The GRASS ROOTS

AN OFFICIAL PUBLICATION OF THE WISCONSIN GOLF COURSE SUPERINTENDENTS ASSOCIATION

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The Par 3 4th Hole at North Shore Country Club, Mequon played 208 yards for the recent Wisconsin State Open.

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It is only the farmer who faithfully plants seeds in the Spring, who reaps a harvest in the Autumn.

By American Journalist and Authur B.C. Forbes, 1880-1954

This quote by Forbes can serve as a reminder our winter planning and spring preperation will lead to a succesfull season next year.

THE GRASS ROOTS

is the bi-monthly publication of the Wisconsin Golf Course Superintendents Association. No part of the *THE GRASS ROOTS* may be used without the expressed written permission of the editor.

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Front Row: Jim Van Herwynen, Jon Canavan, Josh Lepine, Jeff Barlow, Scott Anthes. Back Row: Rob Johnson, Garrett Luck, Benjamin LeBarre, Andrew Noll, Mike Bremmer, Joe Sell, Brett Grams

PRESIDENT'S MESSAGE

My Favorite Time Of Year!

By Jon Canavan, Golf & Recreation Turf Manager, Milwaukee County Department of Parks, Recreation & Culture

As we turn the page to October, the warm afternoons and chilly nights make it feel like we can take a breath and not worry as much about the golf course. On the contrary, October can be just as busy as any summer month, as we try to fit a season's worth of work into a short period of time.

I really look forward to the many projects that get pushed to the end of the season. Drainage work is one of my favorites. You can see such an immediate change to the golf course when you finally get that wet area that has been driving you crazy to dry up!

This season has been one of the hardest seasons that I have had in the past 9 years. Like everyone else, we get pushed to aerify early or late in the season. Milwaukee County Parks has 15 golf courses, so half of the courses are aerified in the spring and the other half in the fall. To please the golfers and the bean counters we usually try to have our spring aerification done by the first week of May.

On the contrary, October can be just as busy as any summer month, as we try to fit a season's worth of work into a short period of time.

Of course this spring it decided to rain every day and run about 5-10 degrees below normal. On the courses that we aerified in mid-April there were holes or "bumpy greens" until mid to late May! This led to many meeting with golfers, co-workers and elected officials explaining why we have to aerify. By the time we got to June 1st I believe I had over 15 sit down meetings to discuss the issues with the greens. I don't remember this being an issue in previous years, but now you have to constantly remind golfers and co-workers that you know what you are doing. I am convinced that other than farmers and turf managers the average person could not tell you what the weather was the previous week!

Just a reminder, we still have some events coming up this year. We've finalized our educational topics for the Golf Turf Symposium in Kohler, and you won't want to miss it. I would like to thank Milorganite and the symposium board for all their hard work in making the symposium such an effective way to gain knowledge while also enjoying a little camaraderie. You'll also want to save the date for the Couples' Outing on November 4th at the Harley-Davison Museum in Milwaukee. It will be a great way to celebrate as we wind down another season.

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Summer Fades Into Autumn

By Bruce Schweiger, Manager, O.J. Noer Turfgrass Research and Education Facility

As summer fades into autumn, turfgrass managers begin to lament how fast the summer has passed. With the beginning of football season we hear the clock ticking faster. They look over the project plans they had planned for the year and it becomes apparent even with summer there was not enough time to accomplish the entire summer project list. Summer staff is a helpful with hand watering (this year flood recovery), weed eating, bunker work and many other such tasks that can be performed by your younger staff.

With Septembers arrival the staff has been reduced to half or even less. Even with the reduced staff the course conditions need to remain constant and then aerification is added to the mix. Staff scheduling and management become even more important this time of year. Around this time of year the Early Order Programs and the presentations commence. Budget season is now upon us and whether the budget is due October 1st or later in the fall, the process is time consuming. The entire growing season is important but the September and early October days are very valuable until frequent frost days arrive. Then frost arrives and the number of hours for work on the course diminishes. With the arrival of frost the turfgrass growth will slow but mowing may not in and attempt to chase course conditions.

Then comes the next set of questions and decisions:

- When is the time to blow out the irrigation system? This call might have been made weeks ago when you reserved your compressor. Will the greens still need water? Can I trade dates with someone else to change my dates? I need to irrigate to re-charge the soil moisture before blowout in case there is little or no snow cover and high winds. How much irrigation will be needed?
- When should I spray for snow mold? Early when the weather is comfortable, a week before snowfall, or just as late as possible as the snow squall approaches. There are reams of Dr. Koch's research on this topic and they are posted on his website. With all this information there will still be much discussion about spraying for snow mold. Normally you only get one chance to get it right.
- Winter desiccation: Many years ago turf managers in Wisconsin did not discuss winter desiccation except of high spots or exposed banks. There seems to be much more discussion about greenscovers (what type to buy), disease incidence under covers (see Dr. Koch Winter Cover research projects, back to his website), spraying anti-desiccants, or turf dyes as winter applications? When do I apply products for spring poa annua seedhead control?
- Last fertilizer application? When should I apply? What product is the best? Should it be more than nitrogen? What nitrogen source should I use? Where did I file Dr. Soldat's fall fertilizer research? Can't find it? Check his website.

NOTES FROM THE NOER

By now you are getting a headache actually reading all these decisions and realizing these are just a small sampling of the number of decisions turf managers make daily. Now is the time to stop your head from spinning and slow down winter is here. Not so fast in our ever-changing industry, staying status quo means falling behind. Winter is the time to seek out those new ideas, learn new techniques and find those new technologies that can be advantageous next year.

In Wisconsin we are very fortunate to have some great education without leaving the state. In December the Wisconsin Golf Turf Symposium is held at the American Club in Kohler. January 6th the WTA hosts the Winter Turfgrass Research Day where you can hear the UW staff present their current research and other expert speakers. The Turfgrass Research Day is held at the Pyle Center on the UW-Madison campus. This is a great time to visit the Madison campus since the students are on winter break. Maybe make the trip to the Winter Turfgrass Research Day and stay overnight to watch the Badger Men's Basketball Team play Nebraska at the Kohl Center. Don't forget the GCSAA Golf Industry Show (not in Wisconsin) is a great place to see new products, talk with company reps and meet with your peers to exchange tales of successes and failures. We are also blessed with smaller one-day meetings sponsored by our great vendor network offered during the entire winter season.

Winter is the time to seek out those new ideas, learn new techniques and find those new technologies that can be advantageous next year.

You are asking yourself why am I boring your with my ramblings? As Superintendent of the O.J. Noer Research Facility I find myself thinking as a Golf Course Superintendent. The challenges turf managers face daily make them some of the best MANAGERS in the business world. To prove this to myself I shared this article with six members of private clubs in the southern Wisconsin. Their response indicted most never realized how much went into being a Golf Course Superintendent. Most never realized that Golf Course Superintendents maintain the course in the fall and accomplish aerification with a reduced staff. Their perception was after Labor Day the Superintendent was on cruise control until re-opening in April.

Why did I undertake this task when I knew the results? I did this because like you, as you read my rambling you knew the answer that you are under appreciated. My curiosity was how has social media changed the perception of the Golf Course Superintendent? All the tweets, blogs, email to club members, computerized irrigation and many other technologies have they advanced our cause. What I found is that things change very slowly! Does this mean we stop communicating? No it proves we need to continue to use new technologies and increase telling our message.

As a last thought, timing of this was perfect for me because I just finished attending the fall Agricultural Research Station meeting and I was asked that age old question: What do you do all winter? Where are you going to spend your winter now that Hurricane Irma hit Florida? Arizona? Here I am 35 years later answering the same question!!

