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Clark Throssell, Ph.D., interviews experts on the newest products formulated to stop those microscopic monsters, the nematodes

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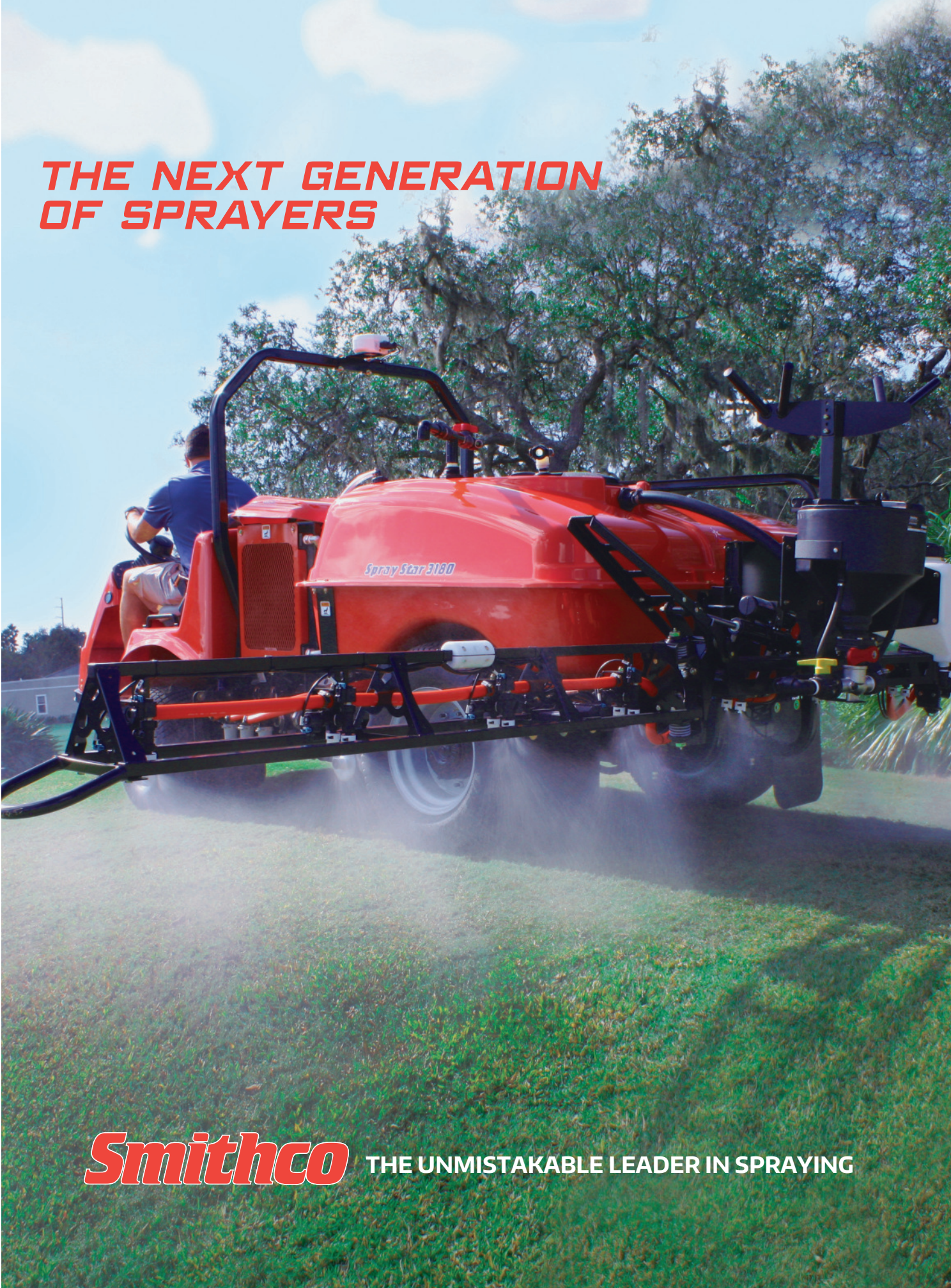
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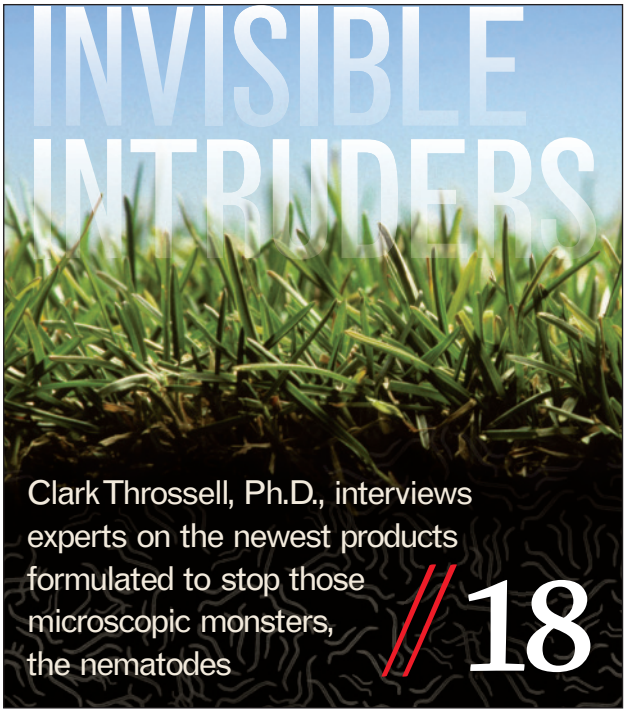

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Part 2 of our 2017 *Golfdom* Summit recap has a central theme: "Better conditions with less maintenance."

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SUPER SCIENCE

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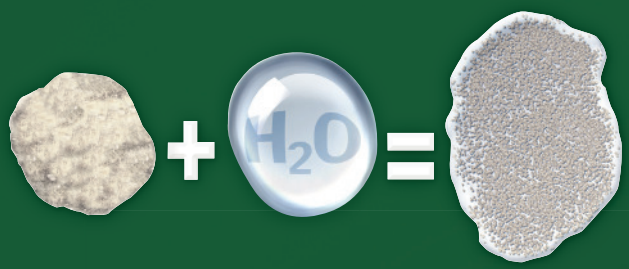

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"While I wasn't worried about getting kidnapped in Killington, I was worried about incurring major damage to a limb. I'm not a skier."

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

Ducking danger in its many forms

I am knocking on wood, thanking my stars, pointing to the heavens while whispering a quiet "thank you." Because once again, your pal Jonesy got through an adventure unscathed.

I sometimes think about the time I got lost in London, or when I was shouting Spanglish in a Guadalajara bar, and I realize how lucky I am to be upright today. I'm happy to report that I've just returned from Killington, Vt. (*sounds ominous, right?*) and I'm still in one piece.

My good luck started at a dinner at the end of the Golf Industry Show, when a friend asked me where I was going for my next trip. I thought about it, then said, "Somewhere northeast to a ski event where these supers all compete in a downhill race." My friend looked across the table and said, "Paul, aren't you doing a ski race here in a few weeks?"

"Paul" was Paul Blodorn, Quali-Pro's northeast sales manager. Not only was he attending the event — the Nor'easter Cup — he lives in Killington and gave me the full scoop. He explained that the Vermont GCSA and the Northeast GCSA were the two main chapters represented at the event, but that I could expect to run into more than 100 friends from the Met GCSA, the New Jersey GCSA, the Pennsylvania GCSA and more. He even hooked me up with a "friends and family" rate at the local resort.

I've said it before: It's better to be lucky than good.

While I wasn't worried about getting kidnapped in Killington, I was worried about incurring major damage to a limb. I'm not a skier. I retired from skiing on New Year's Eve 2000 after I broke my ankle in Angel Fire, N.M. I came out of retirement only once, a few years ago when the CEO convinced me to give it another try while on a business trip to Aspen.

After seeing me on skis for about 10 minutes, he was convinced that I should have stayed retired. He was terrified to hear I was attending an event where skiing was involved. He called me before the meeting and said, "Tell them you're having back problems so you don't have to fake a limp to get out of it."

Good news. I fessed up to being a flatlander but still was able to drive to the site of the race. I hiked a short distance up the mountain and got the photos. My wife, my kids and my CEO were relieved to hear I was able to stay off the skis and still get the story/photos.

That evening I celebrated what turned out to be an amazing event — photos coming soon — with a huge crew from numerous surrounding states. We ended up at a place called the Wobbly Barn, where they awarded a cup-cutter-meets-ski-pole trophy to the fastest skier. I was called up to the stage to say a few words and made a toast that somehow derided the Kansas City Chiefs and celebrated the event at the same time (it made sense in the moment.) Adorably, Frank Wong's little boy, Calvin, quietly heckled me from the side of the stage.

The plan was to finish the trip ice fishing with my old friend Chris Francis of Turf Products Corp. But then a serious Nor'easter "bomb cyclone" ruined that plan. I headed for the airport.

The drive from Killington to Albany, N.Y., was a white-knuckled trek in a cheap rental car. I saw almost a dozen cars in the ditch. I got lucky and was able to draft a heavy-duty plow truck for the last hour of my drive.

Add another moment to my list of near misses. I somehow not only ducked skiing, but also survived a bomb cyclone and even Calvin Wong.

I fly out to Las Vegas tomorrow. Wish me luck.

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NEWS, NOTES AND QUOTES

//L.A. ABRASION TEST IS SO 2004

A crew of USGA officials survey a green during the 2016 U.S. Open at Oakmont.

USGA UPDATES A CLASSIC

Greens construction has evolved over the last 14 years. To keep up with the evolution of greens, the United States Golf Association has unveiled an update to the USGA Recommendations for a Method of Putting Green Construction.

Over the past year, a team of scientists, laboratory technicians, golf course builders, USGA agronomists and yes, superintendents, have worked together to revise the publication. The team met regularly, and the process included trips to research facilities, testing labs and green construction projects.

While the new version is not drastically different from the previous edition released in 2004, it features recommendations based on updates to technology as well as video and multimedia resources.

Some of the updates include the decision to make the Micro-Deval abrasion test (ASTM D6928) the preferred method to evaluate the mechanical stability of gravel (sorry L.A. Abrasion test); an expanded discussion on selecting gravel; an enhanced explanation of the water-holding characteristics of a root zone; recommending perimeter drains be located at all low points along the perimeter of a putting green cavity and not just the lowest point; and expanded information on using various organic amendments.

To read more about the update, visit **USGA.org**. In the next issue of *Golfdom*, Research Editor Clark Throssell, Ph.D., sits down with Brian Whitlark of the USGA to discuss the new updates.

//FIELD TRIP!

GCSAA, NOW ON THE FIRST ~~TEE~~ GREEN

The First Green Foundation and the Golf Course Superintendents Association of America (GCSAA) have signed a memorandum of understanding that will bring First Green under the umbrella of GCSAA's philanthropic organization, the Environmental Institute for Golf (EIFG).

First Green, an education outreach program using golf courses as hands-on environmental learning labs, has worked with superintendents for more than 20 years. First Green and GCSAA representatives have collaborated to support golf courses, train superintendents, conduct field trips and offer instruction at GCSAA's affiliated chapters.

"We are excited to find a home with GCSAA since we share similar missions and goals — to promote the environmental benefits of golf courses," says Karen Armstead, Ph.D., First Green executive director.

GCSAA has 99 chapters in North America and members in 78 countries. Its partnership with First Green will add to the 15,000-plus students the program has affected in the last two decades.

//100 YEARS IN CEDAR FALLS

STANDARD GOLF CO. NOW EMPLOYEE-OWNED

Standard Golf Co., a manufacturer and global marketer of golf course accessories, has announced the successful transfer of 100-percent ownership of the company to its employees via an Employee Stock Ownership Plan (ESOP).

An ESOP provided the ability to transition leadership of the company over time and reward the team that helped the company become successful.

