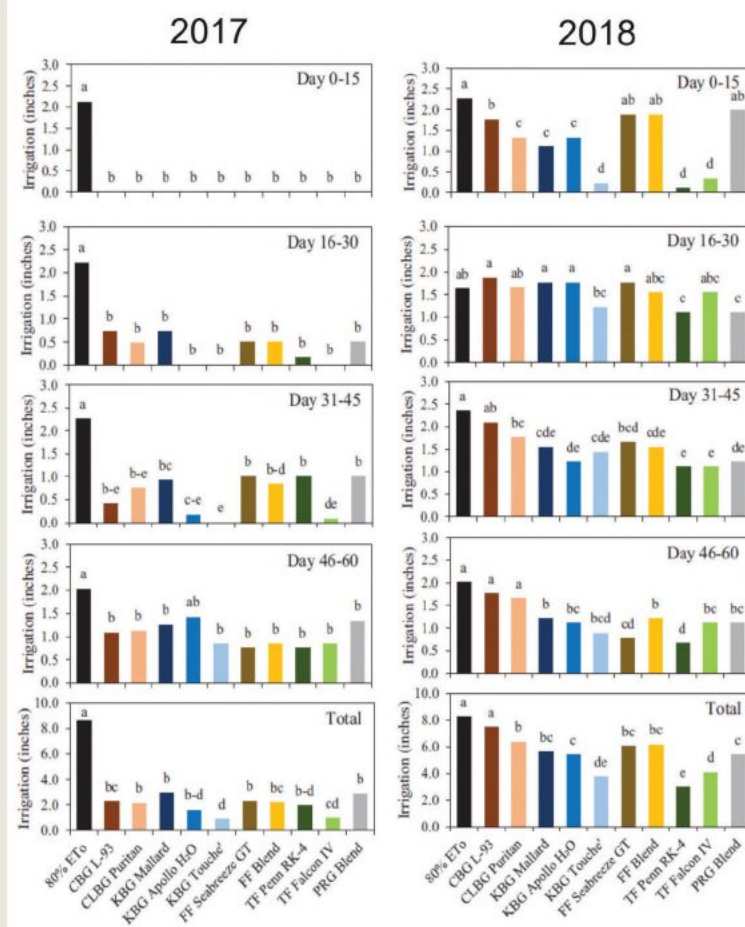
### IRRIGATION APPLIED AND VISUAL QUALITY

Over the 60-day study periods, total ETo replacement was 10.78 inches in 2017 and 10.33 inches in 2018, with daily averages of 0.18 and 0.17 inches, respectively. In 2017, the time to reach a 55 percent GCT (GCT55) varied among species, with SeaBreeze GT fine fescue reaching it quickest and Falcon IV turf-type tall fescue taking the longest (Figure 1).

Increasing the GCT to 65 percent (GCT65) in 2018 reduced the number of days for all grasses to reach the threshold, with the perennial ryegrass blend being the fastest and the Penn RK-4 tall fescue being the slowest. The adjustment to a higher GCT in 2018 led to less time reaching the threshold across species, likely influenced by higher minimum and maximum temperatures experienced during the drought event's initial two weeks (Figure 1).

In 2017, plots receiving 80 percent

**FIGURE 2**



Irrigation applied in 2017 using GCT55 and 2018 GCT65 threshold for creeping bentgrass (CBG), colonial bentgrass (CLBG), Kentucky bluegrass (KBG), fineleaf fescue (FF), tall fescue (TF), and perennial ryegrass (PRG) cultivars compared to 80 percent evapotranspiration (ETo) replacement during Days 0–15, 16–30, 31–45, and 46–60, and total irrigation applied during the 60-days limited irrigation event located in West Lafayette, IN. Means in the columns followed by the same letter are not significantly different according to Fisher's protected least significant difference test ( $P < 0.05$ ).

ETo irrigation received 8.63 inches of water, while those irrigated based on a GCT55 used between 0.83 and 2.90 inches, depending on the grass species or cultivar (Figure 2). Over 60 days, grasses on the 80 percent ETo schedule required 66 to 90 percent more water than those on the GCT55 strategy.