What's Going On At The TDL

By Kurt Hockemeyer, Turfgrass Diagnostic Lab Manager, O.J. Noer Turfgrass Research and Education Facility

We are rapidly approaching the official start of fall here at the Turfgrass Diagnostic Lab. Although I think that unofficially many of us have already been in an autumnal mood for a couple weeks now. Nighttime temperatures have dropped down into the 40s and 50s which has really slowed down the amount of fungal diseases that have been coming into the lab. Dollar spot has been pretty non-existent for a while now on our research plots at the OJ Noer Research Center. Summer diseases like Pythium and brown patch are far in our rear view mirror. But the transition into fall diseases has already begun. Yellow patch, Drechslera leaf spot, and take-all patch are just a few of these fall diseases that should be on turf managers' radar. We will be initiating another take-all patch trial on a golf course fairway that consistently receives heavy take-all patch pressure every year (Figure 1). Symptoms are showing themselves right now, but fungicide applications should not be applied until soil temps reach 60-65 F on a consistent basis.

In one of my *The Grass Roots* articles earlier this year I talked about the many problems facing turf managers when trying to control these root diseases. The temporal separation between active infection and symptom development is one of the many problems. Preventative fungicide applications will be needed if consistent infection is a problem. We will be making two fall fungicide applications and two spring fungicide applications for take-all patch control in our study.

Snow mold trials have already been initiated at some of our northern sites. It may seem very early (it is still very early) but the purpose of the study we've already initiated is to determine the optimum timing for fungicide applications. Putting out these very early fungicide applications typically results in poor snow mold control and this data will help us in our analysis. This in turn helps turf managers to avoid making fungicide applications too early. Just because our applications don't control snow mold, it doesn't mean that we can't learn from it. A negative result is still a result and goes through the scientific process and we learn from it.

Dr. Koch has been giving some snow "mould" talks in Canada and I think this has fired him up for snow mold season a bit earlier than normal. Hopefully our trials will get decent disease pressure and we can have an informative snow mold field day next spring. But in the meantime I will be focusing on getting all the trials initiated and fungicides applied on time.

TDL
TURFGRASS DIAGNOSTIC LAB

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Figure 1. Take-all symptoms will reveal themselves after damage to the roots have already been done. Fungicide applications can be made in the fall and spring when the fungus is active. Photo courtesy of Dr. Paul Koch.

Figure 2. Snow mold trials have already been initiated and will be ongoing into December. The purpose of this study is to help determine the best time to apply snow mold fungicides in the fall.

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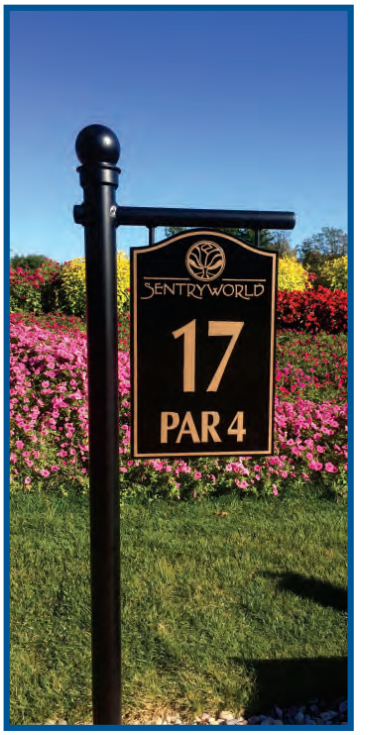

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MEMBER SPOTLIGHT

Kathryn Lifke and Mike Upthegrove

By Josh Lepine, Certified Golf Course Superintendent, Maple Bluff Country Club &
Ben Labarre, Golf Course Superintendent, The Legend at Bristlecone

Author Note: Thank you to everyone who participated in the Membership survey. The information and feedback obtained was invaluable. The requests for more member spotlight stories inspired me to start this column. I hope to randomly highlight a few members each edition from all geographic areas, facility types and membership classifications. It may take me 20 years to get to everyone in the directory but please be ready for that phone to ring and be prepared to share stories, photos and information about YOU!

Name: **Kathryn Lifke**
Company Position: **Assistant Golf Course Superintendent, Trappers Turn Golf Club, Wisconsin Dells**
Years as WGCSA Member: **9**
Membership Classification: **C**

18 Holes With Kathryn Lifke

1. **How did you get started in the turfgrass industry?** Believe it or not, I had no interest in golf whatsoever when entering college. I was in my 3rd year at UW Madison pursuing a degree in Landscape Architecture when I found myself bored with the career path that I had chosen. I decided to double major and add Horticulture to my education just as something to possibly fall back on. Then, one day during my "Intro to Hort" class, John Stier came in and gave a guest lecture on Turfgrass,. He talked about Sea Shore Paspalum and how golf courses could irrigate it with ocean water.

That right there was mind blowing to me and I researched it and came across an article about building and maintaining sustainable golf courses. I loved the idea of sustainability in the golf industry because golf had a bad image when it came to the environment. So the idea of being a golf course architect that focused on building sustainable courses was the new career path. However, after finding out that the industry was very competitive and few golf courses were being built, I had a set back.

I met with Professor Stier and discussed my situation. He then asked me if I ever considered "Turfgrass Management" and I looked at him stupid and said, "People go to school for that"? He explained to me what the profession entailed and I fell in love with it. He encouraged me to set up an internship for that summer and to focus on a career niche; which for me was promoting and practicing sustainability in the golf course industry. I did an independent study on golf course sustainability and the Audubon Cooperative Sanctuary Program for Golf that spring and enrolled in the Turf program in fall.

2. What is the most rewarding part of your career? Visual satisfaction, whether it be taking a step back to enjoy the fruits of your hard work and watching others enjoy and admire what you did or the simple things many take for granted such as sunrises/sunsets and wildlife emerging from every corner of the property throughout the day.

3. What would you consider to be your greatest career challenge? I am absolutely HORRIBLE at finding a healthy work-life balance. I want to be successful in my career therefore I dedicate a lot of my time towards work because I believe if I put in the time, it will help me reach my career goals.

4. Which three adjectives describes you the best? Driven, Meticulous & Passionate

5. Tell us about your family. As I advance through my 30's, I have come to the realization that having a family of my own just isn't in the cards for me. So, I guess I will just accept what I have now which are my supportive parents Mark & Eileen, 2 brothers; Matt & Greg and a sister-in-law; Amanda.

6. Any pets? I have 2 dogs who are my world. Braunson is an 8 year old lab/pit bull mix that I adopted from the Dane County Human Society & Evelyn who is a 9 year old lab/pit bull mix that I rescued from a high kill shelter down south.

7. What drives/motivates you every day? The desire to succeed in this industry. I'm passionate about golf course sustainability and promoting the positive impacts that golf course's can provide to the environment. If I can make an impact around environmental sustainability just here in Wisconsin, I will die a happy woman.

8. Who Would You Admire? Unbeknownst to him, Zach Reineking has been my role model since day one of entering this industry. While interning for Zach, I not only learned how to grow and manage grass but also how to manage people. Zach has always been fair, appreciative and patient with employees and is a great leader who is well respected.

9. Who is the person in history you'd most like to meet? Jesus

10. What's a fun fact that people don't know about you? I'm the original "Martha Stewart" when it comes to baking cupcakes and cakes. The lady has nothing on me!
11. What do you do in your spare time, favorite hobbies? My hobbies include hunting, fishing and snowmobiling.
12. If you could go anywhere in the world on vacation, where would you go? New Zealand
13. What is the one thing you would like to learn/accomplish someday? I would like to become a Certified Golf Course Superintendent
14. What is your favorite turf management related tool or technique? If you follow me on Twitter or Facebook you would know that I have the pleasure of playing around with an irrigation system from hell (electrical wise). So my favorite tool would be my multimeter to help me trouble shoot.
15. Favorites:
TV Show: Game of Thrones
Movie: The Fault In Our Stars
Food: Ahi Tuna
Sports Teams: Packers and Badgers
16. Do you golf? Handicap? Best shot or golf story? I do golf, but not as much as I probably should. The best shot that I've ever had was a 244 yard drive from the tee that landed on the approach on the 17th hole at Wild Rock Golf Club.
17. Top Bucket List Item? Visit Bandon Dunes.
18. If you could provide one piece of professional advice, what would it be? Always treat your employees as assets and not just a number because at the end of the day, they are the ones contributing to your career success.