"This decision to form an Employee Stock Ownership Plan was a long and well-thought-out one," Standard Golf Co. President Peter Voorhees said in a statement. "The primary reason I made the decision to sell to an ESOP rather than a third party was the desire to keep a business that my family founded and has been a part of for over 100 years in Cedar Falls."

PHOTO BY: SETH JONES / ISTOCK.COM (WELLGLAD)

//SEEING RED AGAIN

Toro backs Rounds 4 Research, EIFG

Toro announced during the 2018 GIS that it will once again support the Environmental Institute of Golf by supporting the Rounds 4 Research program with a $50,000 grant. With this contribution, Toro has donated $300,000 to the program over the past six years.

Rounds 4 Research is designed to address a critical shortage in turfgrass research funding by auctioning donated rounds of golf online. The program allows GCSAA chapters and turfgrass foundations to participate as fundraising partners and direct the proceeds from auctioned rounds to specific projects that will have significant impact in local areas.

"Research funding is critical to providing the innovation needed for facilities to operate more efficiently, to enhance environmental performance and to provide more enjoyable playing conditions," said Judson McNeil, president of The Toro Foundation.

Toro is a longtime partner of the EIFG, donating more than $2 million since 1987 to help support scientific research, education and scholarships for future turfgrass professionals.

In other Toro-related news, Grant Rundblade of Reinders, Inc. received the Green Blazer Award for his accomplishments in Toro equipment sales.

The Green Blazer was presented to Rundblade during Toro's annual worldwide distributor business meeting, which is held in conjunction with the Golf Industry Show. It recognizes individuals who are "contributing to the industry and bringing enhanced knowledge to their customers."

"Grant's analytical perspective helps him create individualized plans for his customer," said Jim Heinze, director of Toro's commercial sales. "He is intensely passionate about all he does."

Rundblade has been selling for Reinders since 2014. He previously won Toro's Rookie of the Year award in 2015.

Grant Rundblade of Reinders Inc. receives Toro's Green Blazer Award at the 2018 Golf Industry Show for his accomplishments in equipment sales.

PHOTO BY: REINDERS, JOHN DEERE GOLF

//TIGERS AND DEERES

AUBURN WINS TURF BOWL

John Deere Golf presented Auburn University with a traveling trophy and a check for $4,000 as winners of the 2018 GCSAA Collegiate Turf Bowl. Auburn competed against student teams from 28 colleges and universities across the nation. Student teams were graded on overall industry knowledge and problem-solving skills in high-pressure situations, similar to what superintendents frequently experience on the job.

"As a leader in the golf industry, we understand the critical importance of supporting the next generation of golf course superintendents," said Dave Plaster, sales manager for John Deere Golf. "Collegiate turf programs play an important role in furthering the industry, and we are excited to be a part of their education through our support of the GCSAA Turf Bowl."

In addition to sponsoring the Turf Bowl, John Deere once again helped prepare students for the competition through the Tweet Rally. This year, students were asked three questions during the weeks leading up to the Turf Bowl. Students were asked to respond with the right answer using a special hashtag, which was tallied to determine the winner of the 2018 Collegiate Spirit Award. Michigan State University was named the winner during the GIS closing celebration, and received $1,000 for the school's turf club.

//GOLFDOM WISDOM

When hiring young people, remember: High school athletes know discipline, but the kids who feed livestock before school know hard work. #golfdomwisdom
— Mark Novotny, CGCS

"(Slow play) has to do with the distance the golf ball goes today and the need to extend the time between tee times to allow golfers to hit tee shots safely and to keep the pace of play moving."

SEAN TULLY, *superintendent, Meadow Club, Fairfax, Calif.*

The old and new of slow play

Congratulations to *Golfdom* on celebrating its 90th anniversary recently. I'm honored to be a part of such a long history and that my articles are available for others to read. Had I known this opportunity would have been a reality back in high school, I would have spent more time paying attention in English class all those years ago!

I spend a lot of time reading old golf publications and newspaper articles looking for information while piecing together stories and learning more about golf's history. I focus largely on golf course architecture and architects, along with turfgrass management practices. I occasionally come across some surprises that change the way I look at things. Sometimes it's complicated, but often it's a basic concept that has a ripple effect.

Today, slow play is one reason why golf rounds are decreasing and some people give up the game entirely. Other reasons include course set-up being too penal, green speeds too fast, and too much rough. All play a part. I argue that another reason comes into play before golfers even tee off, and it has to do with the distance the golf ball goes today and the need to extend the time between tee times to allow golfers to hit tee shots safely and to keep the pace of play moving.

In doing my research, I found references to tee times for 1923's opening day at Harding Park Golf Course in San Francisco, where they had tee times that fluctuated between four and six minutes. That day, Harding saw more than 1,400 rounds of golf played. Almost as hard to comprehend, one golfer managed to play 72 holes! I originally thought this was done to handle the influx of golfers who wanted to play on opening day, and not done normally.

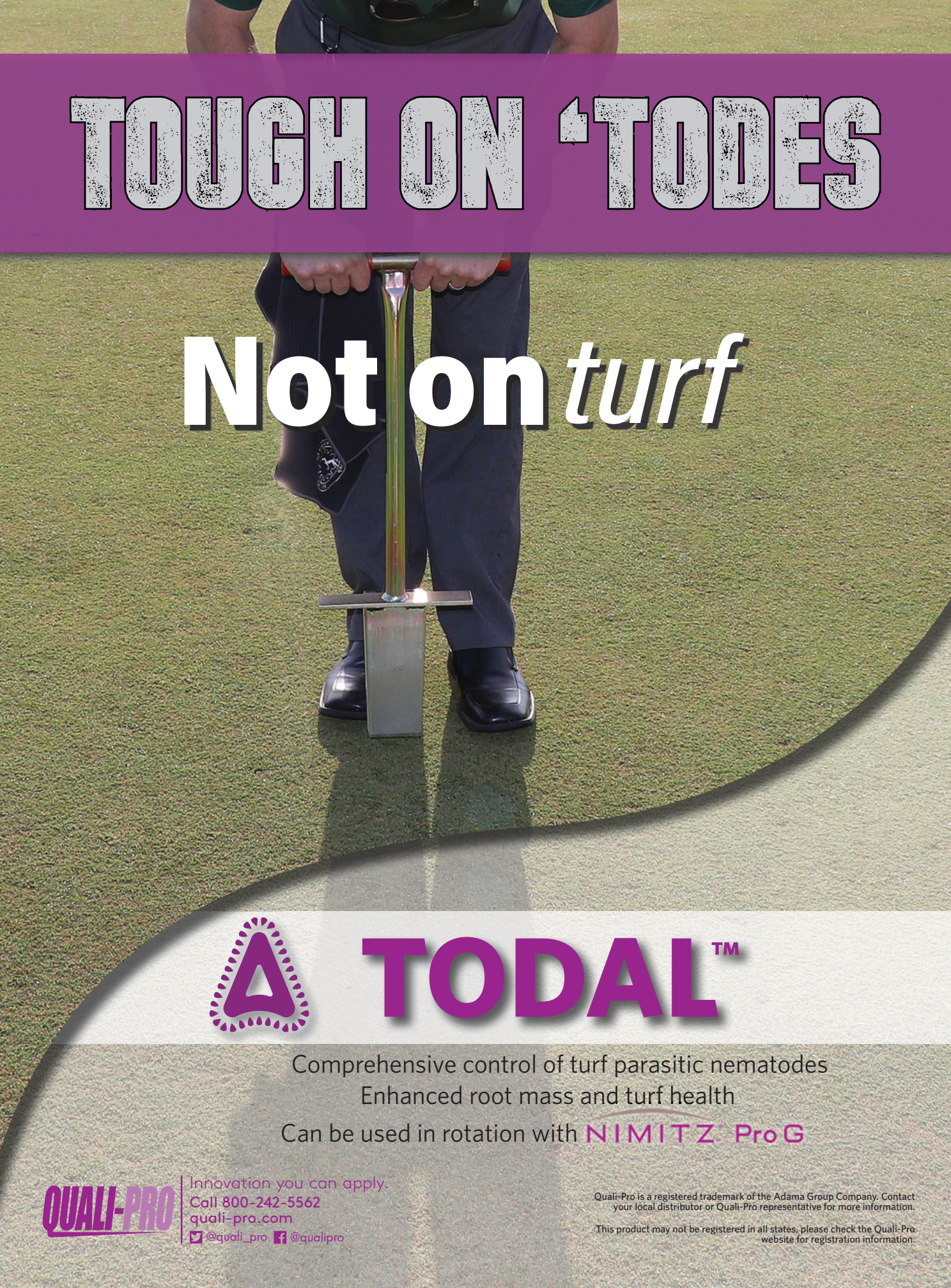
To my surprise, I found an article on the 1929 U.S. Amateur at Pebble Beach that listed tee times to be played in twosomes in just five-minute increments. Golfers at that time were likely not driving more than 250 yards, so they were able to get to their ball and play away quicker than current professional golfers.

For comparison, let's look at this year's U.S. Open at Erin Hills, where the final round went out in twosomes and were sent off in 11-minute increments. So, the distance golfers are hitting the golf ball has an impact on how much time it takes to play a course even before they tee off. In addition, with today's golfer hitting the ball 50-75 yards farther, they also find the walk to be longer as golf courses are lengthened to accommodate the ball going farther. Then the walks to the back tees continue to get longer, and have a negative effect on the rhythm one gets into while playing a round of golf.

So, professional golfers having longer waits on the tee translates into longer walks on the golf course — both of which are brought on by the distance golf balls are going. Of course, golfers today take way too much time to hit their shots. Given the latest swing theory, sports psychologists and gauging whatever way the wind is blowing, these factors all come together to have an impact on pace of play. Throw in narrow fairways, more rough and faster greens and you have a game with which the average golfer can't identify. This situation is reflected then on golf courses all over the country, where its impact is far greater on the pace of play, and so on the enjoyment of the average golfer.

Tournament golf is just that, an event for an identifiable group in which the course gets a certain conditioning. But after the tournament, conditions should be brought back to more realistic expectations.

Sean Tully is superintendent at the Meadow Club in Fairfax, Calif. He can be reached at stully@meadowclub.com or followed at @tullfescue.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Golfdom Gallery

1 He's got the tools, the talent At the 2018 Golf Industry Show, Greenworks Tools Senior Product Manager David Glueck made short work of a tree with a battery-powered chainsaw.

2 Stay thirsty, my son Turf's Most Interesting Man, Bob Farren (right), CGCS, Pinehurst Resort, toasts a Dos Equis with his son Casey and daughter-in-law Megan at the Jacobsen party at GIS.

3 Hail to the chief Standard Golf's Matt Pauli shows off the company's new bunker rake, the Chief. The rake, which debuted at the GIS, is designed for rugged "Australian-style" bunkers.

4 Big league players Armen Suny, search executive at Kopplin Kuebler & Wallace; Jason Straka, ASGCA, Fry/Straka Global Golf Course Design; Jacob Hoffer, PGA, general manager, Union League National, Swainton, N.J.; and Louis Pitcock, superintendent, Union League National, stopped by the *Golfdom* booth to make sure their subscriptions were current.

5 Dueling smiles "Uncle" David Hay, CGCS at Mission Hills CC, Rancho Mirage, Calif., and North Coast Media President & CEO Kevin Stoltman share a laugh at the BASF party.

6 We like compliments Rey Gomez, superintendent at Horseshoe Bay Resort in Marble Falls, Texas, had some nice words about our magazine, so we sent him home with a *Golfdom* T-shirt.

7 Rowdy Roddys It's not often *Golfdom* Group Publisher Bill Roddy (left) meets a fellow Roddy, but here he is with Erin Hills (Erin, Wis.) Equipment Manager Tim Roddy.

8 The *Golfdom* gang Thanks to everyone who stopped by at GIS to say hello! (Left to right) Publisher Craig MacGregor, Roddy, Managing Editor Abby Hart, Science Editor Karl Danneberger, Ph.D., and Western Regional Sales Manager Jake Goodman look forward to seeing you all again next year in sunny San Diego.