Touché Kentucky bluegrass and Falcon IV tall fescue required the lowest irrigation among GCT55 plots, demonstrating significant water savings with

targeted irrigation approaches.

In 2018, the shift to a 65 percent GCT (GCT65) and an increase in supplemental irrigation to 0.33 inches per event led to higher total irrigation volumes for all turfgrass species and cultivars compared to the previous year's GCT55 strategy, with amounts ranging from 2.97 to 7.48 inches for GCT65 treatments versus 8.26 inches for the 80 percent ETo replacement (Figure 2).

Continued on page 38



Continued from page 37

Early in the evaluation period, differences in irrigation needs were observed, with L-93 creeping bentgrass and several fine fescues requiring more water. In contrast, the two turf-type fescue cultivars and Touché Kentucky bluegrass needed the least irrigation. By employing the GCT65 approach, L-93 creeping bentgrass irrigation requirements aligned closely with the 80 percent ETo

replacement strategy, with Penn RK-4 tall fescue showing the most significant water savings over the 60 days.

In 2017, species and cultivars receiving 80 percent ETo replacement consistently maintained acceptable turf quality ( $\geq 6.0$ ) throughout the study, outperforming those irrigated with the GCT55 approach (Table 2). Higher turf quality was noted in Penn RK-4 tall fescue, Touché Kentucky bluegrass,

L-93 creeping bentgrass, and Puritan colonial bentgrass under the 80 percent ETo regimen, especially on days 36 and 48, compared to the fine fescue and perennial ryegrass blends.

Turf-type fescue cultivars and Kentucky bluegrass varieties initially showed higher visual quality under the GCT55 irrigation. Still, by day 36, all species under this regime fell to or below a minimum acceptable quality, with tall fescue cultivars, Apollo H2O and Touché Kentucky bluegrass cultivars, eventually exhibiting slightly higher mean quality ratings.

In 2018, initial visual quality for turf receiving 80 percent ETo replacement varied, with the fine fescue blend and Puritan colonial bentgrass starting at ratings between 6.0 and 8.0, respectively, and generally consistent quality observed across Kentucky bluegrass and turf-type fescue cultivars, as well as the perennial ryegrass blend, over 60 days (Table 3).

By day 60, quality for Seabreeze GT fine fescue improved under 80 percent ETo irrigation, whereas L-93 creeping bentgrass and Puritan colonial bentgrass saw declines in quality, with the highest mean quality scores awarded to the Touché Kentucky bluegrass and turf-type fescue cultivars.

In 2018, initial turf quality for grasses under the GCT65 irrigation strategy ranged between 6.0 and 8.0. Still, values for L-93 creeping bentgrass, Puritan colonial bentgrass, Seabreeze GT fine fescue and the fine fescue blend dropped below the acceptable threshold of 6.0 by day 20. Turf-type fescue cultivars,

**TABLE 2**

**Visual turf quality ratings during 2017 for various cool-season fairway grasses located in West Lafayette, IN, when irrigated based on 80 percent evapotranspiration (ET<sub>0</sub>) or a 55 percent green cover threshold (GCT<sub>55</sub>)**