Top: Kate with her parents Mark and Eileen

Bottom: Golfing at Wild Rock Golf Club with some members from Trappers Turn.

MEMBER SPOTLIGHT

Top: Rolling the 9th green at the 117th U.S. Open at Erin Hills

Right: My Fur-Children Braunson and Evelyn; the protectors of the Trappers Turn maintenance fortress.

WGCSA MISSION STATEMENT

The Wisconsin Golf Course Superintendents Association is committed to serve each member by promoting the profession and enhancing the growth of the game of golf through education, communication and research.

WGCSA VISION STATEMENT

The Wisconsin Golf Course Superintendents Association is dedicated to increase the value provided to its members and to the profession by:

- Enhancing the professionalism of its members by strengthening our role as a leading golf organization in the state.
- Growing and recognizing the benefits of a diverse membership throughout Wisconsin.
- Educating and promoting our members as leaders in environmental stewardship.
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MEMBER SPOTLIGHT

Author Note: Thank you to everyone who participated in the Membership survey. The information and feedback obtained was invaluable. The requests for more member spotlight stories inspired me to start this column. I hope to randomly highlight a few members each edition from all geographic areas, facility types and membership classifications. It may take me 20 years to get to everyone in the directory but please be ready for that phone to ring and be prepared to share stories, photos and information about YOU!

Name: **Mike Upthegrove**
Company Position: S**ales Reresentative for DHD Turf and Tree Products**
Years as WGCSA Member:**15**
Membership Classification: **Affiliate**

18 holes with Mike Upthegrove

1. **How did you get started in the turfgrass industry?** My Dad and some other men from the town we lived in decided our town needed a golf course. So they found some land and got an architecht to design an 18 hole layout, hired a Superintendent to guide them through the construction process and Bird Creek Golf Course was created. My dad and the other gentlemen sold 250 shares at $2000 each. That money bought all the materials for the construction of the golf course. The construction crew consisted of all volunteers pulled from the pool of shareholders, this included the heavy equipment operators. At 13 years of age I had the title of rock picker and gopher(you know "go for this and go for that"). After 3 years a beautiful 18 hole course had been created and I was hooked into the golf business.

2. What is the most rewarding part of your career? When I was a Superintendent it was directly following prep for a big tournament, the satisfaction that you get when your course is pimped out to the max, every blade of grass is perfect, the greens are fast, firm and true and you know that you've created a true test for even the best golfers.

3. What would you consider to be your greatest career challenge? Balancing work life with family life. It is easy to get sucked in to being at the course 24/7. In fact I would say that it's easier to blame not being home to help with kids etc on the necessity to be at work. In many cases it may be true but I know there were times when I choose to be there instead of home. So finding that balance between the two was and still is my greatest career challenge.

4. Which three adjectives describes you the best? Honest, hardworking, fun

5. Tell us about your family. I have my wife Jen, we've been married for 17 years and two daughters Grace, age 11, and Ruby, age 7.

6. Any pets? I just had to put down my dog, Isabelle, she was 16 years old. I have not convinced my wife that we need another dog yet…

7. What drives/motivates you every day? I'm really not sure… fear of failure??? Funding my obsession to hunt animals in far away places… helping superintendents solve problems on their courses… probably a combination of all three

8. Who Would You Admire? My Wife, Jen, and my Dad. My wife because she provides the lions share for our family and then comes home and puts her time in with her daughters. She is the nicest person I know. If you know me and my wife you have probably heard me say this, "I utilize my wife to judge new people I meet…if you can't get along with her then there is something wrong with you."

My Dad served in Vietnam in 1969-70. He flew huey gunships for the Marines stationed near the demilitarized zone he received 2 distinguished flying crosses a bronze star and a silver star. The flying cross is the highest medal awarded to a pilot except for the congressional medal of honor. He discusses his time with me there often, mostly the good memories but sometimes the bad ones too. He was a baseball coach, vice president of the family company, taught math and shop class for 20 years and still marches twice a year wearing his dress blues and whites for memorial day and 4th of July. To me the epitomy of american hero.

9. Who is the person in history you'd most like to meet? Fred Bear, he was the original!

Mike and his nice bird.

MEMBER SPOTLIGHT

10. What's a fun fact that people don't know about you? 1)I was born in Esfahan, Iran. 2)I have a Culinary Arts degree.

11. What do you do in your spare time, favorite hobbies? Hunting, fishing and golfing. In that order.

12. If you could go anywhere in the world on vacation, where would you go? Iran, if I could. Unfortunately this may never happen for me. The current and former government in Iran requires 2 years of service from all Iranians. While I am not Iranian my birth certificate and passport list Esfahan as my place of birth and well lets just say that could make things difficult.

13. What is the one thing you would like to learn/accomplish someday? I want to see my Girls graduate from College.

14. What is your favorite turf management related tool or technique? Toro Pro Core Aerifier…it's a game changer

15. Favorites:

TV Show: Game of Thrones

Movie: Scareface or Goodfellas.... something about living outside the law that is intriguing.

Food: Brioche toast points with pan seared Foie gras

Sports Teams: Lions, Tigers, Red Wings, Pistons, Spartans, Badgers, Brewers

16. Do you golf? Handicap? Best shot or golf story? I do golf, I'm an 18 handicap. My best golf shot was an ace that I shot while playing with my Dad in his member guest.

17. Top Bucket List Item? A 2 month hunting and fishing trip through Africa, Europe, and Asia culminating in a harvest of Marco Polo the largest sheep species in the world.

18. If you could provide one piece of professional advice, what would it be? Never leave good fishing for the possibility of better fishing somewhere else.

Above: Jen with a big catch.

Above Right: Jen and Mike with Grace and Ruby serving as flower girls this past summer.

LAUGHTER ON THE LINKS

After slicing his tee shot into the woods, a golfer heads off in search of his ball, which he finds behind a large tree. After considering his position -- and not wanting to take a drop and lose a stroke -- he decides to hook the ball around the tree. He swings, the ball hits the tree, ricochets back at him, and instantly kills him.

When he opens his eyes, he sees the Pearly Gates and St. Peter standing before him.

"Am I dead?" he asks.

"Yes, my son," replies St. Peter, who looks the man over and notices his clubs.

"I see you're a golfer," St. Peter says. "Are you any good?" "Hey, I got here in two, didn't I?"

Annual WGCSA/NGL Member- Guest Meeting Eclipses the Eclipse!

By Brett Grams Chapter Manager, WGCSA

Where were you for the August 21st, 2017 Great Solar Eclipse? If you were one of the 86 attendees of our August meeting you will surely remember you were playing golf on the beautiful and Green Bay CC. We had a great weather, great attendance, and a great golf course to play our annual Joint Meeting with our colleagues and guests from the NGLGCSA. Even if the Solar Eclipse was not as evident here as the hype that I was hearing, it was still neat to be outside and to see.

The day began with a presentation on Smart Spray Technology by Mr. Ken Rost of Frost, Inc. My duties at the registration table kept me from attending the presentation but Garrett Luck and Michael Bremmer were able to attend.

They reported that Ken started the meeting by providing the historical development of GPS technology in agriculture and its adaptation to specialized sprayers for turfgrass. He compared and contrasted the accuracy of the different types of GPS technologies that are available and the cost associated with each. The key to making a sprayer smart is combining the use of GPS technology with individual nozzle control. This provides the end user with multiple benefits. At the top of the list was of product savings, which Ken provided as a conservative 8-14% annually. Additional benefits include increased productivity through increased ground speed, more accurate sprays, less drift, extremely accurate record keeping, and greater confidence. He also pointed out that older sprayers can be retrofitted with this technology. Ken finished his presentation by highlighting what is coming down the road with prescription mapping and variable rate application based on the needs of any particular area. Without a doubt we will be seeing more and more turf grass professionals adapt this technology to their operation.