PHOTOS BY: SETH JONES (1-4, 7); BILL RODDY (5); MICHELLE MITCHELL (6, 8)

Nanea Golf Club is on the island of Hawaii. But they're never on an island with John Deere.

In terms of service and support, a golf course superintendent can, at times, feel like they're on an island. And yet, **Billy "Biggie" Quirit**, equipment manager of Nanea Golf Club, Island of Hawaii, never feels that way, thanks to his John Deere Golf dealer. Says Biggie "They've done really well at supporting us with our equipment, our parts, even our financing." Sitting on over 1,000 acres, Nanea is breathtaking in both its conditioning and size. "The 8000A is one of the best fairway mowers we've seen. And the greens mowers are pretty much bulletproof."

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"Almost nothing fazes these guys anymore. They've pretty much seen it all (or at least most of it) and lived to tell about it."

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

Like fine wine

They say we live in a youth-obsessed culture. "They" say a lot of things, much of which is somewhere between dubious at best and ridiculous at worst, but I think most would agree this statement is true. One could argue that it certainly is true within our profession.

According to demographic data from GCSAA, the average superintendent is 46 years old. Twenty nine percent of superintendents are between the ages of 30 to 39, while only 6 percent are age 60 and up and 28 percent are age 50 to 59. It's clearly a young person's game.

It makes sense. The physical nature of the work combined with the hours and, at times, high stress level certainly could favor younger people. But for all the supposed advantages of youth, being a grizzled industry vet certainly seems to have a considerable upside.

Why? Glad you asked.

The experience factor

Almost nothing fazes these guys anymore. They've pretty much seen it all (or at least most of it) and lived to tell about it. Why waste time getting fired up about a problem when you can just fix it and move on? The assistants might be freaking out about something while the GIV is just sitting there calmly eating his lunch, waiting for the kids to stop crying long enough to tell them everything will be fine.

The stories

Maybe I'm crazy, but being able to say that you learned to mow fairways on the tank-like death traps of a bygone era gives you a certain street cred that's tough to beat. Think about it. Telling a story about the first time you rolled out on an F-10 is a million times cooler than talking about your first time out on the ergonomically designed, power steering- and ROPS-having Cadillacs (complete with cup holders) we use now. If you get into a sketchy situation on a piece of equipment nowadays, it's probably your fault. I get the sense that wasn't always the case back in the day.

Weather historians

GIVs frequently have an almost Rain Man-esque recall of past years' weather going back 20-plus years. This frequently is demonstrated in statements like, "You think this year is tough? It's got nothing on the summer of '95." While it possibly can be argued that time has, shall we say, slightly increased the severity of those bad years in their memories, the point still stands. Insane weather recall is pretty typical in this business. Climatologists probably could save themselves a ton of time and frostbite by simply talking to a bunch of veteran supers instead of drilling ice cores in the Arctic.

Political geniuses

This goes along with experience, but knowing when to stand your ground and when to concede is vital to career longevity. Deftly navigating club politics truly is an art, and GIVs are masters of it. They probably wouldn't be GIVs otherwise.

Impressive (course) résumés

I'm not referring to actual career résumés. I'm talking about course résumés: the places that, as longtime members of the industry, they've been able to play that most golfers can only dream about. I guess it's only fair. There needs to be some payoff for making it through dozens of summers "when it never got below 85 degrees… even at night."

While youth certainly seems to be idolized in our culture, there's a whole lot to be said for experience and the wisdom that often comes from it. I, for one, am grateful for the many industry vets who have shared their experience and knowledge with me over the years, and I hope eventually to be a GIV myself. My chances probably are decent, since risking life and limb to mow a fairway is no longer standard operating procedure.

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

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The Golfdom FILES

FROM THE ARCHIVE

In the June 1938 edition of *Golfdom,* golf course architect Robert Trent Jones wrote about the evolution of American golf course design, and in particular the areas that torment golfers and superintendents alike: bunkers. He explained that the charm and challenge of these hazards comes from their inconsistent sizes, shapes and depths and their intentional placements on the course — all in the effort to provide a "balanced source of punishment." To read the full article, visit **golfdom.com/exclusive.** And stay tuned for our April issue, where we'll be looking at today's bunker renovations and how several courses have approached renovation projects.

Traps—What size? What depth?

By Robert Trent Jones

One of the charms of the English seaside courses is the infinite variety, the tumbling irregularity and the rugged appearance of their traps. Like the catch in the Scotch fishermen's baskets, they are all sizes and shapes. So important has been their influence in the realm of golf that some of them have been given such names as Hell's Bunker at St. Andrews (which cost Gene Sarazen the British Open one year), Sandy Parlor and Hell's Half Acre.

One of the weaknesses of our early American courses was the tendency to standardize the size, shape and depth of the traps, as if they came out of one mold. While through this we may have become proficient in blasting to within a drop-putt area of the pin, at the same time it has made golf lose some of its charm.

While deep traps still have their spine-quivering effect, they no longer produce that aggravating fear that existed before the advent of the sand-wedge. When a Revolta will play from

13 traps during the course of a championship tournament and still turn in a card of 71 by virtue of his trap-shot efficiency combined with a velvet putting stroke, traps have certainly lost some of their sting for the expert. But even the sand-wedge has not proved infallible, particularly as far as the average golfer is concerned, for he can still be seen looking for the ball at the pin when he should be looking at his feet after a vigorous effort in the trap.

How then, can we combine the design of the hole to give a balanced source of punishment to all types of golfers, making it sufficiently fearful for the crack golfer without making it too tough for the average shooter? This can be done by having key or master traps from the tee and at the green, the location of which will depend upon the strategic value of the shot. These can be made fearful looking by flashing the sand and sod, and actually fearful by undulating the traps so that a constant variety of shots must be played due to the stance one obtains at the spot where the ball has stopped.

At the same time, such undulations can be made to blend with the subtle green contours and the dune-like framework of the green, making the hole an artistic one as well as a fair test of golf. Such traps should be located primarily to affect the shots that would be normally played by the expert.

To make hole and green design more attractive and to administer a psychological effect, other traps necessary to complete an attractive and interesting golf hole should be of varying depths and sizes with a tendency toward the shallow, so that while the average golfer may frequently find his ball in them, he will require but one stroke to get out of them. Even though the traps are shallow, tests have shown that the odds of the golfer's getting down in one putt after having recovered from such a trap are decidedly against him.

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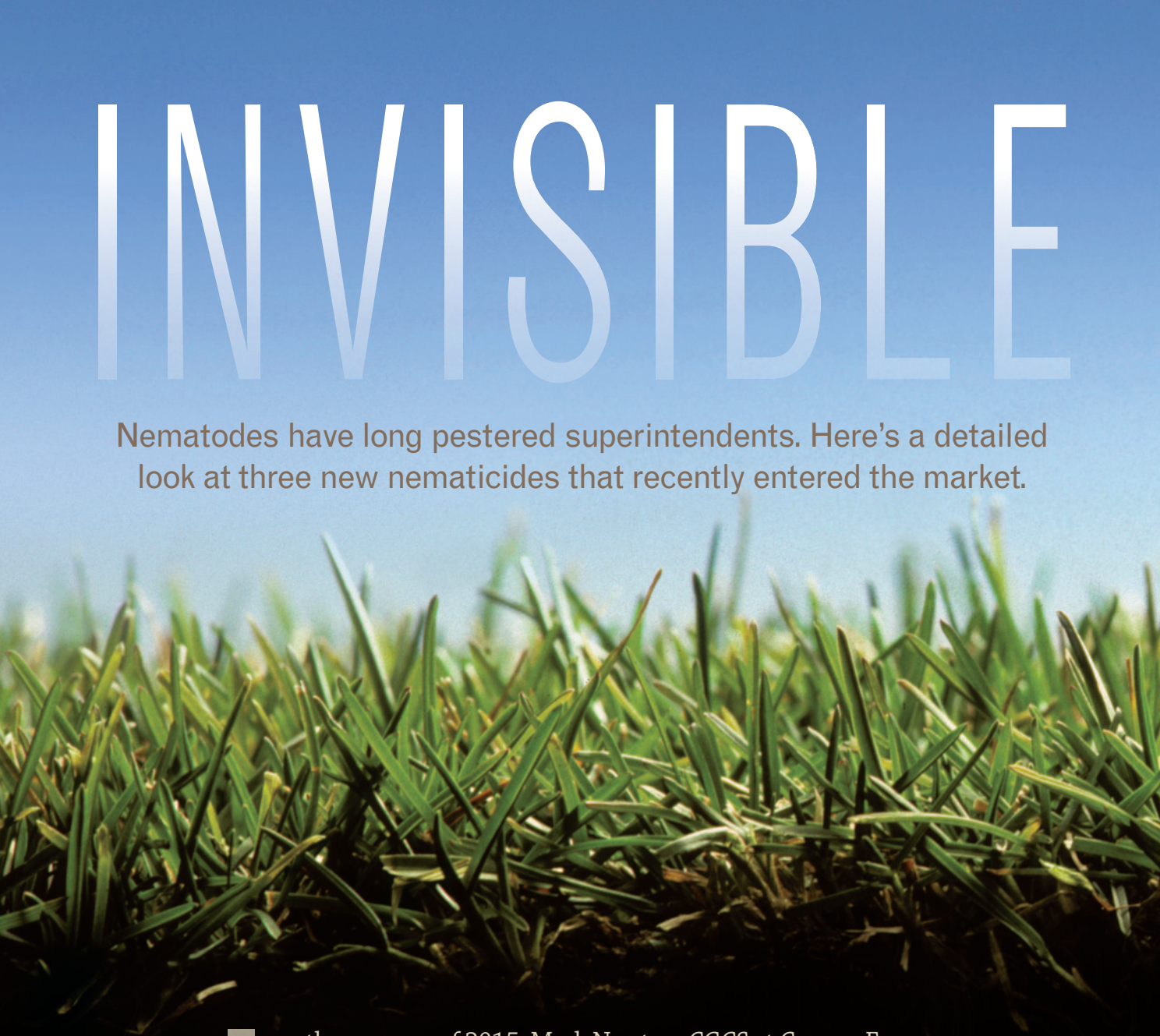
INVISIBLE

Nematodes have long pestered superintendents. Here's a detailed look at three new nematicides that recently entered the market.



In the summer of 2015, Mark Newton, CGCS at Canyon Farms Golf Club in Lenexa, Kan., was worried he might lose his job.

He and his two assistant superintendents were spot-watering greens up to five times a day. His greens turned purple any time the temperature went above 75 degrees F. The greens had poor uptake of nutrients and didn't respond to nitrogen. While they didn't lose grass, the greens were difficult to maintain. Members started to notice — and complain — that the staff was watering too often.