Schedule *	Species or cultivar *	Rating date					
		Day 0	Day 18	Day 36	Day 48	Day 60	Mean
		Visual turf quality (1-9) *					
80% ET	CBG L-93	6.8 a	7.3 a	7.7 a	7.3 ab	7.3 a	7.4 a
	CLBG Puritan	6.3 a	7.2 a	7.7 a	7.8 a	7.3 a	7.2 ab
	KBG Mallard	7.3 a	7.7 a	7.0 bc	7.2 abc	6.9 a	7.2 ab
	KBG Apollo H <sub>2</sub> O	7.2 a	7.7 a	7.0 bc	6.9 bcd	7.1 a	7.1 abc
	KBG Touché	7.0 a	7.7 a	7.5 ab	7.4 ab	7.5 a	7.5 a
	FF Seabreeze GT	6.2 a	7.3 a	7.2 abc	6.7 cd	7.0 a	7.0 abc
	FF blend	5.8 a	6.8 a	6.7 c	6.3 d	6.7 a	6.5 c
	TF Penn RK-4	7.3 a	7.7 a	7.5 ab	7.2 abc	7.3 a	7.4 a
	TF Falcon IV	7.2 a	7.0 a	7.5 ab	6.9 bcd	7.2 a	7.2 ab
	PRG blend	6.3 a	7.0 a	6.8 c	6.5 d	6.7 a	6.7 bc
P value		NS†	NS	*	**	NS	*
GCT <sub>55</sub>	CBG L-93	6.5 bc	6.0 cd	6.0 a	5.3 a	5.5 a	5.8 cd
	CLBG Puritan	6.3 c	6.5 bc	5.5 a	5.4 a	5.3 a	5.8 cd
	KBG Mallard	7.0 abc	6.5 bc	5.7 a	5.2 a	5.8 a	6.0 bcd
	KBG Apollo H <sub>2</sub> O	7.3 a	7.5 a	6.4 a	5.7 a	5.8 a	6.3 ab
	KBG Touché	6.7 abc	6.7 abc	6.7 a	5.8 a	5.7 a	6.3 ab
	FF Seabreeze GT	6.5 bc	6.0 cd	6.0 a	5.5 a	5.7 a	5.8 cd
	FF blend	5.5 d	5.2 d	5.7 a	5.4 a	5.0 a	5.5 d
	TF Penn RK-4	7.3 a	7.3 ab	6.5 a	6.2 a	5.8 a	6.3 ab
	TF Falcon IV	7.2 ab	7.3 ab	6.8 a	6.0 a	6.2 a	6.5 a
	PRG blend	6.5 bc	6.2 c	5.8 a	5.5 a	5.8 a	6.1 abc
P value		**	**	NS	NS	NS	**

Note. Means in the same column within irrigation schedules followed by the same letter are not significantly different according to Fisher's protected least significant difference test ( $P < .05$ ).

\* Irrigation treatments were based on either 80 percent ET<sub>0</sub> from an on-site weather station or a GCT<sub>55</sub> using digital image analysis on a Monday-Wednesday-Friday schedule.

† Species evaluated include creeping bentgrass (CBG), Kentucky bluegrass (KBG), fine fescue (FF), turf-type tall fescue (TF), and perennial ryegrass (PRG).

\* Visual fairway quality was rated on a 1-9 scale where 1 = brown, dead turf; 9 = optimal uniformity, density, and green color; and 6 = minimally acceptable value.

\* Significant at the .05 probability level.

\*\* Significant at the .01 probability level.

† NS, nonsignificant.

## Research Takeaways

- Irrigating with a green-coverage-based approach reduced irrigation needs compared to an 80 percent ETo replacement approach.
- A Mid-Atlantic type Kentucky bluegrass and tall fescue required the least supplemental irrigation.
- Turf-type tall fescue maintained acceptable quality with less irrigation than creeping bentgrass.



the perennial ryegrass blend, Mallard, and Apollo H2O Kentucky bluegrass maintained consistently acceptable quality throughout the season, whereas L-93 creeping bentgrass, Puritan colonial bentgrass and fine fescues experienced quality declines after reaching the GCT65.

### OVERALL IMPACT OF SPECIES SELECTION AND IRRIGATION STRATEGY

Supplemental irrigation is essential for maintaining the turfgrass health and playability of golf course fairways, but traditional scheduling practices that ignore actual weather conditions and evapotranspiration rates can lead to water wastage and increased costs.

In response to sustainability efforts and potential water use restrictions, many golf courses are adopting more efficient irrigation practices and considering alternative cool-season species such as fescues, which require less water than traditional choices like creeping bentgrass, thereby significantly reducing overall water consumption on fairways (35).