After the education session a great lunch was served prior to the shotgun start of the Two Man Best Ball format golf outing. Green Bay CC proved to be a great test for all our players. GBCC is one of the newer Country Clubs in WI having been established 22 years ago in 1995. The course is a Dick Nugent design and incorporates good use of the natural terrain and elevations.

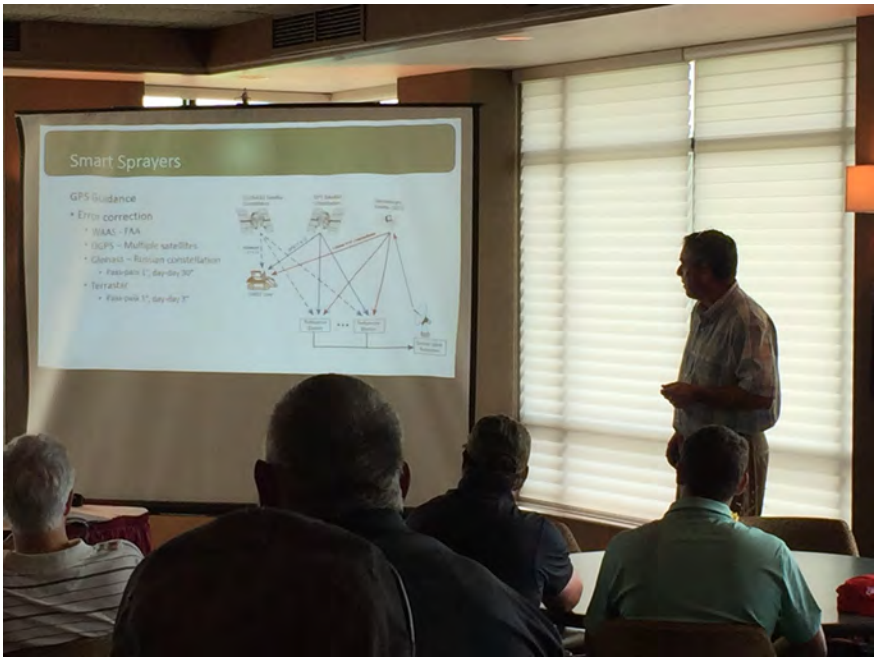
It has been well known as a premier facility and course since its opening, and the course continues to be the showcase of the club. WGCSA member Mr. Ben Larsen in his third year as the Golf Course Superintendent, and was a gracious host allowing us to see and play the expertly groomed course and surrounds. Helping Ben with the operations are his Assistant Superintendents Paul Schlag and Nicholas Bannach who are also Class C members of the WGCSA. Green Bay CC has been the most recent WI golf course to become a Certified Audubon Sanctuary Facility in October of last year.

The golf course proved to be a good test for the field. The Gross Division winners were Scott Anthes and Tim Bressers, taking second was Paul and Pat Bastron, and Todd Marten and Brent Johnson came in third. The Net division saw the team of Scott Bushman and Casey Kopf come in first, Brandon Nebl and Jim VanHerwynen taking second and third place going to Scott Allsup and Dennis Kominski.

Closest to Pin winners were Evan Belland #4, and Peter Meyer #13. Long Drive prizes went to Matt Kinnard #6, and Andy Esten #15. Longest Putts of the day went to Aaron Goninen #9 and Jeff Barlow #18.

Special thanks to Ben, Paul, and Nicholas for the preparation and time made for hosting our meeting. Mr. Tim Bauman, PGA Professional and Director of Golf and his staff handled the event and scoring and were great to work with. Ms. Molly Krueger and staff provide a great lunch and reception as well.

Thanks to all were able to make the time to attend this last WGCSA event of the 2017 season!



Ken Roast of Frost Inc discussing Smart Spray Technology.

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Scott Anthes and Tim Bressers were the Champions in the Gross Division of the 2 Person Best Ball

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Views of the course from the clubhouse deck during the time of the maximum solar eclipse. Birds seemed to go quiet but golf played along as normal.

The top photo is of 1 tees with 9 green and fairway in the background.

The lower photo is of the first hole on the right and the 18th hole coming on the left.

White Grubs Abound!

By Dr. R. Chris Williamson. Department of Entomology, University of Wisconsin – Madison

The 2017 growing season shaped-up to be an ideal (optimal) year for white grubs, especially coupled with the conducive moisture levels in the fall of 2016. Much of Wisconsin experienced a relatively cool and moist spring, followed by relatively consistent rainfall events throughout the summer. These conditions are idea for most white grub species including Japanese beetle, European chafer, May/June beetle and Black Turfgrass Ataenius to name a few. And, now heading into fall, many parts of Wisconsin are relatively dry. Consequently, symptoms (feeding damage) of white grub damage is occurring quite frequently, even in turf areas that was not irrigated due to adequate/sufficient soil moisture when the eggs were laid.

If you chose not to or were unable to make a preventative white grub insecticide application, you have likely experienced grub-feeding damage to your turf. Unfortunately, white grubs are much more difficult to control curatively (older, larger grubs) than preventatively! By the time this article is published, it will be far too late to take action this year.

Therefore, you should focus your attention to next spring when soil temperatures reach 50°F. Begin sampling and monitoring for white grubs in the spring, simply pull-back the turf and look for grubs where you suspect they may be. If present, you will need to make an executive decision whether to make an insecticide application to control the white grubs. Keep in mind, white grubs are most difficult to control when they are larger (older). Unfortunately, grubs are largest in the late-fall and spring.

With high grub populations the turf will pull back easily due to the root damage from feeding. The root loss is the reason skunks and other varmits can do a lot of damage in one night looking for a snack.

There are a few options for treating white grubs curatively with an insecticide, they are limited to the following: 1) clothianidin (Arena); 2) clothianidin + bifenthrin (Aloft); 3) carbaryl (Sevin); 4) carbaryl + bifenthrin (Duocide) or 5) trichlorfon (Dylox). Even under the "best or optimal" conditions, these aforementioned insecticides will likely provide up to about 75-80% control. Therefore, consider a preventative insecticide application from late-May to late-July/early-August for the next generation of white grubs (next year), especially if you have a history of white grub problems. Preventative insecticides typically provide measurably higher control (> 90%) compared to curative or rescue insecticide treatments previously mentioned. Several preventative insecticides are available, they include: 1) chlorantraniliprole (Aceylepryn); 2) clothianidin (Arena); clothianidin + bifenthrin (Aloft); 3) dinotefuran (Safari or Zylam); 4) imidacloprid (Merit and various other post-patent products); and 5) thiamethoxam (Meridian). Regardless of the product, timing or approach (curative or preventative), ALL white grub control products (insecticides) MUST be watered or irrigated-in with an appropriate amount (about 0.15 – 0.25 inches) of post-treatment irrigation in order for the insecticide to reach the target and provide maximum efficacy (control).

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The Economics of Golf Course Maintenance

By Robert Vavrek, USGA Green Section, Central Region Director and
David Oatis, USGA Green Section, Northeast Region Director

Golf course maintenance programs must innovate to adjust to changing demographics and economic conditions.

The economic recession that started nearly 10 years ago has had a significant impact on the golf industry, one that is still being felt today. A few golf facilities have prospered since that difficult time, but far more have struggled, some closing their doors while numerous others changed hands or significantly altered their business model. These effects are not surprising, given the challenges created by an oversupply of golf courses that is partially the product of the aging golfer demographic and declining participation rates among younger generations. Furthermore, extended periods of severe drought have increased the price of water and limited its availability for golf courses.