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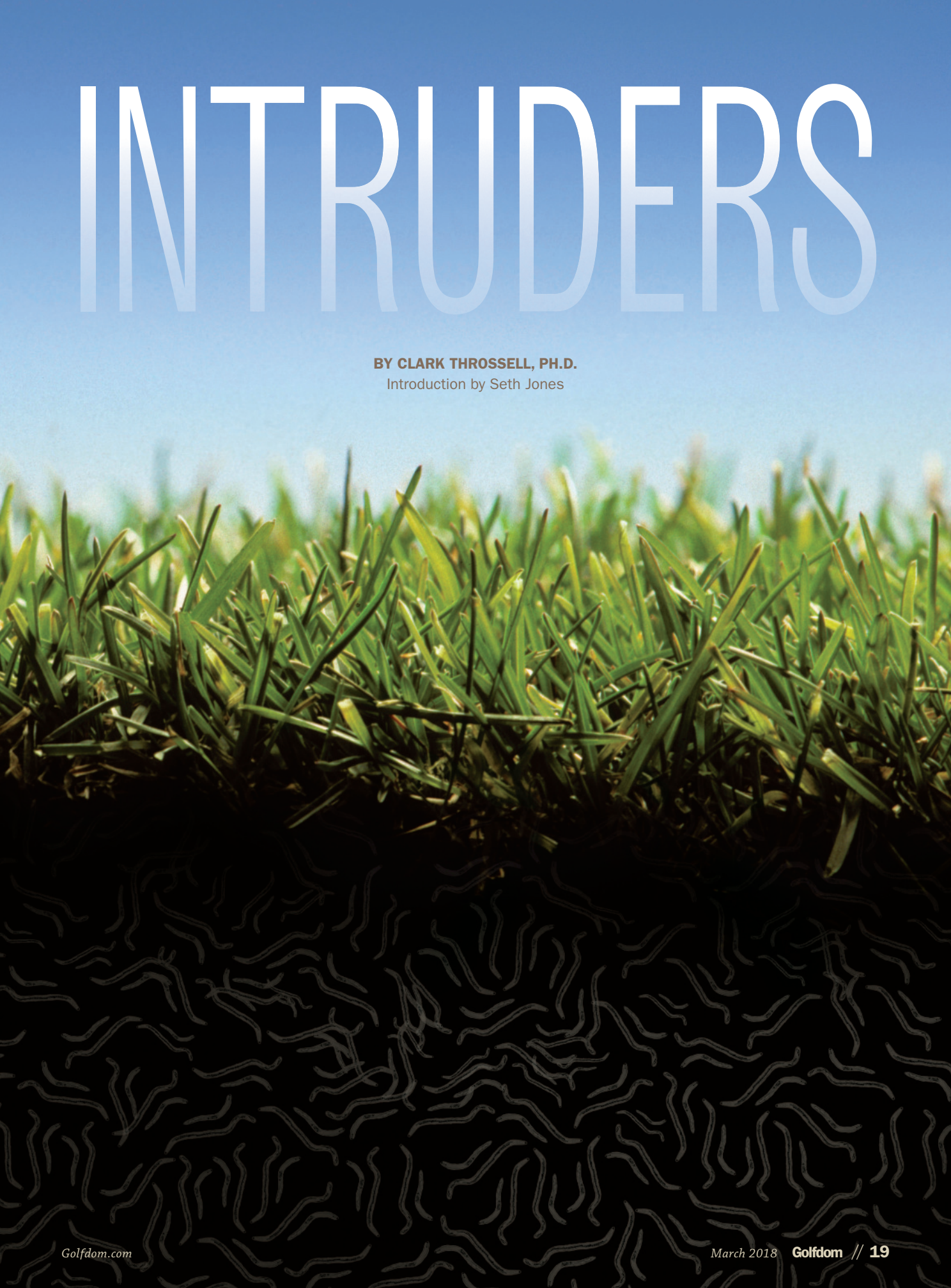
INTRUDERS

BY CLARK THROSSELL, PH.D.
Introduction by Seth Jones



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"Normally on an 80-degree day, we'd literally have to hand water in the morning, go back out again at noon, back out again at 2 p.m. and sometimes again at 4 p.m.," Newton says. "Hand water, hand water, hand water. It was a pain.

"We'd probe them, and instead of them being rock-hard like you would see in isolated dry spots, it would be like butter — like there was nothing in the ground," Newton recalls. "We have a lot of organic matter, so we attributed it to that."

After they started cutting cups on the back of No. 9 green — a pin position they hadn't used in a while — they noticed the problem spreading to that area. Newton sent soil samples to the University of Missouri and the University of Florida. What came back was something they never could have seen with the naked eye — a sting nematode population 10 times above the normal threshold.

"It was eye-opening for me," Newton says. "I'd never been at a course where nematodes were an issue."

Canyon Farms was the first course in Kansas City to try Indemnify on its greens. Newton describes it as a "night-and-day difference."

Mark Newton

After applying a nematicide, he and his crew could water in the morning and "everything holds." He saved $18,000 in labor on hand watering in 2017. And the greens are excellent.

"Nematicides aren't cheap by any means," Newton says. "But we're doing applications again this year. It's a no-brainer."

A history of nematodes

Superintendents have battled nematodes for years. The battle was considerably easier with chemical controls. With the removal of Nemacur (fenamiphos, Bayer) from the market several years ago, superintendents searched to find an effective, consistent and affordable chemical control product.

Canyon Farms Golf Club's struggle with nematodes, as seen on the practice green (inset) and the No. 18 green.

When trying to control nematodes, it's vital to know which species of nematodes are present and the number of each species present. Proper sampling is the only way to answer these questions. "Sampling Instructions for Nematode Assay," by T. Mekete and W. Crow, provides step-by-step instructions to collect and submit a sample for nematode analysis **(http://edis.ifas.ufl.edu/sr011)**.

When sampling, keep in mind that nematode populations fluctuate dramatically during the growing season and are not distributed uniformly across a putting green. You must sample during periods of active root growth and take multiple soil core samples from the area of declining turf. You may have to sample several times during the growing season to get a good understanding of the problem.

A nematode assay provides important information on the nematode species present, but nematodes-present results are difficult to interpret. While published damage-threshold numbers for many nematode species are helpful, don't interpret nematode counts as black or white when considering treatment options. Assess the turf's condition and talk to colleagues

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PHOTOS BY: MARK NEWTON

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Continued from page 20

and university and industry experts before deciding whether to apply a nematicide.

In the last two years, three new nematicides — Divanem (abamectin, Syngenta), Indemnify (fluopyram, Bayer) and Nimitz (fluensulfone, Quali-Pro) — have been introduced into the turf market. With a year or two of experience with these products, we talked to experts at each company to learn more about them.

Figure 1. Soil cores taken from a Champion ultradwarf bermudagrass putting green in Florida show the root system of an area treated with soil surfactant only (left) and an area treated with Divanem and a soil surfactant (right) applied Aug. 23 and Sept. 21, 2016. Samples were collected on Oct. 25, 2016.

Syngenta's Divanem

"Divanem has been well received by superintendents, and it was no surprise since superintendents asked for the product in the first place," says Lane Tredway, Ph.D., Syngenta technical services manager and turfgrass pathologist. Tredway explained that Billy Crow, Ph.D., nematologist at the University of Florida, worked with Avid (abamectin, Syngenta), which at the time was labeled for insect control in ornamentals on turf, and found it provided effective nematode control. Once superintendents saw the results of Crow's research, they asked Syngenta to make abamectin available for turf. Syngenta responded by making Divanem, which is abamectin formulated specially for turf use. Divanem is a restricted-use pesticide.

Lane Tredway

"With today's new nematicides, it pays to be proactive," Tredway advises, suggesting superintendents sample regularly and apply Divanem while there is active root growth and before the turf declines. Superintendents can use Divanem as a rescue treatment, but it requires multiple applications and requires favorable weather conditions and cultural practices to stimulate turf recovery.

"The most successful use of Divanem is as part of a preventive program that includes multiple applications of nematicides with different modes of action," Tredway says. "Think of a strategy similar to controlling fungal diseases season-long and with multiple active ingredients. Applications are especially important during times of active root growth, which is when nematodes are most active." Find examples of season-long programs using Divanem at **GreenCastOnline.com/Programs**.

Tredway also encourages superintendents to consider applying Heritage (azoxystrobin, Syngenta) or Velista (penthiopyrad, Syngenta) fungicides in a tank mix with Divanem plus a soil surfactant to control root diseases. This, along with controlling nematodes, improves turf performance. Because all the products need to be watered in for maximum effectiveness, the tank mix makes sense, Tredway says.

Always leave an untreated area for comparison when treating with Divanem. "Nematode populations fluctuate widely during the growing season, so relying on nematode counts to gauge success can be misleading," Tredway stresses. Nematodes numbers fluctuate because of weather and root growth. The more roots present, the more nematodes present. Tredway advises focusing on root growth and turf performance rather than focusing on nematode counts, and having an untreated area for comparison makes it easy to judge the effectiveness of Divanem (Figure 1).

Divanem has broad-spectrum activity on root-feeding nematodes and controls sting, lance and root knot nematodes, the most common nematodes in turf. In addition to applying Divanem during periods of active root growth, Tredway recommends tank mixing Divanem with a soil surfactant and watering in 0.1 inches immediately after application, with 0.25 inches of water within 12 hours after application. Applying Divanem after aeration, while aeration-created channels are still open, helps move Divanem into the soil.

When used according to the label, Divanem has a low impact on the environment. It is tightly bound to soil and organic matter so has a low risk of leaching but underscores the need to water in Divanem

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> "NEMATODE POPULATIONS FLUCTUATE WIDELY DURING THE GROWING SEASON, SO RELYING ON NEMATODE COUNTS TO GAUGE SUCCESS CAN BE MISLEADING."
>
> **LANE TREDWAY, PH.D.**

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Nematodes embedded in root tip (left). Evidence of nematodes feeding on young bermudagrass roots (right).

PHOTOS BY: BRUCE MARTIN, PH.D.

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before it dries to get it effectively into the root zone.

Bayer's Indemnify

"Superintendents using Indemnify have loved it. Indemnify has improved turf quality on golf courses across the country," says Zac Reicher, Ph.D., technical specialist with Bayer Environmental Science. Indemnify is effective on a broad range of nematodes, including soil-borne nematodes like root knot, sting and cyst,

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as well as the stem and gall nematode, *Anguina pacificae*.

According to Reicher, the most effective way to use Indemnify on courses with a history of nematodes is preventively. He urges superintendents to apply Indemnify before turf decline is obvious, and schedule applications based on the course's history of nematode-caused turf damage. On courses diagnosing nematode problems for the first time, curative applications of Indemnify are effective, but recovery will be slower because damage is most common when the turf is under stress and/or growing slowly. Once nematodes have been identified they're likely to remain a problem. Preventive applications are necessary to maintain the highest quality turf.

Zac Reicher

"The time it takes for the turf to recover after an application of Indemnify varies and is based on root growth and the number of nematodes present at application," explains Reicher. "In some cases if *Poa annua* is actively growing and Indemnify is applied to control *Anguina pacificae*, superintendents may see a positive turf response in a few days. On bermudagrass greens, a positive turf response may take two to three weeks depending on how fast the turf is growing."

"Nematicides, including Indemnify, are not silver bullets," Reicher emphasizes, "and must be used as part of a well-conceived and properly executed year-round management plan to promote healthy turf. Budget, management approach and expectations all play a role in deciding whether or not to apply a nematicide to a green or greens. Each golf course is unique, and when applying Indemnify for the first time it may make sense to treat only the problem greens to learn about the product, the turf response and the economics."

Good results using Indemnify have come from two preventive applications at 17.1 oz. per acre made four weeks apart, with the applications made in spring during active root growth (Figure 2). On courses suffering from high levels of nematode damage, Reicher adds, superintendents may make four applications of Indemnify at 17.1 oz. per acre per year. Find more information on Indemnify at **BackedbyBayer.com/golf-course-management/talking-turf**.

To receive the best performance from Indemnify, Reicher recommends watering it in with 0.1 inches within 24 hours after

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Figure 2. Champion ultradwarf bermudagrass green in southern Florida with a history of sting and root knot nematodes. Lower left was untreated while top right received two applications of Indemnify in fall 2015. Photo was taken on Feb. 5, 2016.

PHOTO BY: DEREK SETTLE, PH.D.

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application. No surfactant is needed in a tank mix with Indemnify, and it's not necessary to aerate prior to application. He also recommends applying Indemnify with no major thunderstorms in the two-day forecast. This prevents Indemnify from being washed through a sand root zone. Reicher says there have been no reports of turf phytotoxicity following an Indemnify application.

He also says superintendents should reach out to their area Bayer sales managers before making a final decision about Indemnify. "The decision to use Indemnify should be made on a case-by-case basis and not (made) in a bubble," he says.

Quali-Pro's Nimitz Pro G

"Superintendents have had a positive reaction to Nimitz Pro G. There was excitement about the launch of Nimitz and

that has continued with repeat orders in the second year of availability of the product," says Marie Knox, nematologist and director of product development for Control Solutions, Inc. Nimitz Pro G is extremely effective on lance, root knot and sting nematodes.