Previous research indicated that cool-season turf species could sustain acceptable quality with irrigation below 80 percent ETo (9 and 11). Yet, this study revealed variability among species and cultivars at 80 percent ETo replacement, with L-93 creeping bentgrass maintaining acceptable quality in 2017 but not in 2018 due to higher initial ETo rates.

The findings suggest that irrigation levels above 80 percent ETo may be necessary during periods of increased evapotranspiration to preserve turf quality. This research highlights differences in drought-resilient species, such as fine fescues and perennial ryegrass, which exhibited about 12 percent lower average quality than Touché Kentucky bluegrass and turf-type fescue cultivars under the same irrigation conditions.

A GCT irrigation approach resulted in substantial water savings — up to 77.1 percent in 2017 and 35.5 percent in 2018—compared to the traditional

**TABLE 3**

**Visual turf quality ratings during 2018 for various cool-season fairway grasses in West Lafayette, IN, when irrigated based on 80 percent evapotranspiration (ET<sub>0</sub>) or a 65 percent green cover threshold (GCT<sub>65</sub>)**

Schedule <sup>a</sup>	Species or cultivar <sup>b</sup>	Rating date					
		Day 0	Day 18	Day 36	Day 48	Day 60	Mean
		Visual turf quality (1-9) <sup>c</sup>					
85% ET	CBG L-93	7.0 cd	6.3 cd	6.2 d	5.8 f	5.7 e	6.2 cd
	CLBG Puritan	8.0 a	6.2 d	6.2 d	6.3 ef	6.2 de	6.5 c
	KBG Mallard	7.0 cd	6.8 bc	7.0 c	7.0 cd	7.0 c	6.9 b
	KBG Apollo H <sub>2</sub> O	7.0 cd	7.2 ab	7.2 bc	7.0 cd	7.2 bc	7.1 b
	KBG Touché	6.7 de	7.7 a	7.7 ab	7.7 ab	7.7 ab	7.5 a
	FF Seabreeze GT	6.3 ef	5.8 d	6.2 d	6.3 ef	6.7 cd	6.0 d
	FF blend	6.0 f	6.0 d	6.2 d	6.7 de	7.2 bc	6.3 cd
	TF Penn RK-4	7.7 ab	7.3 ab	7.8 a	7.8 a	8.0 a	7.7 a
	TF Falcon IV	7.3 bc	7.7 a	8.0 a	7.5 a-c	8.0 a	7.6 a
	PRG blend	7.0 cd	6.8 bc	7.0 c	7.2 b-d	7.2 bc	6.9 b
P value		***	***	***	***	***	***
GCT <sub>65</sub>	CBG L-93	7.0 bc	5.5 d-f	5.7 e	5.7 c	5.3 d-f	5.8 e
	CLBG Puritan	8.0 a	5.0 f	5.2 f	5.0 d	4.7 f	5.5 e
	KBG Mallard	6.7 c	6.2 a-c	6.7 ab	6.3 ab	6.0 b-d	6.4 bc
	KBG Apollo H <sub>2</sub> O	6.7 c	6.3 ab	6.7 ab	6.3 ab	6.3 a-c	6.5 a-c
	KBG Touché	7.0 bc	6.0 b-d	6.2 cd	5.8 bc	5.0 ef	6.2 cd
	FF Seabreeze GT	7.0 bc	5.2 ef	5.8 de	5.7 c	5.7 b-e	5.8 de
	FF blend	6.7 c	5.7 c-e	5.7 e	5.5 bc	5.5 c-f	5.8 de
	TF Penn RK-4	7.3 b	6.7 a	6.5 bc	6.7 a	7.0 a	6.8 a
	TF Falcon IV	6.7 c	6.5 ab	7.0 a	6.5 a	6.5 ab	6.7 ab
	PRG blend	6.0 d	6.0 b-d	6.3 bc	6.5 a	6.2 a-d	6.2 c
P value		***	***	***	***	***	***

Note. Means in the same column within irrigation schedules followed by the same letter are not significantly different according to Fisher's protected least significant difference test ( $P < .05$ ).