When the recession hit, golf course superintendents faced the familiar challenge of trying to do more with less. Out of necessity, maintenance budgets were frozen or cut at many golf courses while the cost of many inputs — e.g., plant protectants, water, equipment — continued to rise. The maintenance budgets at some courses still remain lower today than they were 8-10 years ago, testimony to the long-term effects that changes in demographics and the economy have had on golf.

Golf course superintendents are accustomed to budget cuts. Recent rounds of belt tightening, however, were accompanied by pressure to reduce costs and course closures by avoiding disruptive maintenance practices.

Convenient changes to maintenance practices, such as skipping or rescheduling aeration and topdressing, took precedence over more sensible ways to reduce costs, such as reducing the intensity of bunker maintenance or scaling back unnecessary landscaping. Golf facilities also wanted to achieve budget cuts without a noticeable change in course conditioning. Unfortunately, cutbacks were noticed by golfers at many facilities.

When it comes to cutting costs, there is a big difference between eliminating needless amenities and compromising essential agronomic programs. The good news is that the recession caused golf facilities to re-evaluate maintenance practices, presentation options, and course amenities.

Many golf courses were forced to differentiate between essential and nonessential maintenance programs so they could focus on what matters most. Surprisingly, some cost-saving changes had positive effects on playability and aesthetics. Numerous strategies have recently been utilized to reduce golf course maintenance costs; a brief review of the more common strategies and their overall impacts follows.

Limiting ornamental plantings and utilizing perennial plants instead of annuals can reduce maintenance costs.

LABOR

Not surprisingly, reducing staff size is a very common cost-cutting strategy because labor often represents between 50 and 60 percent of a typical golf course maintenance budget. However, reducing the number of staff, particularly when experienced and motivated employees are lost, can have very negative consequences.

Golf course maintenance work is demanding and the labor market is very competitive. Recruiting and retaining reliable maintenance staff is currently one of the biggest challenges at golf facilities across the country.

Additionally, there are many hidden costs associated with hiring and training new maintenance employees. It often takes several weeks to train a motivated individual to perform multiple maintenance tasks with a consistent level of competency. However, it may take several years for new employees to become as efficient as experienced staff. Eliminating experienced, dependable, and highly skilled staff that are paid more than new hires can save money in the short term, but replacing them with new employees to reduce payroll expenses often results in more mistakes, reduced efficiency, and generally more wear and tear on turf and equipment.

A well-trained labor force is an extremely valuable asset. If labor costs must be cut, a better option may be to reduce the number of less-experienced staff. This approach may save less money than eliminating experienced staff positions, but it is also likely to minimize the disruption to overall productivity and result in fewer costly mistakes. Staff with less experience are more likely to be assigned tasks that require less skill, so their loss may have a smaller impact on playing conditions than the loss of a higher-paid, experienced staff member. Reducing the number of inexperienced staff makes especially good sense if the number of tasks requiring less skill — e.g., weeding landscape areas and filling ball washers or divot boxes — can also be reduced.

Reducing staff size can also be an effective way to reduce costs if highly efficient maintenance equipment is available to offset the lost labor. However, turfgrass health, playability demands, and the design of the course must allow for the use of such equipment.

FERTILIZER AND PLANT PROTECTANTS

Carefully analyzing fertilizer costs can reveal some significant opportunities to save money, even though fertilizer does not represent a major percentage of a typical golf course maintenance budget. Savings can add up if expensive, highly specialized plant nutrient products can be replaced with more cost-effective products — e.g., urea and ammonium sulfate. The USGA article "Does the Grass Know the Cost?" explains the subject in greater detail. A fertilizer calculator can be useful for determining the amount of savings that can be realized by switching products.

Many courses have adjusted fertility, pest control, wetting agent, and plant growth regulator (PGR) programs in an effort to cut costs. However, overzealous reductions to these programs are a double-edged sword. For example, timely applications of wetting agents can reduce the need for labor-intensive hand watering. Abandoning preventive insect- or disease-control programs can yield initial savings, but the cost of controlling major pest outbreaks can far exceed the cost of preventing the problems from occurring.

It also is important to recognize that the impacts associated with cutbacks in fertility and plant protectant programs do not always have immediate consequences. For instance, a course may have low weed pressure because it properly fertilized and judiciously used herbicides to control weeds for several years. In this situation, skipping preemergence weed control for a year may result in some savings and little weed encroachment. However, cutting preemergence weed control and reducing fertility for several consecutive years may lead to a steady increase of weed encroachment. Once weeds become established, aggressive control programs that rely on expensive herbicides and higher application rates may become necessary to reduce weed pressure and restore turf density. In such cases, short-term savings can lead to greater expense in the long run.

Fertilizer, plant protectants, and other applications are areas where money can sometimes be saved, but it is important to maintain turfgrass health and adequate wear recovery. Otherwise, the benefits of short-term savings may be outweighed by longterm problems and increased future costs.

CAPITAL EXPENDITURES

A common approach to save money during the recession was to suspend capital expenditures for course improvements, replacing turf maintenance equipment, and upgrading infrastructure such as irrigation systems and maintenance facilities. In the short term, this tactic was reasonable and successful.

On the other hand, courses with available capital during the recent economic downturn were able to negotiate better prices for irrigation systems and course improvement projects. Despite rising costs associated with daily maintenance, golf course contractors were hungry for business.

Some courses maintain ornamental plantings but inadequately invest in fertility, weed control, and other programs that directly benefit playability.

Some courses obtained terrific deals on capital expenditures during the worst of the recession.

Unfortunately, many courses simply did not have enough liquid capital to take advantage of the reduced pricing offered by golf course contractors. Many facilities now are exposed to high costs caused by failure to replace old equipment or upgrade inadequate facilities, including higher equipment repair costs, reduced efficiency, increased labor requirements, playability issues, and many others. Failing to invest in improvements and upgrades may also affect how golfers perceive a facility. Golf is a competitive business, and golfers are more likely to play at golf courses that demonstrate a commitment to quality by making improvements.

Finally, courses that are unable or unwilling to invest in replacing equipment will eventually get to a point where a major influx of capital will be needed to get their equipment fleet to a stable, efficient position.

FAIRWAYS

During the recession, many courses streamlined fairway mowing operations by simply switching from striped mowing patterns to the classic half-and-half pattern. This pattern reduces mowing time and reduces labor, fuel consumption, and equipment wear. Many also feel that the more traditional appearance of the classic cut pattern is an improvement over complex stripe patterns.

Fairway mowing frequency was also reduced at many courses in an effort to cut costs. Often, this was achieved with the help of PGR programs. Reduced mowing frequency has had minimal impact on turf quality and the playability of fairways at most courses. Furthermore, a shift to mowing fairways two or three times per week versus three to five times per week reduces labor and fuel consumption while extending the life of equipment.

Clipping removal is another important consideration. There are agronomic, playability, and aesthetic reasons to collect and remove grass clippings, but the costs associated with doing so have spurred many courses to forgo collecting clippings in favor of dispersing them. Using PGRs to reduce clipping yield and blowing or dragging excess clippings to disperse them when necessary can prevent playability or aesthetics from deteriorating. The nitrogen released as clippings decompose can also help reduce fertilizer budgets.

Striped mowing patterns are less efficient than the classic half-and-half mowing pattern in terms of labor, fuel consumption, and equipment wear.

PUTTING GREENS

Putting greens are the most frequently mowed area of golf courses, and the associated costs are significant. Mower technology has improved to the point where triplex units can produce a quality of cut equivalent to that of walk-behind mowers. The labor savings can be considerable because a single operator with a triplex can accomplish the same amount of work as several employees operating walk-behind mowers.

While the initial investment in equipment is high, making the switch to using triplex mowers on putting greens can generate long-term savings in labor. Unfortunately, course design makes it challenging for some facilities to utilize this strategy. Other courses sporadically use triplex mowers to reduce costs.