Knox cautions that nematode management and control is not as simple as treating an aboveground pest. She explains that nematodes live in an "unseen world." Populations fluctuate throughout the growing season and counts aren't as reliable as anyone would like.

Marie Knox

"Monitoring turf response, focusing on damaged areas that fill in, increased root growth and overall improved turf vigor," is key to determining the effectiveness of a Nimitz Pro G application program, she says. "In general, it takes two to four weeks after making the first Nimitz Pro G application before the turf starts to show signs of recovery. The turf needs time to respond before signs of recovery are seen." Find more information on the use of Nimitz at **Nimitzpro.com**.

The general recommendation for applying Nimitz Pro G is to make three to four applications at 60 lbs. to 80 lbs. product per acre, with each application one month apart. A complete Nimitz Pro G program totals 240 lbs. per acre applied over a three- to four-month period. Superintendents see the best results when turf is actively growing and soil temperature at a 2-inch depth is at least 55 degrees F. Creeping bentgrass may be sensitive to Nimitz Pro G, so don't apply more than 60 lbs. of product per acre. Spreader calibration is important for applying the proper amount.

For Nimitz Pro G to be most effective, Knox recommends applying it to actively growing turf, not overlapping (small gaps between spreader passes will not affect efficacy and are preferred to overlap) and watering in with 0.25 inches of water. Begin watering immediately after application with 0.1 inch. You may apply the remaining 0.15 inches in two to three cycles over the next two hours. Knox says aeration prior to Nimitz Pro G application is not necessary but can help move Nimitz Pro G into the root zone.

Nimitz has no effect on honey bees, and there is no reentry interval restriction. Knox adds that Nimitz has no negative impact on fungi, bacteria and beneficial soil micro fauna, so superintendents may use it in programs that apply beneficial biological organisms.

Summarizing THE Summit

BY THE *GOLFDOM* STAFF

Part 2 of our 2017 *Golfdom* Summit recap has a central theme: "Better conditions with less maintenance."

Ted Fist, head of U.S. business operations for Capillary Concrete, is someone you might consider a "first-time caller, longtime listener" when it comes to the *Golfdom* Summit. He was aware of it for a long time but participated in the Summit for the first time last year.

He's now tuned in.

"What's been great about the *Golfdom* Summit — unlike a traditional trade show — we get solid one-on-one time to talk directly about our products for a couple minutes," Fist says. "That doesn't always happen at a trade show, where it's more rapid fire — they come into the booth, they leave pretty quickly. (The Summit) gives us an opportunity to have a dialogue that I haven't found anywhere else in the industry."

2017 Summit keynote speaker Rich Lerner

PHOTO BY: GRANT B. GANNON

In last month's cover story, we asked seven of the 15 vendors to give us their "pitch" at the 2017 Summit (we also included a photo of all 70 attendees on our cover). This month, we round out the balance of vendors with interviews of the remaining eight.

Quali-Pro

It's never a bad thing to travel with the boss.

And the boss of Quali-Pro — Mark Boyd, president and CEO of Control Solutions Inc., which is the parent company of Quali-Pro — attended the *Golfdom* Summit to meet superintendents in person.

"Because we had Mark Boyd, the president of the company there, a lot of the conversation was around 'Who is Quali-Pro?'" says Paul Fox, Quali-Pro's Gulf Coast area manager. "A lot of people aren't familiar with who we are, so we got to tell our story."

So, what's the story? "It's a family-owned company that started in 1958, and now it's a part of Adama, one of the largest chemical manufacturers globally," Fox says. "We not only sell post-patent products, but we also focus on new, value-added differentiated products like Nimitz, Taurus and Enclave."

Fox says that beyond the "Who is Quali-Pro" conversation, the chemical solutions conversation depended on where the superintendent is based. He did say that Nimitz, their nematicide, is doing well and being sold in a large geographic area.

"There's no doubt that over the last several

At GIS 2018, Oregon's Joe Amalfitano demonstrated a backpack battery-powered trimmer, one of the many products of interest at the Summit.

PHOTO BY ED HISCOCK (TOP), ABBY HART (RIGHT)

years, nematodes were considered a coastal/southern issue," Fox says. "But we're selling product all over the place. Places in Kansas, in Missouri, all over the North, where nematodes historically were not thought to be an issue… they've found that they are."

Oregon Outdoor Power Equipment

If there was one product that was turning heads at the Oregon demo area, it was their blower, according to Joe Amalfitano, North American business development manager for the company.

"When you talk in terms of commercial-grade blowers, ours is going to put out 22 newtons worth of blow force," Amalfitano says. "To give you an idea, that's mid-range or a step above a mid-range gas blower."

Benefits of the blower include sound reduction — at full throttle, it produces 59 decibels; the ingest protection — the blower can ingest water and simply blow it out; and it's emissions free.

Amalfitano was happy to meet with a group of superintendents from around the country. He says superintendents are seeing battery-powered equipment as a more viable option for maintenance operations.

"At the end of the day, a two-cycle blower has its drawbacks; it's noisy, messy, has down time and gas issues can lead to spills and damage to the course," he says. "The driver for golf is, 'How do I get away from (gas) and become a greener company, and can I still function the way I have been without the traditional drawbacks of battery… which is less power, less run time, less performance?' Oregon pretty much answers and checks all those boxes."

PBI-Gordon

"We want to make sure that whatever the golf course superintendent is looking for, we're bringing the right thing to the market," says PBI-Gordon's Jim Goodrich, product manager, fungicides, insecticides and plant growth regulators. "We have a seemingly endless supply of active ingredients, so we want to make sure the things we have in the pipeline are what's going to help them with their problems."

PBI-Gordon's Jim Goodrich (right) and Jay Young give attendees the rundown on Tekken, a new broad-spectrum fungicide.

Goodrich and his crew took advantage of their time at the *Golfdom* Summit and asked one simple question to every attendee: "What are your needs?"

The company's new Tekken broad-spectrum fungicide was frequently discussed, even though it wasn't available at the time (it became available last month.) Goodrich was prepared, telling attendees that Tekken controls 21 problematic diseases, uses two modes of action, delivers control for up to 28 days and is applied at one rate for all turfgrasses, eliminating guesswork.

"In the development process, we were looking for a product that highlighted our new active ingredient, Isofetamid," Goodrich says. "We wanted to team it with something to broaden the spectrum. We put into motion a series of products… Tekken rose to the top. It has a unique formulation that is doing wonderful things on creeping bentgrass fairways and creeping bentgrass greens and other grasses, where it doesn't have the same effect that higher-load DMI products have."

Capillary Concrete

This was the first *Golfdom* Summit for bunker company Capillary Concrete. The

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Golfdom columnist Joe Gulotti (center), of Newark (Del.) CC, talks about his bunker challenges with Capillary Concrete's Martin Sternberg, CGCS (left) and Rusty McLendon.

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company brought the heavy hitters in Martin Sternberg, CGCS, CEO and founder, and Ted Fist, head of U.S. business operations.

Fist says that once a superintendent sat down with the duo, they explained the highlights of their product — that it is a homogenous blended product delivered in a ready-mix truck and installed in a one-step process. It goes in a bunker, is covered in 2 inches of sand and is ready to be played the next day.

"It drains at hundreds of inches an hour," Fist says. "We're looking at water, moisture content and how that relationship with the sand and our gravel layer and the drainage system interact… so we can provide better playing conditions with less maintenance."

Fist says a highlight of the event for him, aside from meeting such a talented group of superintendents, was when one of their meetings ended and another was about to begin. Fist says the previous superintendent stopped the incoming superintendent. "He tells the other guy he's not going to use anyone else but us — he's talking about our product and selling for us!" Fist laughs. "That's when I knew our message was getting through."

Primera

Primera gave a unique pitch to superintendents at the 2017 Summit. "We told these guys right away, we're not going to sell you anything," says Rocky Dreibrodt, director of Corbin Turf, a Primera distributor.

Instead of pitching products, the company wanted to find out what superintendents look for in a distribution representative, and to educate them on their company. Primera is a distribution network cooperative spanning 61 companies and 525 distribution sites throughout the United States. It works with a range of manufacturers, including big names such as Syngenta, Bayer and Dow.

Michael Kropp, national director of professional markets for Wilbur-Ellis, another Primera distributor, says, "We do about $650-700 million dollars in sales, and that buying power helps us provide the best products, the best pricing and the best service that we can as a co-op."

Communication with sales reps was a hot topic in the one-on-one meetings. Though many younger superintendents prefer to interact with their reps via text and the old-school crowd tends to prefer phone calls, they had one thing in common. "They all have to have trust that I'm going to stand behind the products," Dreibrodt says.

Fortunately for Primera, it seems that they're building trust while also growing the company. Kropp notes that the co-op went from 9 percent market share in 2011 to 22 percent market share in 2016.

"We've had tremendous success the last six years," says Dreibrodt. "This allows us to continue to tell people who we are and keep us relevant, because we don't want to rest."

Healthy Grow

Who knew that chickens could help grow high quality turf?

Pearl Valley Organix is a family owned poultry farm in Illinois that manufactures Healthy Grow, an organic fertilizer made from the waste of egg-laying chickens on the farm. The waste is then mixed with organic materials and turned into fertilizer through a 45-day aerobic composting process.

According to Healthy Grow, the natural timed-release fertilizer helps grow healthy, disease-resistant turf without flush growth, which cuts back on mowing.

Jeff Leuzinger, Healthy Grow's sales manager, explains, "We're a manufacturer that makes a granular

PHOTO BY: GRANT B. GANNON

organic fertilizer from start to finish. From producing the manure to composting to granulation. We do it all and we have control over every process, up to when you open your bag."

Healthy Grow has been a *Golfdom* Summit partner since 2013, and it looks forward to the event every year as an opportunity to learn more from superintendents about their practices and the products they use. This year, the company wanted to "get more detail on the superintendent's program because everyone is a little different," says Leuzinger. "We have a conversation and then we get superintendents to try our product, and for us that's what we feel we need. Once they try our product they're going to like it."

The boardroom presentations gave superintendents a first look at each of the partners' products and programs, and a chance to digest that information before their meetings.

PHOTO BY: ABBY HART

Textron Golf

There was plenty to talk about at Textron Golf, especially since the company encompasses several golf brands. Jeff Barrett, Textron's regional director

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of sales, says, "We recently integrated the Jacobsen product into our portfolio. Now we've got an umbrella of three brands — E-Z-Go, the Cushman brand and now Jacobsen."

At the Summit, the company focused on Cushman and Jacobsen products and how those brands are being integrated under Textron and presented to the marketplace.

"A lot of our feedback has been about our technology," Barrett says. "We've got the Eclipse mower in the Jacobsen line; that's superior cutting quality in the industry." Attendees were also able to demo the main star of Textron's show, the Cushman Hauler Pro electric vehicle.

Cushman underwent a redesign for the Hauler Pro, which focused on feedback from superintendents. Updates include the 72-volt AC system and a more functional dash with expanded storage, because superintendents use their vehicles every day as their office on the course.

The Textron team has seen reception to their equipment evolve over the six years they've been a Summit partner. "We used to have to talk a lot about the (Hauler Pro), and now that transition has been 'Talk to your peers,'" says Barrett. "There's enough folks here who have utilized the product, and now we've got that reference point close by."

WinField United's John Smith (left) and Aaron Johnsen (middle) show Brian Birney of The Club at Admirals Cove, Jupiter, Fla., the GPS-powered GeoTech platform.

WinField United

Between topdressers, GPS sprayers, electric power equipment and rollers, there was plenty of action on the ground during the Summit — but you had to look up to catch WinField United's demonstration.

Powered by drone imagery, WinField United's GeoTech platform is a facility management tool that also aggregates GPS data from satellites and airplanes. The WinField team demonstrated the GeoTech's capabilities by surveying via drone the conditions on Reunion Resort's driving range and analyzing the health of the turf, while also providing a look at the platform's interface.