<sup>a</sup> Irrigation treatments were based on either 80 percent ET<sub>0</sub> from an on-site weather station or a GCT<sub>65</sub> using digital image analysis on a Monday-Wednesday-Friday schedule.

<sup>b</sup> Species evaluated include creeping bentgrass (CBG), Kentucky bluegrass (KBG), fine fescue (FF), turf-type tall fescue (TF), and perennial ryegrass (PRG).

<sup>c</sup> Visual fairway quality was rated on a 1-9 scale where 1 = brown, dead turf; 9 = optimal uniformity, density, and green color; and 6 = minimally acceptable value.

\*\*\*Significant at the .001 probability level.

80 percent ETo method across all turf species studied. Specifically, Penn RK-4 turf-type fescue utilized 64 percent less water with the GCT65 strategy while maintaining turf quality, highlighting the efficiency of Mid-Atlantic type Kentucky bluegrass cultivars, like Touché, for lower mowing heights due to its significantly reduced water needs.

Despite turf-type fescue's advantages in water conservation and maintaining density without overseeding or significant

annual bluegrass encroachment over two years in this study, concerns about its long-term performance under close mowing and disease susceptibility remain considerations for fairway use.

The study suggests utilizing a GCT of at least 65 percent to guide the irrigation needs of cool-season species on fairways, potentially leveraging future advancements in drone or camera technologies for accurate measurement.

Continued on page 40



Continued from page 39

While most species maintained acceptable quality at this threshold, a higher irrigation volume of 0.33 inches per application is recommended, noting that specific adjustments to the GCT might be necessary for species like fine fescues to account for their unique green cover characteristics.

## CONCLUSION

Based on this study, tall fescue and Mid-Atlantic-type Kentucky bluegrass appear to be alternatives for creeping bentgrass that could have the potential for fairway use in the cool-humid region to reduce irrigation needs.

These grasses require substantially less, 50 to 65 percent, supplemental irrigation and generally maintain higher visual quality than a traditionally maintained creeping bentgrass. Additionally, a GCT55 and GCT65 irrigation approach reduced irrigation needs by 77 and 35 percent, respectively, compared to an 80 percent ETo approach.

Further studies should evaluate wear tolerance, divot recovery, traffic tolerance, resistance to annual bluegrass encroachment and other functional characteristics before widespread adoption is fully recommended.

In summary, this field study demonstrates the ability to significantly reduce cool-season fairway supplemental irrigation by selecting species and cultivars that remain green longer under acute drought and limited irrigation. **G**

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“More importantly, the politics concerning potable water use for golf course irrigation were a concern in many parts of the country, and effluent water use was mandatory in some areas.”

MIKE KENNA, PH.D., *Research Editor*

## The history of reclaimed water on golf courses

**I** find it interesting that one form of non-potable water has so many terms. For example, it's been called effluent, wastewater, recycled water or treated sewage water. However, to make it more attractive to golf, words like effluent, waste or sewage are rarely used anymore.

Now, recycled or reclaimed water has become a more popular term, but it's slightly ambiguous. I use all three names, especially for a historical discussion on this water resource.

In 1978, four golf organizations joined together to sponsor the first national symposium concerning the use of effluent water for golf course irrigation — the USGA, the American Society of Golf Course Architects (ASGCA), the National Golf Foundation (NGF) and the GCSAA.

Although effluent water from sewage treatment plants and wastewater from other sources were used for irrigation worldwide for some time, there was not a lot of information about this widespread practice for golf courses.

To correct the deficiency, those four organizations helped to launch a Wastewater Conference in Chicago. A conference proceeding was published sharing the experiences of turfgrass managers, engineers, agronomists, equipment manufacturers and other professions that have a role in the

planning, designing and operating of wastewater irrigation systems.

The proceedings provided a convenient source of practical answers to questions about wastewater use for irrigation and encouraged greater use of this resource as it became available. They also served for many years as an essential reference for golf course architects, engineers, superintendents, equipment manufacturers, municipal water officials and others involved in irrigating golf courses with wastewater.