Reducing the mowing frequency of putting greens while increasing the frequency at which they are rolled can generate the same or better playability with fewer inputs. Additionally, some courses have found that outfitting a putting green mower with 14- or 15- bladed reels or adjusting its clip rate can eliminate the need to double cut.

Understandably, some courses cut back or altered the timing of aeration programs in an effort to minimize golfer disruption and reduce costs during the recession. This strategy achieved mixed results. In situations where organic matter levels are optimal, a slight reduction in core aeration can be tolerated if an effective topdressing program is in place. Conversely, even with a very aggressive aeration program, significantly reducing the topdressing amount or frequency is likely to cause problems. Ultimately, cutting back on putting green aeration and topdressing programs is rarely a good strategy to reduce maintenance spending.

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BUNKERS

With fewer funds available to pay for labor, bunker maintenance changed at most golf courses during the recent economic recession. A common change was to reduce the frequency of bunker raking so that bunkers were completely raked only once or twice per week. On the remaining days, only those bunkers that had been disturbed were raked. Labor-saving raking techniques also became more common. Mechanical bunker rakes experienced a resurgence in popularity, though their use can be limited by bunker design and construction method. Courses that have bunkers with steep faces, irregular shapes, and certain types of liners may find that mechanical bunker rakes do not work well.

The "Aussie method" of bunker raking also gained popularity. Courses that use this approach rake the floors of bunkers by hand or with a mechanical bunker rake. The bunker faces are then groomed by hand with the smooth side of a rake, a paint roller, or a squeegee. This raking technique leaves the sand on bunker faces firm and requires less labor than hand raking entire bunkers. The USGA case study "Bunker Raking to Reduce Labor and Washouts" describes the "Aussie method" in more detail.

Many facilities also took a hard look at the design and number of bunkers on their golf course. A growing trend has been to decrease the size of bunkers and remove those that rarely come into play. Bunker reduction has the potential to provide significant long-term cost savings since the cost of maintaining bunkers is high. Some courses also are making their bunkers more maintenance friendly by softening slopes in and around bunkers and improving drainage to reduce washouts. The USGA article "Bunkers: Can Your Golf Course Afford Them?" discusses many of these issues in great detail.

Moss on a putting green may be the result of scaling back aeration and topdressing programs combined with failing to remove trees that block sunlight.

Although golfers still want bunkers to be well maintained, there seems to be an understanding that bunkers are hazards and their maintenance can be taken down a notch in the interest of significant cost savings.

Bunkers are expensive to build and maintain, leading many courses to reduce the number and size of bunkers to save money.

ROUGHS

Roughs represent the largest area of maintained turf at most golf courses. Even though they usually are not maintained intensively, the mowing and equipment costs associated with roughs add up because of their large size. The cost of maintaining rough areas may be much higher in arid regions where rough requires irrigation and water costs are high. Out of necessity, many courses in the Southwest removed maintained rough in peripheral areas to cut down on water usage and save money.

For years, golf courses have also replaced mown rough with naturalized or unmown rough. The visual and strategic impacts of naturalized roughs can be dramatic, and reducing mowing can generate significant cost savings. However, savings can quickly evaporate if golfers insist on maintaining pristine, thin, wispy, and weed-free conditions in unmown roughs. Achieving such conditions requires extensive inputs; hence, the savings associated with naturalized roughs vary greatly. The savings can be significant, negligible, or nonexistent depending on the level of maintenance desired by golfers.

The pressure to reduce maintenance costs also prompted golf courses to re-evaluate whether the expense of maintaining dew paths and intermediate roughs is worthwhile. Maintaining dew paths and intermediate roughs adds labor costs and requires dedicated and expensive equipment. Furthermore, few courses maintain primary roughs at a high enough mowing height to justify having intermediate rough, so the playability benefit is negligible.

Intermediate rough also can be challenging to maintain, and many golf courses produce excellent playability and aesthetics without the burden of intermediate rough. The USGA article "A Waste of Time and Money" explains this issue in greater detail.

The weeds you see this summer may be a result of cost-cutting decisions made during previous years, such as reducing fertilizer or weed-control applications.

TREES

Many golfers enjoy the presence of trees on a golf course, but trees also increase maintenance costs. Although the cost of planting a tree is a one-time expense that is easy to compute, few golf courses fully consider the longterm economic impact of trees. A tree may live for 100 years or more, and a considerable amount of labor is required each year for trimming turf around tree trunks, removing debris, pruning branches and roots, controlling pests, and ultimately removing a damaged or dead tree. Trees can also make it more difficult and expensive to maintain healthy and wear-tolerant turf, which affects golfer satisfaction in addition to the budget.

Tree removal is expensive, but so are the hidden costs of maintaining trees. Tree maintenance may be worthwhile when trees provide tangible, clearly defined benefits to a golf course, but it is difficult to justify years of increased expenses for poor-quality or poorly located trees. Few courses undertake tree removal just to reduce expenses, but many have removed trees to realize substantial improvements in turf performance and notable reductions in expenses.

NEW TECHNOLOGY AND DATA-DRIVEN DECISIONS

GPS-guided sprayers can help reduce the amount of product applied to a golf course by 15 to 20 percent, resulting in obvious financial savings. Moreover, the improved application accuracy also ensures better product efficacy by greatly improving the uniformity and precision of each application. The startup costs are steep, but the savings can make an investment in GPS-guided equipment worthwhile, especially considering the value of improved applications.

Robotic mowing equipment also has the potential to reduce labor costs. The benefits of this technology are just beginning to be evaluated on golf courses. Unfortunately, like GPS-guided application equipment, the entry costs for adopting robotic mowing equipment are high. The USGA article "Advancing Golf Course Maintenance Equipment with Positioning Technology" discusses many of the factors associated with some of these new technologies.

Course accessories are nonessential amenities that divert time and money away from programs that directly help maintain quality playing conditions.

The USGA is currently developing and testing a web-based product called USGA Resource Management.

It will help golf facilities better understand and measure how resources are allocated to different playing surfaces. Using site-specific information, the cost of maintaining each putting green, tee, bunker, fairway, and rough area can be estimated using interactive mapping technology. Facilities can also use USGA Resource Management to model alternative maintenance strategies and design changes to understand their potential financial impacts.

SUMMARY

Golf course superintendents are an innovative group. The economic pressure on golf course maintenance programs has stimulated even further innovation. It also has prompted many golf courses to evaluate which programs are essential and which they could do without. Golf facilities have no choice but to adjust to changing demographics and economic conditions, taking necessary steps to remain viable in a volatile environment. Golf is a challenging business, and most courses are constantly evaluating options to reduce inputs without negatively impacting the golf experience.

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Quantifying the Impact of Soil Type and Moisture Content on Soil Compaction by Golf Carts – A Research Update

By Dr. Doug Soldat, Department of Soil Science, University of Wisconsin – Madison

Golf carts represent a major source of revenue for golf courses and many golfers in the US will only play golf when carts are allowed for use. Therefore there is a strong desire by owners to open the course to golf cart traffic as soon as possible following a rain event. Golf course superintendents are often making difficult decisions that balance soil compaction with revenue and customer satisfaction, among other considerations. In addition, the precise impact of cart traffic on soil properties has not been well studied. There is a need to develop data that demonstrates the impact of golf cart traffic on a variety of soil types under a variety of moisture levels.

I suspect that the majority of cart decisions are made based on rutting. Water is a non-compressible fluid, and when a vehicle drives over a saturated soil, the wheels push the soil underneath them down which causes the soil on the edges of the wheel to move up. Ruts interfere with play and are costly to fix. But we should also care about soil compaction when the soil is wet, but dry enough where rutting isn't happening. Could a soil moisture probe be used to guide decisions on when to send carts out? If so, I think that could eliminate some of the friction between the clubhouse and maintenance facility staff.