"(GeoTech) takes data, consolidates it and provides insights to improve or develop agronomic plans," explains John Smith, WinField United's director of marketing. "The tool has five years of satellite imagery that can be incorporated in those plans. We take all these layers and create individual zones, which can then be incorporated into a variable-rate sprayer or manually incorporated into a superintendent's agronomic practice."

Aside from the drone data, the GeoTech tool also can incorporate information from other sources, such as TDR Soil Moisture Meter, Pogo Turf Pro or NDVI (normalized differentiation vegetation index) data to monitor turf health.

"These guys are really interested in new innovations in technology happening right now," Smith observes. "Many of them have seen it in the ag space, and now that it's coming to turf they're interested in where it's going and how they can best take advantage of it on their individual properties."

PHOTO BY: ABBY HART

Hosted by Clark Throssell, Ph.D. | *clarkthrossell@bresnan.net*

Super Science

// TIPTOEING THROUGH THE DAFFODILS

SPRING BULBS ADD COLOR TO DORMANT WARM-SEASON TURF

By Michelle Wisdom and Mike Richardson, Ph.D.

Warm-season turfgrasses in the Transition Zone can go dormant for up to six months of the year. Early-spring bulbs add color to dormant lawns, yet their persistence in the turfgrass environment largely is unknown. In addition to aesthetics, flowering bulbs might also provide early-season forage for honeybees and other pollinators. The objectives of this study were to investigate early-spring bulbs in warm-season turfgrasses to gauge their flowering and persistence and evaluate whether these bulbs can also provide early-season forage and habitat for pollinators.

We chose bulbs based on their established flower heights (less than 6 inches) and their ability to flower prior to mowing warm-season lawns. Thirty species and/or cultivars of flowering bulbs were planted in November of 2015 in Fayetteville, Ark. We established bulbs in both bermudagrass (*Cynodon dactylon* cv. Riviera)- and buffalograss (*Buchloe dactyloides* cv. Cody)-simulated lawns mowed at 3 inches. We established each bulb entry with 25 bulbs per plot and evaluated performance over the spring flowering periods of 2016 and 2017.

Bulbs bloomed from mid-January through May in both years of the trial. Bulbs that performed well over the two years included entries of daffodil (*Narcissus spp.*), *Crocus* (photo) and grape hyacinth (*Muscari spp.*). Blooming and persistence was slightly better in the buffalograss lawn, presumably because of more competition in the bermudagrass turf. Best early-season pollinator sources included entries of grape hyacinth and *Crocus*. These results demonstrate that several early-spring bulbs can provide color to dormant warm-season turf and food resources for early-season pollinators.

Michelle Wisdom and Mike Richardson, Ph.D., are at the University of Arkansas. You may reach Mike Richardson at mricha@uark.edu for more information.

Crocus Crysanthus cv. 'Cream Beauty' flowering in a dormant buffalograss lawn.

PHOTO BY: MIKE RICHARDSON, PH.D.

NEWS UPDATES

NUFARM RECEIVES EPA REGISTRATION FOR TRACTION FUNGICIDE

Nufarm Americas has been granted federal EPA registration for Traction fungicide.

Based on the combination of FRAC 29 and FRAC 3 active ingredients Fluazinam and Tebuconazole, Traction fungicide was developed as a new management tool for disease control and resistance management in cool- and warm-season golf course turf.

"This proprietary combination provides fast and exceptional disease control on a wide range of foliar diseases," said Jason Fausey, Nufarm Turf & Ornamentals technical services director. "This product will be a real asset to golf courses, especially in hot, humid summertime conditions."

Traction fungicide's dual actives work on contact and systemically within the plant to provide effective broad-spectrum control of 19 turf diseases and algal scum. Available in a premix formula, it has been shown to provide strong performance against disease pressure from anthracnose, dollar spot, brown patch and snow mold across field trials in various settings, the company said.

"The fact that Traction is an easy-to-use premix fungicide that can be applied in the summertime to any golf terrain means significant time savings for superintendents," said Fausey.

Traction can be applied on all golf course settings, including fairways, tees and greens.

> "...THE INJURY AREA ASSOCIATED WITH SPILLS OF THESE MACHINE FLUIDS EXPANDED WITH TIME TO A MAXIMUM INJURY AREA, THEN CONTRACTED WITH TIME AS HEALING OF TURF BEGAN."
>
> **Lee Berndt, Ph.D.**
> *(see story on page 36)*

//OIL & FUEL DAMAGE

Hydrocarbon machine fluid injury on greens: What do we know?

By Lee Berndt, Ph.D.

Motorized turfgrass management equipment uses hydrocarbon-based machine fluids, including fuels, lubricants and hydraulic oils. Leaks of these machine fluids injure turf, especially on greens (Photo 1). The most pronounced visual symptom of machine-fluid injury is an area of turf exhibiting loss of visual green color with the onset of shoot necrosis.

Over the last 35 years, only a handful of research reports have addressed machine-fluid injury. Gaining a better understanding of this injury type through additional research may lead to enhanced spill-mitigation tactics. This could be important for golf course superintendents, as spills of machine fluids occur frequently on greens all over the world. This article summarizes our current understanding of machine-fluid injury on putting green turf.

MACHINE FLUIDS ARE CONTACT PHYTOTOXINS

It's not yet clear why machine fluids are phytotoxic. A literature review suggests petroleum hydrocarbons (i.e., gasoline) are lipid solvents, which upon contact with grass shoots causes dissolution of cell membranes. Rupturing of cell membranes causes cell constituents to leak out, resulting in cell death. Alternatively, other petroleum hydrocarbons (i.e., oil) may physically obstruct stomata, interfering with gas exchange and transpiration. Hydrocarbons infiltrating the root zone may cause anaerobic or hydrophobic root zone conditions that interfere with essential functions such as root respiration and the uptake of water/nutrients.

SPILLS AFFECT SHOOTS AND ROOTS

It's obvious that machine fluid spills affect turfgrass shoots, as canopy injury is visually observable. What's not so obvious is that roots are affected as spills of hydrocarbons infiltrate soil. This was demonstrated in 2017 when fluorescent dye was added to vegetable hydraulic oil.

The oil containing the dye, which fluoresces under UV light, was heated to 176 degrees F, and 0.1 fl. oz. was applied to the center of a 4-inch diameter plug of TifEagle hybrid bermudagrass (*Cynodon dactylon* X C. *transvaalensis*) (Photo 2). Shining a UV light on the turf canopy (left) clearly showed shoots were covered with oil, as the dye fluoresced wherever oil had spread. Cutting the plug in half revealed that some of the oil had infiltrated to a depth of about 1 inch, affecting not only roots but root zone micro-organisms as well. Research to determine the spatial distribution of machine fluid spills begins this year.

MACHINE-FLUID INJURY BEHAVIOR IS DYNAMIC

The term "dynamic" refers to changes in a pattern or process with time. Injury resulting from spills of six different machine fluids, including brake fluid, diesel fuel, gasoline, motor oil, petroleum hydraulic oil and vegetable hydraulic oil were similar in some

PHOTO 1

The aftermath of a hydraulic oil spill on a TifEagle hybrid bermudagrass putting green in southwest Florida.

ALL FIGURES AND PHOTOGRAPHS BY LEE BERNDT, PH.D.

respects. For example, the injury area associated with spills of these machine fluids expanded with time to a maximum injury area, then contracted with time as healing of turf began. Shoots treated with machine fluids also lost visual green color with time, turning from green to brown with onset of shoot necrosis. However, differences in the behavior of both injury area and visual green color loss have recently been documented.

Injury Area. The time it took to attain maximum injury area on TifEagle hybrid bermudagrass varied with machine-fluid type (Figure 1). Injury resulting from a spill of 0.1 fl. oz. of gasoline expanded to a maximum injury area of 4.6 sq. inch at 1.8 days after the spill event. This was determined using statistics known as nonlinear regression modeling. In contrast, injury resulting from a spill of 0.1 fl. oz. of motor oil expanded to a maximum of 4.2 sq. inch at 14.1 days after the spill. The maximum injury areas for these two fluids were similar, but it took 12 days longer for the injury from motor oil to reach its maximum area. In other words, the oil spread over the turf for 14 days after the spill. As a result, injury from motor oil began healing 12 to 13 days later at a much slower rate. Projected injury-area duration for the motor oil spill was estimated at 1,004 days versus 173 days for gasoline.

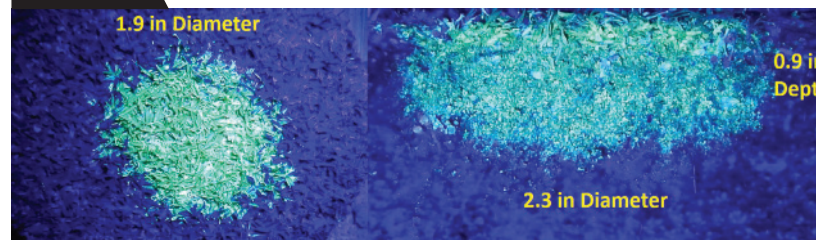
Ultimately, we discovered that injury areas from machine fluids having higher viscosity (i.e., motor oil and hydraulic oils) began healing later and had longer recovery times, with slower rates of healing, compared to machine fluids with lower viscosities (brake fluid, gasoline and diesel fuel). These differences may have been due to differences in biodegradability among fluids, as the literature suggests high-viscosity petroleum hydrocarbons have relatively slow rates of biodegradation.

Visual Green Color Loss. The onset rate of shoot necrosis also varied with machine-fluid type (Figure 2). In other words, there were differences in how quickly the shoots died in response to spills. When 0.1 fl. oz. of gasoline was applied to TifEagle, the shoots became necrotic within 24 hours, which was evidence the shoots had been killed quickly. The visual green color half-life associated with gasoline was about six hours. In contrast, application of vegetable hydraulic oil resulted in a more gradual loss of visual green color; the visual green color half-life was 4.3 days. All shoots treated with brake fluid, diesel fuel, gasoline, motor oil, petroleum hydraulic oil and vegetable hydraulic oil were dead 12 days after treating. But the rate at which shoot death occurred differed significantly.

The nature of the fluids may explain these results. For example, gasoline contains high levels of constituents like toluene and benzene, which are lipid solvents. These compounds probably dissolved cell membranes quickly,

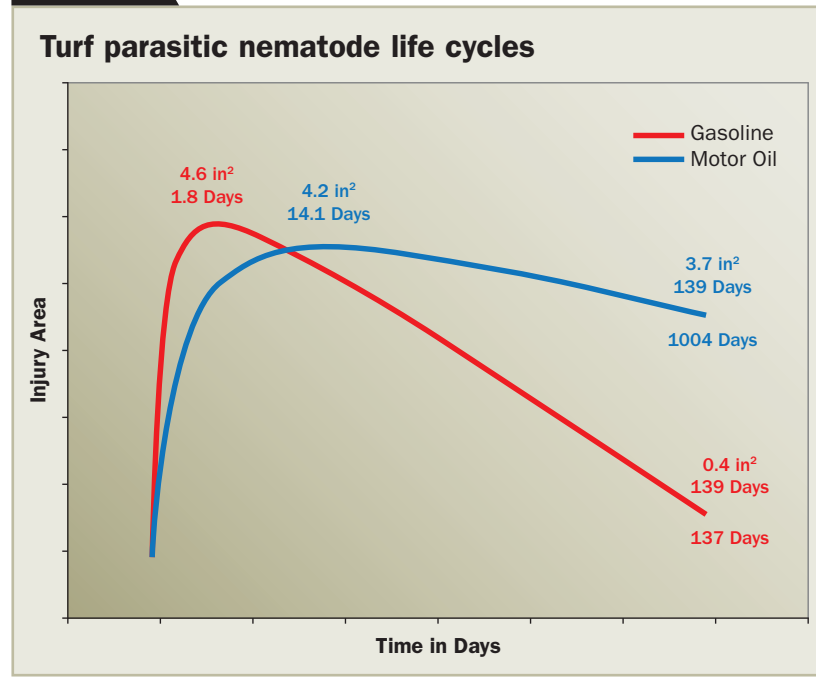
Continued on page 38

PHOTO 2



Spatial distribution of a spill of vegetable hydraulic oil heated to 176 degrees on a plug of TifEagle hybrid bermudagrass. The oil contained fluorescent dye. Shining a UV light with a wavelength of 362 nm showed that the oil had spread over the shoots (left) and had infiltrated into the soil impacting roots and microorganisms (right).