### CIRCLING BACK

Fifteen years later, in 1993, the USGA, ASGCA, NGF, GCSAA and the Golf Course Builders Association of America cooperated to sponsor another conference to update information about using effluent water on golf courses during the intervening years.

A lot had changed — technically and politically — since the first symposium in 1978. Irrigation technology improved significantly, and we better understood the effects of wastewater on

golf course turfgrasses and soils. More importantly, the politics concerning potable water use for golf course irrigation were a concern in many parts of the country, and effluent water use was mandatory in some areas.

During that time, it was clear that there was a need to educate officials, environmentalists and others about the benefits and potential problems of using effluent water on golf courses.

The USGA published the 1993 wastewater symposium in the *Waterwater Reuse for Golf Course Irrigation*. The book had five chapters, authored by leading researchers and practitioners. The topics covered water quality, conservation, regulations, rights, delivery, system design, monitoring concerns, retrofitting a course for recycled water and case studies.

The book included a comprehensive list of courses that used effluent water for irrigation. The target audience included golf course superintendents, irrigation consultants and golf course architects and builders.

### RECLAIMED WATER TODAY

In 2022, the latest GCSAA *Wastewater Reuse for Golf Course Irrigation* found that wells still provide the largest source of water (531,274 acre-ft.) followed by open lakes and ponds (382,476 acre-ft.) Nationally, the use of recycled water remained consistent with the usage reported in 2005.

The largest recycled water consumption occurred in the Southeast and Southwest, accounting for 87 percent of the projected recycled water on golf courses. Facilities in the Southwest applied nearly 13,000 more acre-ft. of recycled water in 2020 than in 2005.

My advice to you is, don't hesitate to transition to this valuable resource when it becomes available. **③**

Mike Kenna, Ph.D., retired director of research, USGA Green Section. Contact him at [mpkenna@gmail.com](mailto:mpkenna@gmail.com).

# The Shop

// MUST-HAVE NEW PRODUCTS



1



2



3

## 1 ES-80 sprayer

A zero-emission spraying solution for superintendents the ES-80 from **BROYHILL** has a runtime of five to six hours at 40 PSI with a charge time of six hours. The ES units offer a more sustainable and environmentally friendly option for golf courses, according to the company. The ES-80 sprayer features a roller pumping system with a Hypro 4001 XL-R pump that provides 9 gallons per minute at 100psi. It is powered by a 24v lithium-ion intelligent battery with a 3kWh nominal energy and an IP65 environmental protection rating. The ES-80 has an 80-gallon tank capacity, with other models available in 110 and 160 gallons.

[Broyhill.com](http://Broyhill.com)

## 2 DPB-5800T

The DPB-5800T from **ECHO** is the first three-battery port backpack blower. This blower is compatible with Echo's 56v battery platform and features outdoor grade power, comfortable ergonomics and quiet operation. Additional features of the DPB-5800T backpack blower include a brushless motor, LED Grip Control Display that provides quick and accurate indication of all three batteries and a turbo button to boost performance to 195 mph and 795 cfm.

[Echo-USA.com](http://Echo-USA.com)

## 3 Azo Root

In collaboration with 3BarBio, **HARRELL'S** launched Azo Root, a product that targets plant health and root development. Designed with Live-Microbe packaging, Azo Root delivers of live, high-concentration Azospirillum brasilense microbes directly to plant roots, promoting better growth, faster recovery and greater stress resistance. Azo Root's formula addresses traditional challenges in microbial product efficacy by maintaining the viability of its beneficial bacteria from production through to application. Azo Root is now available exclusively through Harrell's and can be integrated into existing soil management and spray programs.

[Harrells.com](http://Harrells.com)





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### 4 | M18 Fuel dual-battery backpack blower

The M18 Fuel dual-battery backpack blower from **MILWAUKEE TOOL** delivers a higher blowing force than up to 60cc gas. The backpack blower reaches a full throttle of 650 cfm and 155 mph in under one second. The blower requires at least two M18 RedLithium batteries for operation and includes two additional battery terminals to extend runtime. The battery setup allows the operator to adjust the number of batteries for either lighter weight in quicker clean-ups or more runtime in extended clearing applications.