Could a soil moisture probe be used to guide decisions on when to send carts out? If so, I think that could eliminate some of the friction between the clubhouse and maintenance facility staff.

When I began to search the literature about what we currently know about how soil properties affect compaction, I found that the folks that build roads and walls have something to teach us. Building on an unstable surface is unwise, so the subsoils beneath structures are compacted. Civil engineers use the Proctor Density Test to determine the water content that results in the maximum soil compaction. I wondered if the Proctor Density Test could be extremely valuable for turfgrass managers to better understand when their soils are at maximum risk for compaction.

The laboratory portion of the work included gathering a range of soils from golf courses around the US that varied in organic matter content and sand, silt, and clay percentage. We were provided samples from our esteemed and tireless Grass Roots Editor at Rolling Meadows Golf Course, from Mike Bremmer at the Wisconsin Club, the O.J. Noer Facility (of course), and even from places I recently visited in Iowa and North Carolina. The work was carried out by Kyle Kazmierczak, a UW-Madison undergraduate whose father, Dave, is a golf course superintendent in Minnesota who recently served as the MGCSA President and provided us a sample from his course (Prestwick Golf Club in Woodbury, MN).

We then created a range of moisture using the various soils and subjected them to the Proctor Density Test. The test is conceptually simple, but some specialized equipment and a bit of skill is required to execute it. But generally the test works by dropping a heavy weight repeatedly on a soil of known moisture content and then measuring the resulting compaction caused by the weight.

Our soils covered a broad range in texture, from clay at Rolling Meadows, to the fine sandy loam from North Carolina, and the silt loams of Milwaukee and Madison **(Table 1).** Most of our soils had relatively high organic matter content as well. The water contents where the soils were most susceptible to compaction were lower than I had expected. For most of the soils, maximum compactability occurred in the upper 20's of moisture content. From my experience, this is well within the normal operating range for fairways. It would be impractical to restrict carts based on these Proctor Density test results. However, it does serve as a reminder that your soil is likely highly subject to compaction by golf carts and maintenance vehicles for the large majority of the year. Managing that compaction remains as important as ever.

I have not yet given up on the ideal of finding a metric that can be used to determine when carts traffic should be restricted. We have ran some tests recently at the O.J. Noer Facility using a golf cart from University Ridge on a silt loam soil that had moisture in the range where cart traffic use would be questionable. We are still in the process of analyzing the soil samples and other data we collected from that trial. I assure you that we will continue working on this problem in 2018 and will provide an update in a subsequent Grass Roots edition. Finally, I would like to thank the Wisconsin Golf Course Superintendents Association for funding this work and to all those that have contributed soils or other resources for it.

Soil	Sand (%)	Clay (%)	Organic Matter (%)	Water Content for Maximum Compaction (% by volume)
Wisconsin Club Silt Loam	22	20	7.2	24
Rolling Meadows Clay Loam	28	36	7.4	29
Rolling Meadows Clay	18	46	6.3	29
OJ Noer Silt Loam	18	26	4.5	27
Prestwick GC (MN) Sandy Loam	54	16	3.0	20
North Carolina Loamy Fine Sand	84	10	4.1	27
Iowa Loam	30	22	6.6	29

Table 1. Soils were most susceptible to compaction in the 20-29% moisture range. This did not seem to vary consistently by soil texture or organic matter content. Unfortunately, the Proctor Density test does not appear to be useful for decision making about cart traffic.

SDHI Fungicide Resistance: Coming Soon to Your Course

By Paul Koch, Ph.D. Department of Plant Pathology, University of Wisconsin – Madison

The last few years have seen a mini-boom of effective new fungicides for the golf market. New active ingredients have included fluxapyroxad (Xzemplar®), penthiopyrad (Velista®), isofetamid (Kabuto®), and fluopyram (Exteris®). There are likely more products to come in the SDHI class as the major fungicide companies mine all possible useful molecules in this class. Each one of these products has different strengths and weaknesses, but they all have one thing in common…they belong to the succinate dehydrogenase inhibitor (SDHI) class of fungicides. While this seems like a relatively new class of fungicides, older products like flutolanil (Prostar®) and boscalid (Emerald®) also belong to the SDHI's.

Most of the products listed above with the exception of Prostar® have good to excellent efficacy against dollar spot. In Wisconsin, dollar spot fungicides are used more frequently then any other disease, sometimes requiring 10 or more applications in a single season to provide effective dollar spot control. This puts heavy selection pressure on the dollar spot fungus, which can lead to the development of fungicide resistance.

This puts heavy selection pressure on the dollar spot fungus, which can lead to the development of fungicide resistance.

Each SDHI fungicide works in a slightly different way, but in general they all inhibit the ability of fungi to convert succinate to fumarate via a dehydrogenase inhibitor (hence the name). This process occurs during fungal respiration, hence preventing the fungus from producing enough energy to survive. This is a single site of activity so it is susceptible to fungicide resistance, though not controlled by a single gene so resistance development will occur relatively gradually over time. The Fungicide Resistance Action Committee (FRAC) lists SDHI fungicides as 'medium to high' risk of developing resistance and recommends resistance management strategies be put in place from the onset of use **(Figure 1).** This means they are not quite as prone to resistance development as fungicides like thiophanate-methyl, but they are slightly more susceptible to resistance development then the demethylation inhibitor (DMI class).

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Resistance to SDHI fungicides have already been reported in other agronomic and horticultural crops, so it's likely that at some point SDHI resistance will be widespread in turfgrass. But is it present already? The answer is almost certainly yes, both from anecdotal reports from golf course superintendents and from laboratory research conducted by various turfgrass pathologists. University researchers have found decreases in in vitro SDHI sensitivity in the lab and reports have been increasing of dollar spot breakthrough on reapplication intervals that used to be effective.

The mechanism of resistance in the SDHI's is more similar to the DMI fungicides than the benzimidazoles (ie thiophanate-methyl), so we would expect resistance to develop in a similar manner. Rather then a single mutation conferring complete resistance like in the benzimidazoles, mutations and other forms of resistance accumulate over time and lead to a gradual reduction in efficacy. This same phenomenon has been observed with the DMI fungicides. When propiconazole first came on the market, it was common to achieve 28 or more days of dollar spot control even in heavy disease pressure. Now 14 to 21 days is more common. This doesn't mean the product is lost or cannot be used any longer, but it does mean that some level of dollar spot resistance is widespread among the DMI fungicides.

Code	Target site of action	Group name	Chemical group	Common name	Comments
7	Complex II; succinate-dehydro-genase	SDHI (Succinate dehydro-genase inhibitors	Phenyl-benzamides	Benodanil Flutolanil Mepronil	Resistance known for several fungal species in field populations and lab mutants. Target site mutations in sdh gene, e.g. H/Y (or H/L) at 257* or P225L**. Medium-high risk. Resistance management required
			phenyl-oxo-ethyl thiophene amide	Isofetamid	
			Pyridinyl-ethyl-benzamide	Fluopyram	
			Furan-carboxamides	Fenfuram	
			Oxathiin-carboxamides	Carboxin Oxycarboxin	
			Thiazole-carboxamides	Thifluzamide	
			Pyrazole-carboxamides	Benzovindiflupyr Bixafen Fluxapyroxad Furametpyr Isopyrazam Penflufen Penthiopyrad Sedaxane	
			Pyridine-carboxamides	Boscalid	

Figure 1: SDHI fungicides are in FRAC Group 7. The different fungicides included in the SDHI class, their various groups, and their resistance risk are included in this table from the FRAC SDHI webpage (http://www.frac.info/working-group/sdhi-fungicides/introduction-and-general-information).