FIGURE 1



Expansion and contraction of turfgrass injury area resulting from spills of 0.1 fl. oz. of gasoline and motor oil on a TifEagle hybrid bermudagrass green. Gasoline attained maximum injury area faster than motor oil. Motor oil injury began healing later and at a much slower rate. The Y axis is injury area and the X axis is time in days after treating.

Continued from page 37

killing shoots within 24 hours. Vegetable hydraulic oil, which does not contain significant amounts of lipid solvents, probably smothered the shoots/roots, resulting in a more gradual shoot death.

VOLUME INFLUENCES INJURY; TEMPERATURE DOESN'T

The volume of a spill has a great deal of influence over injury area (Figure 3). Injury area on TifEagle hybrid bermudagrass was directly proportional to the volume of machine fluid spilled, which makes sense. As spill volume increased from 0.03 fl. oz. to 0.17 fl. oz., injury area increased linearly for both petroleum hydraulic oil and vegetable hydraulic oil. Petroleum hydraulic oil always resulted in a larger injury area than vegetable hydraulic oil, but both oils killed shoots just as dead.

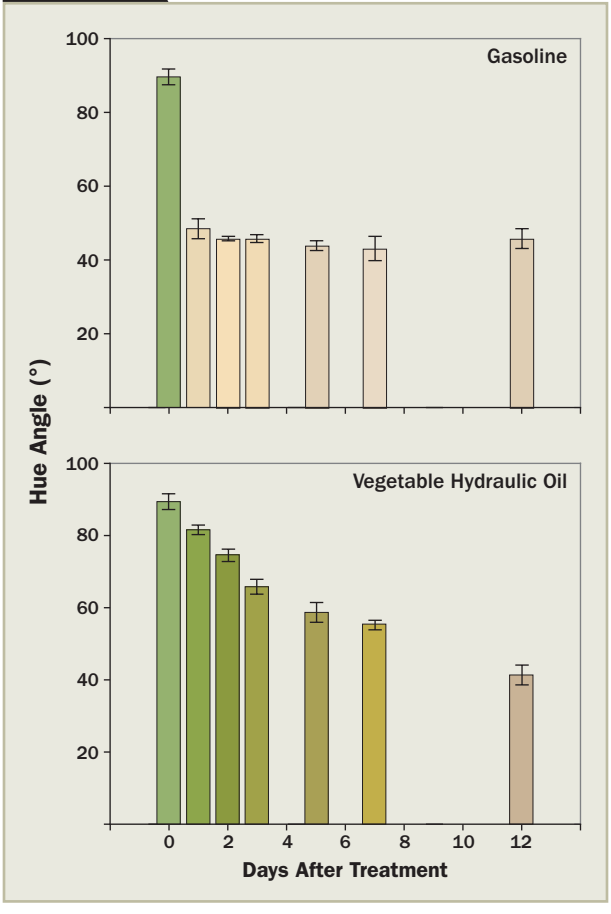
However, the temperature of the fluid at the time of the spill did not significantly influence the area of injured turf (Figure 4). There were no significant differences in injury area for hydraulic oils spilled at 95 degrees F or 176 degrees F. The notion that machine fluids need to be hot to kill turfgrass is a myth. Hot oils kill turf, but so do machine fluids at ambient temperature.

LIQUID DETERGENT INCREASES INJURY

Over the past 40 years, several methods for remediating machine-fluid spills have been described with limited success. A classic research example involved detergents, charcoal and calcined clays being applied to spills of various petroleum products. Researchers concluded that treating spills of hydraulic fluid and motor oil with detergent was an effective corrective treatment. Yet at two weeks after treating, only 45 percent turf cover was present, which in today's world would be unacceptable.

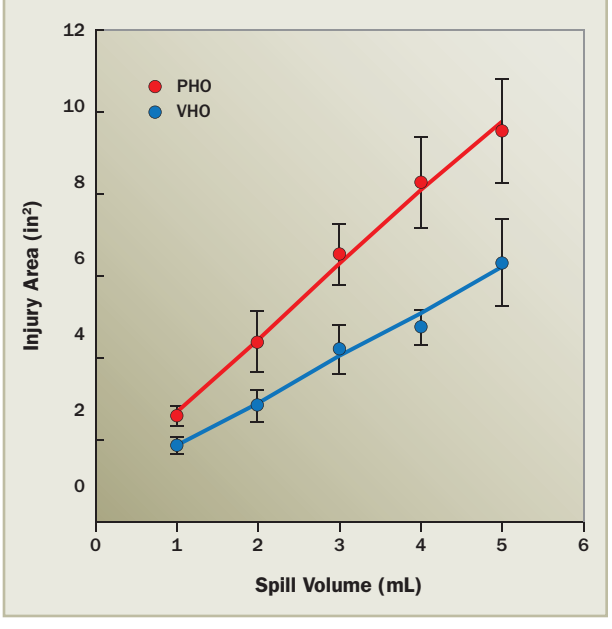
Research with liquid detergent and spills of vegetable hydraulic oil showed that applying liquid detergent after a spill may not be such a good idea (Photo 3). In this research, 0.1 fl. oz. of vegetable hydraulic oil was heated to 176 degrees then applied to pots of TifEagle hybrid bermudagrass. Half of the experimental units were left unwashed while the other

FIGURE 2



Changes in visual green shoot color with time in response to spills of 0.1 fl. oz. of gasoline and vegetable hydraulic oil. The Y axis is hue angle, which is a numerical descriptor of color. The X axis is days after treatment. Note how gasoline immediately caused loss of visual green color while color loss in response to vegetable hydraulic oil was more gradual. At 12 days after treating, all shoots were dead.

FIGURE 3



Influence of volume on injury area for petroleum hydraulic oil (PHO) and vegetable hydraulic oil (VHO) spilled at ambient temperature (i.e., 95 degrees F). Injury response was linear for both oils. The PHO always resulted in larger injury area for a given spill volume, but shoots treated with VHO were just as dead.

half was treated with 1 fl. oz. of Dawn dishwashing detergent, then washed with a stream of water for 10 minutes. Distinct injury was visible where turf shoots were left unwashed. But where detergent had been applied and shoots were washed, injury appeared to be more extensive, affecting all shoots, not just those where hot oil made contact.

Based on this research, treating a hydraulic-oil spill with liquid detergent probably would not be the best choice in remediation tactics. Research now is being conducted to determine effective machine-fluid injury mitigation strategies.

You may reach William L. Berndt, Ph.D., Fort Myers, Fla., at leeberndt@aol.com or @Dr_Lee_Berndt for more information.

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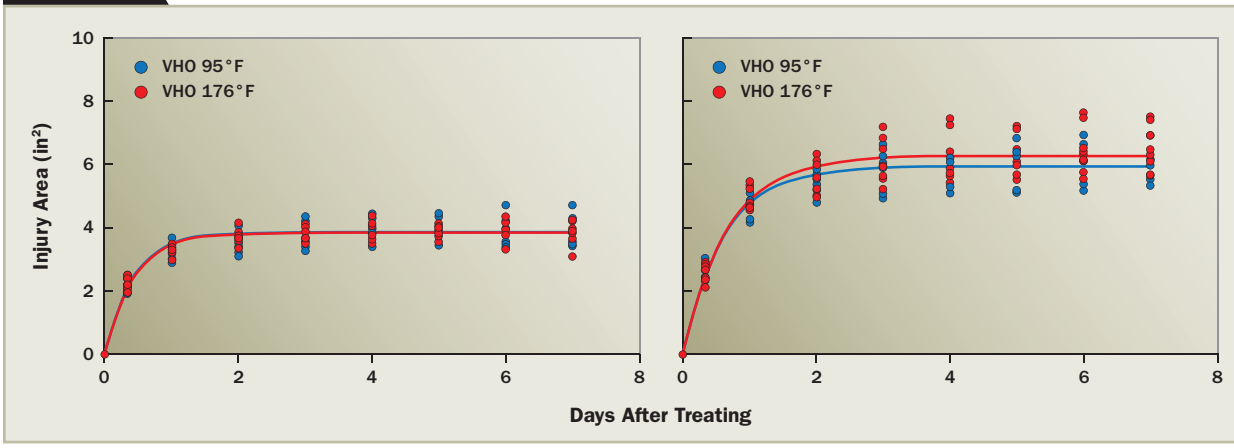
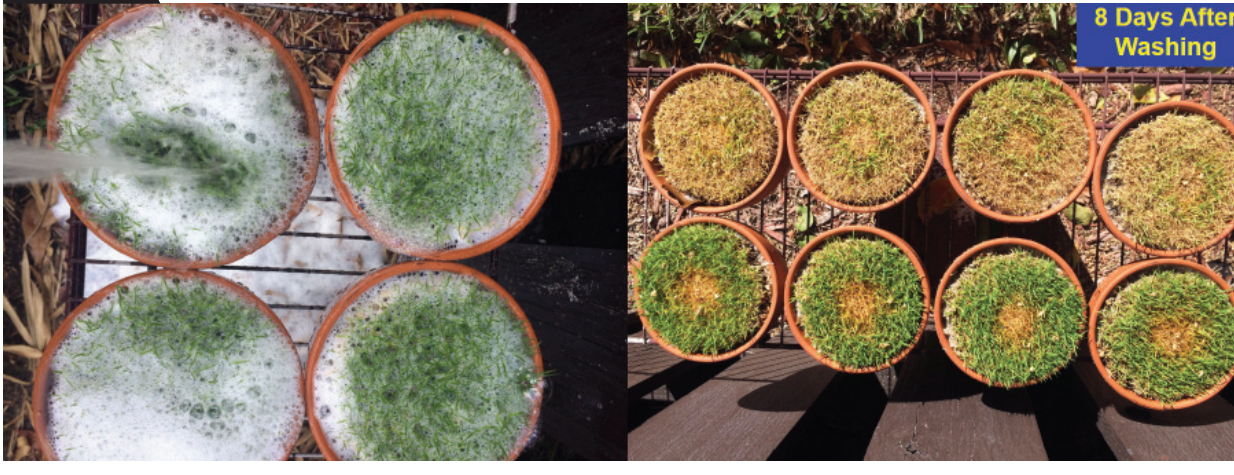
FIGURE 4



Influence of fluid temperature on injury area for petroleum hydraulic oil (PHO) and vegetable hydraulic oil (VHO). Shoots of TifEagle hybrid bermudagrass were treated with oil held at ambient temperature (95 degrees F) or heated to 176 degrees F, which was the estimated equipment operating temperature. Temperature of the fluid at the time of the spill was not a significant factor in injury area for either hydraulic oil. The PHO always resulted in a larger injury area, but shoots treated with VHO were just as dead, regardless of temperature.

PHOTO 3



Effect of washing spills of vegetable hydraulic oil heated to 176 degrees F on plugs of TifEagle hybrid bermudagrass with liquid dish soap. When plugs were left unwashed (bottom right), the injury was visible and distinct. Washing (top right) with detergent either injured all shoots directly (i.e., a detergent effect) or may have helped spread the spilled oil over a larger area, causing more extensive injury.

"Someone mentioned the show app for my phone, and I was set."

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

Impressions of 2018's Golf Industry Show

Returning from GIS 2018 this past month, an email from *Golfdom* Managing Editor Abby Hart was waiting for me, reminding me of my March column deadline. What better time, I thought, to write on my impressions of GIS in San Antonio.