[MilwaukeeTool.com](https://MilwaukeeTool.com)

### 5 | Primo Maxx

Primo Maxx plant growth regulator from **SYNGENTA** helps superintendents produce denser, healthier turf with fewer clippings. In conjunction with Primo's 30th anniversary, Syngenta surveyed superintendents who gave Primo Maxx 4.5 stars out of 5. The survey found the top uses of Primo Maxx include reducing clippings, improving turf color and quality and saving on labor costs.

[GreenCastOnline.com](https://GreenCastOnline.com)

### 6 | ELiTE lithium upfront

With the release of the ELiTE lithium upfront **JACOBSEN** added PACE Technology — an equipment management and geofencing system that is a screenless web-based solution — to enhance the efficiency and productivity. Superintendents can access PACE from any device and use real-time tracking and task management to maximize the effectiveness of their operation. The ELiTE lithium upfront joins the company's Eclipse 2 ELiTE walking greens mower, AR1 ELiTE articulated rotary mower and the Eclipse 360 ELiTE and SLF1 ELiTE models in its battery-powered mowing solutions portfolio.

[Jacobsen.com](https://Jacobsen.com)

# The 19<sup>th</sup> Hole



## Erin Stevens

**CGCS, MG, DIRECTOR OF AGRONOMY** // Coral Creek Club, Placida, Fla.

**Erin, drinks are on me... what are you having?**

I'll have a cold Miller Lite.



**It was great seeing you at Augusta National. How was your Masters experience?**

The last time I visited Augusta was in the late '90s or early 2000s ... this was my first time seeing the tournament. I enjoyed it. The elevation changes there just blew me away. You see it on TV, but you don't realize it until you're walking the property, and God knows, I spent three days walking the property and felt it.

**Tell me about Coral Creek Club.**

We're a very private, exclusive membership here in Placida, Fla. I would consider us one of the premier clubs in our area. We're a Tom Fazio-designed course, and we just did a redesign with Tom Fazio in 2020, too. It's very reminiscent of old South Florida. We don't really have any homes around us. We have a private airport next to us, then we're all surrounded by preserves and creeks.

**Tell me about your family. What do you like to do for fun?** I've got my daughter, Juliana, she's graduating high school in a couple of weeks. She's going to

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### // BEST ADVICE

**"I LEARNED THROUGH MY MENTORS, THE ONE THING THAT STANDS OUT TO ME, IS RELATIONSHIPS. WE ARE WHO WE ARE BECAUSE OF THE RELATIONSHIPS WE ESTABLISH IN THIS INDUSTRY."**



go to the United Kingdom for a month, then we're getting her into college. She doesn't know what she wants to do yet, which I think is a smart move. My wife, Kristin and I just got married last June. We like to get on the boat and go fishing or traveling over the weekend.

**What is your favorite car you've ever owned?**

Probably my first car: a 1976 Camaro. It had a 350 4-bolt main in it. I had it all restored, with an aftermarket paint job: charcoal gray with a pearl blue clear coat. It was nice. I sold it when I went into the Navy.

**What years were you in the Navy? What did you learn in the Navy that you've applied to being a superintendent?** 1990 to 1995.

I think it was the discipline and the focus. Another big thing is a sense of urgency. When you know stuff needs to get done, it's about having a sense of urgency — in a good way — because you get all your ducks in a row. You're very organized and you shift your speed to a sense of urgency speed. It just comes naturally.

**Do you have a favorite golf memory?**

My father really instilled golf into me and my brothers. He's passed away, but I remember sitting in the clubhouse with him ... we were at Montgomery CC in Maryland ... and watching when Jack (Nicklaus) won his final green jacket in 1986. That was a pretty memorable moment with my father.

As interviewed by Seth Jones, April 26, 2024.

PHOTO OF ERIN BY: GOLFDOM STAFF / USNA (BILL THE GOAT)





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