I arrived in San Antonio just in time for the opening ceremony, where Ernie Els received the Old Tom Morris Award. I enjoy the format where the recipient is interviewed. The result often provides insight into the person. I was struck by a question Els was asked. I'm paraphrasing, but it was something like, "Is it hard to keep up the grind of playing tournament golf?" His reply was classic. Again, paraphrasing: "Are you kidding? I'm leaving to go play Pebble Beach. Who would not want to do that?"

His reply reminded me why the golf industry is so great.

Following Els, three award recipients made short but emotional speeches. Drs. Latin, Brilman and Rossi all spoke of the joy and gratification they receive from helping golf course superintendents. Much of their personal satisfaction is seeing superintendents succeed.

The trade show opened on Wednesday. I did not plan what to see and ended up lost on the show floor. Someone mentioned the show app for my phone, and I was set. As I looked at the face of my phone, it struck me what a large and indispensable part of life a mobile phone has become. At seminars or talks, we take notes on the phone, not paper, and you can record talks. Questions on products, turf problems or equipment are answered through search engines. Then there are the apps associated with running a course, from irrigation to timing of products.

Also, did you notice how targeted "sponsor" advertisements crossed your Twitter or Instagram accounts? These were specific to turf companies and even GCSAA. Do any superintendents use these advertisements to target high school students for summer employment? I don't know how sponsor insertions work, but I would be interested in knowing if anyone is using them to target future employees. It must be more effective than running an ad in a newspaper.

Walking the aisles, I was reminded by a former student that there is a big difference between the aisles and the booths. The difference is like night and day. The aisle is a fun place, walking, talking, telling old, boring stories to friends and colleagues. But working the booth is hard. I give the exhibitors a lot of credit; long days (up early, to bed late), short breaks, minimal lunch, continual questions from the aisle, being nice to everyone, meetings and on your feet all day. It takes special people to be exhibitors.

Thursday's highlight is the academic Turf Bowl for college and university turfgrass students. The first Turf Bowls consisted of individual competitors, then they evolved into team competitions. With that change, the popularity of the Turf Bowl grew and help spur student attendance at the GIS. The Turf Bowl builds camaraderie among team members, not only in the competition, but in the studying leading up to the competition and with students from other teams.

Additionally, the Turf Bowl awards ceremony has evolved from a pizza party paid for by donations with winners announced casually, to John Deere's gracious sponsorship and announcing of the winners in their booth, to a polished evening celebration. I hope, though, that we don't lose sight that the Turf Bowl was developed to provide an event for students to build friendship among students.

I judged the GIS a success, based on being able to see and talk to people who I haven't seen in a year. It is a rejuvenating experience that makes you look forward to the coming year.

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

Golfdom Summit

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"The *Golfdom* Summit is the best event I have ever attended. Everything about it felt right, from the one-on-one's to the number of attendees to the organization of the event."

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Superintendents can apply to attend the 2018 Golfdom Summit at:

GolfdomSummit.com

PGR overregulation on greens, collars

Bill Kreuser, Ph.D., is a turfgrass scientist at the University of Nebraska-Lincoln, where he conducts research on plant growth regulators (PGRs), turf growth and remote sensing. You may reach Bill at wkreuser2@unl.edu for more information.

Q Describe the term "overregulation" as it pertains to PGRs.

Overregulation occurs when there is a large enough quantity of PGR in the turfgrass plant that the plant can't handle traffic and wear. Simply put, the turf is not growing fast enough to cope with stress.

Q What are the symptoms of overregulation on a green?

On greens, segregation between annual bluegrass and creeping bentgrass will be pronounced. Specifically, annual bluegrass and ultradwarf bermudagrass becomes sunken, and creeping bentgrass becomes bluer in color. Individual segregates of creeping bentgrass can stand out, and off-types of bermudagrass greens will be obvious.

On annual bluegrass and creeping bentgrass collars, the grass has a reddish-brown color and has poor traffic tolerance.

Q How does overregulation occur?

Overregulation can occur through a large single PGR application or when repeat applications are made too close together. The intensity of suppression is rate dependent. High application rates increase the amount of suppression and increase the risk of phytotoxicity. Application rate has a much smaller impact on the duration of growth suppression. Air temperature and mowing height and frequency affect the length of control.

Applying PGRs too frequently leads to an accumulation of PGR within the plant because superintendents are applying a PGR faster than the plant breaks it down. This increases the effective application rate and increases suppression.

Another common overregulation situation is applying PGRs on summer intervals during the cool spring and fall weather. It also happens where different turf areas meet (i.e. greens and collars). Generally, cool-season collars are slower to break down PGRs than greens. Many repeat PGR applications then can lead to overregulation on collars. Our research plots showed we can cause severe collar decline simply by applying PGRs to collar-height turf on greens intervals.

Q Do different PGRs have an additive effect on turf?

Yes, PGRs work on the same biochemical pathway, albeit at different points in the pathway, but the impact of different PGRs is additive to the turfgrass. If a superintendent wants to switch PGRs (a different a.i.), wait until the first PGR is exhausted before applying a different PGR.

"OVERREGULATION CAN OCCUR THROUGH A LARGE SINGLE PGR APPLICATION OR WHEN REPEAT APPLICATIONS ARE MADE TOO CLOSE TOGETHER."

Q What should superintendents do to minimize the problem if they notice overregulation on a collar?

First, monitor PGR application intervals using GDD (growing degree day) models found at the GreenKeeper app (**greenkeeperapp.com**) and adjust application intervals based on weather. In areas where different turf species meet, avoid PGR overspray or eliminate PGRs for collar applications. This can be challenging because tank mixes typically contain other important fertilizer and control products. I recommend GPS sprayers and stand-alone PGR applications on greens to minimize this issue.

We are just beginning to explore the use of GA (gibberellic acid) applications to minimize overregulation impact. Based on what we now know, a single low-rate GA application may help in some situations. The downside of a GA application: If it's applied to locations where the turf is not overregulated, the turf becomes etiolated and looks horrible.

Preventative options we are testing include a small reduction in collar mowing height, increased nitrogen fertilization on collars and even washing foliar-absorbed PGRs off the leaves with a hose.

Q Is there anything else you would like to add?

Be constantly aware of the impact PGR applications are having on turfgrass growth. Carefully monitor the volume of clippings produced from a green or two and determine if those greens are handling traffic as desired. GreenKeeper can help monitor PGR performance and clipping yield production. Adjust nitrogen and PGR applications as necessary to achieve healthy levels of growth.

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

Defending Our Turf

Congratulations to the *Golfdom* editorial and design teams on another haul of TOCA Awards!

Golfdom

The *Golfdom* team once again led all golf market publications with 16 total Turf & Ornamental Communicators Association (TOCA) awards — matching the number won by *GCI*, *GCM* and *Superintendent* combined!

toca

TOCA First Place Awards

- **Design**
  Printed magazine/two-plus page design, advertising: “Hole of the month” Grant B. Gannon, Pete Seltzer
- **Photography, Video And Multimedia**
  Best single photo – Use of stock art “The sky is the limit” Pete Seltzer
- **Photography, Video And Multimedia**
  Best single photo – created by a TOCA member or freelancer commissioned by a TOCA member “Pay up or go home,” Seth Jones
- **Photography, Video And Multimedia**
  Best print magazine cover (stock photos, commissioned art, illustrations, typography, etc.) “So you're considering the dark side,” James Bennett, Seth Jones, Pete Seltzer
- **Special Projects**
  Writing for special projects “A tribute to the king” Seth Jones, Pete Seltzer, Grant B. Gannon, Mark Woodward, Joel Jackson, Steve Wright, Karl Danneberger
- **Special Projects**
  Miscellaneous special publishing project “The Fall Classic, Early Order Program special” Seth Jones, Pete Seltzer, Grant B. Gannon, Jared Nemitz
- **Special Projects**
  Special Event – Publishing “The Golfdom Summit” Kevin Stoltman, Pat Roberts, Seth Jones, Bill Roddy, Craig MacGregor
- **Writing**
  Turf feature article – commercial publications “The admiral of ultradwarf,” Seth Jones
- **Writing**
  Product information article – commercial publications “Hidden beneath the GIS waves,” Ed Hiscock, Grant B. Gannon
- **Writing**
  Headline writing – commercial publications “In-tents course management,” Curt Harler

TOCA Merit Awards

- **Design**
  Cover page design – printed magazines
  Page 15 – “The sky is the limit,” Pete Seltzer
- **Photography, Video And Multimedia**
  Portrait/Personality (photo of individual or group of individuals) “Game on!,” Pete Seltzer, Matt Hawthorne
- **Writing**
  Series of columns by regular department columnist – commercial publications
  “Keeping up with the Jones,” Seth Jones
- **Writing**
  Product information article – commercial publications “What's new at GIE+Expo,” Seth Jones
- **Writing**
  Operations profile – commercial publications
  “Reverse the Course,” Chris Lewis

Gardner Award – “Best of Show”
Photography, Video and Multimedia – Publishing
“So You’re Considering the Dark Side” *Golfdom*, North Coast Media, James Bennett, Seth Jones, Pete Seltzer

The 19th Hole

Justin VanLanduit

SUPERINTENDENT // Briarwood CC, Deerfield, Ill.

After 18 holes, what's your drink of choice? If I'm in Wisconsin, a Spotted Cow, because that's the only place you can get it. Otherwise, just a nice cold beer.

How did you get into the business? I was basically dragged off my parents' front lawn into it. I grew up on a farm, across the street was a 9-hole golf course. I was mowing the lawn and the superintendent, Steve Wolf, walked across the street and said, "How would you like a summer job?" I said, "Doing what?" He said, "Doing what you're doing right now." I was in the sixth grade and started working summers making $5 an hour. A hundred dollars a week as a sixth-grader was a pretty big deal.

Tell me about your family. There are three humans and one dog — my wife, Erin, and I have been married for eight years. My daughter Rourke is 2. And we have a Weimaraner named Kaylor.

What are your sports teams? The Cubs, the Bears and the Blackhawks.

If you got to take an at-bat for the Cubs, what song would you want playing as you strolled to home plate? "Bulls on Parade" by Rage Against the Machine. I saw them at Lollapalooza a few years ago; that was the most intense live show I've ever seen.

Lollapalooza 2008. I was at that show, too, and I agree.

"I'VE GOT EIGHT GUYS ON MY STAFF WHO HAVE BEEN HERE FOR MORE THAN 30 YEARS. I'VE GOT ONE GUY — MO SANCHEZ — WHO HAS BEEN HERE 55 YEARS. IF YOU DO A GOOD JOB, (BRIARWOOD) TAKES CARE OF YOU LIKE YOU'RE FAMILY."

So, where's the best food in Chicago? If you want deep-dish Chicago-style pizza, I'd say Lou Malnati's. If you want a steak, I'd say Gene & Georgetti or Gibsons.

You recently had back surgery. I'm stunned to hear you had back problems, based on golfing with you. I've been battling my back for five years. The thing is, when I'm feeling good I can really hit the ball, but I've been using a protective swing for a while.

Is your game a result of hard work or talent? It used to be talent, now it's hard work. I played in college and used to play to a +2, now I'm a -4. I also just have to accept that a little of it is getting older, as well as muscular dystrophy.

Muscular dystrophy? Yes, I was diagnosed six years ago with facioscapulohumeral muscular dystrophy. It mostly affects the face and shoulders. For example, I struggle putting luggage in the overhead compartment. I've come to terms with it and I'm very proud that my wife and I have gotten involved in the Muscular Dystrophy Association. In two years we've raised $20,000. Now that I'm laid up with back surgery, I'm working on creating my own not-for-profit foundation.

Do you have a name for it? Yes, it's based on my nickname: The Turf Tank Foundation.

As interviewed by Seth Jones, Feb. 19, 2018.

PHOTOS BY: ABBY HART (JUSTIN), PETE SELTZER (GIBSON'S STEAK-FISH)

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