The same pattern appears to be developing for the SDHI fungicides. Emerald for years was the gold standard of dollar spot fungicides, routinely providing 28 to 35 days of dollar spot control. However in the past 5 years I have been hearing more reports of dollar spot breakthrough from superintendents in Wisconsin and elsewhere before that 28-day interval is reached. More recently, Xzemplar was providing exceptional dollar spot reapplication intervals of 35 days (or more in some cases) under high disease pressures. Just a few years later, few are achieving that level of control and most reapplication intervals are approximately 28 days or less depending on the rate. Again this doesn't mean the product is failing or 'lost', but it does mean that some level of fungicide resistance to SDHI fungicides is present in the dollar spot population… and it will likely continue to increase.

Are the SDHI fungicides a lost cause then, destined to be an ineffective and resistance-laden dollar spot class like the benzimidazoles? Absolutely not, though reapplication intervals will need to continuously be monitored for breakthrough and adjusted as needed. The SDHI's will continue to be a tool for superintendents to use across a variety of diseases, but just like any other product outside of Daconil and Secure they will need to be used carefully to limit resistance development to the fullest extent possible.

Careful use of the SDHI's starts and ends with building a dollar spot management program focused on a healthy plant and proper cultural practices (ie fertility, moisture management, drainage) to limit unnecessary sprays.

The fewer overall fungicide applications you make, the less fungicides resistance you are likely to encounter. However no matter how healthy we make our plant and how fine-tuned our cultural practices are, fungicides are an integral piece of dollar spot management on Wisconsin golf courses.

Fungicide programs for dollar spot control should contain a mix of DMI, SDHI, and even QoI (Pinpoint fungicide is a QoI with efficacy against dollar spot) fungicides to keep the fungus from experiencing the same selection pressure over and over. And don't forget tank-mixing and rotating with multi-site contact fungicides like Daconil and Secure, which aren't at risk for developing fungicide resistance. If you're ever confused about what chemical class your product is in, remember to look at the FRAC code in the upper corner of the first page of the fungicide label **(Figure 2).** Those products with the same number are in the same class, so rotating among fungicide classes is as simple as rotating among FRAC code numbers.

While following the above guidelines are unlikely to completely prevent resistance to the SDHI fungicides from occurring at your course, they are likely to slow its spread and limit the overall severity of resistance that does develop. More SDHI fungicides will be coming on the market in the near future, and as older products get taken off the market for regulatory and economic reasons it will he harder then ever to maintain an effective resistance management program. However, it is our responsibility as an industry to use our fungicide portfolio in a responsible manner to ensure that these products remain effective for many years to come. Please don't hesitate to contact me (plkoch@wisc.edu; 608-262-6531) if you ever have any questions when building your fungicide program.

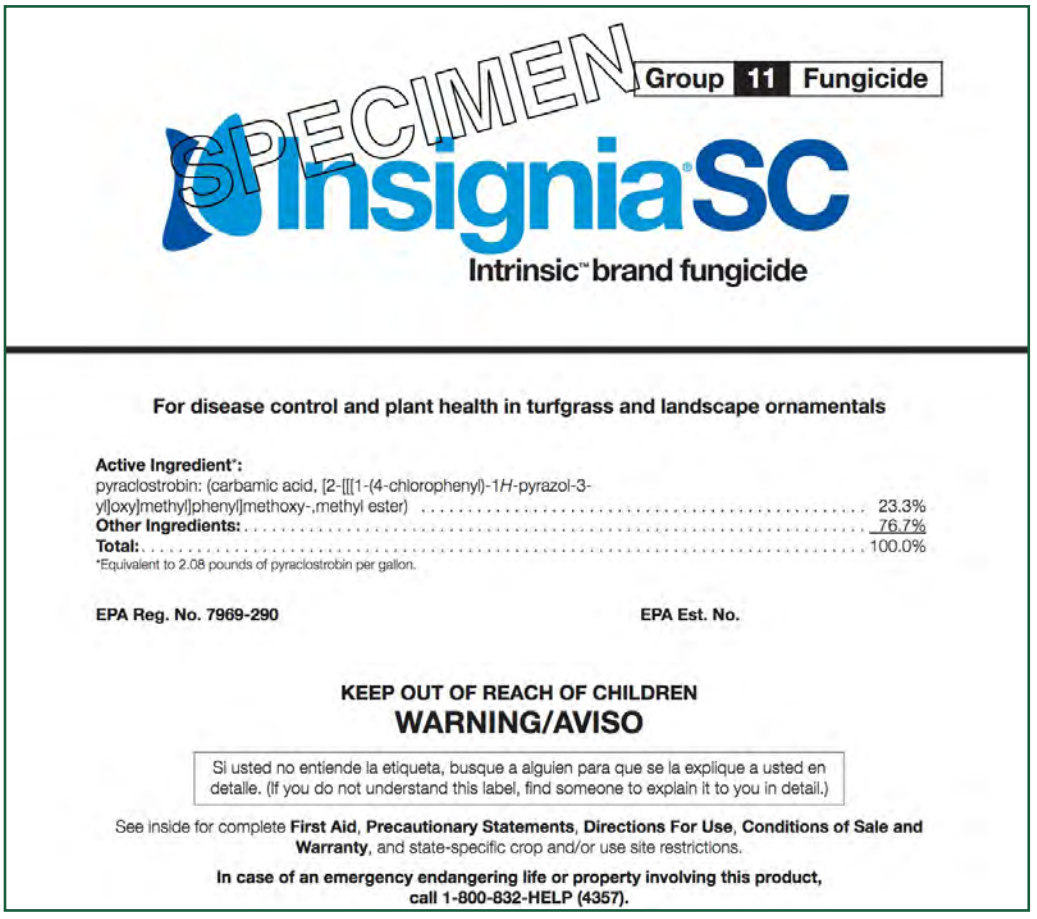

Figure 2: Determining which fungicides are in the same chemical class for the purposes of rotation and fungicide resistance management can be difficult. But most fungicide labels have their FRAC code on the first page of the label. In this case, Insignia (and all strobilurin fungicides) are in FRAC group 11. Rotating classes is then as simple as rotating FRAC codes. Premixed fungicides will have multiple FRAC codes on the label to account for the multiple chemical classes present.

North Shore Country Club Hosts Wisconsin State Open

By David A. Brandenburg, Editor, The Grass Roots

North Shore Country Club in Mequon played host to the 97th Morgan Stanley Wisconsin State Open for the Wisconsin PGA.

The open is played over 72 holes with low 60 and ties playing the final 36 holes. It was a tight contest to start the final round but eventually former State Junior Champion Max Hosking of Madison birdied the 71st hole to head to the 18th tee with a two shot lead. Hosking playing as a professional finished one ahead of amateur Phillip Johnson, Colgate who plays for the University of Dayton.

Golf Course Superintendent Joel Larsen and his staff had the course in incredible condition for the tournament. Conditions were green but firm and fast to challenge the states best players.

Larsen has been at North Shore for 3 years after leaving Sand Creek CC in Chesterton, Indiana. As an assistant superintendent he served at Milwaukee Country Club and Point O' Woods County Club in Michigan.

North Shore was founded in 1920 as the Michiwaukee Golf Club, changed its name to North Shore in 1935. As membership grew the course was landlocked and moved to its current larger site in 1964. The club hosted the Greater Milwaukee Open from 1968-1970.

The club offers 27 holes and has a very active tennis program and clubhouse operation to go with the golf course.

The 450 Yard Par-4 18th hole with the North Shore Clubhouse in the background.

PGA Wisconsin Section

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**@ 3600 rpm. Engine Manufacturer Gross Power. Tested in accordance with SAE J1349. Engine horsepower and torque information are provided by engine manufacturer for comparison purposes only. Actual operating horsepower and torque will be less. Refer to engine manufacturer's website for additional information.

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WISCONSIN STATE OPEN

Top Left: Rolling the Par-4 15th

Top Right: Bunker work on the 15th

Left: Mowing the well protected Par-3 17th hole.

Below: Mowing the 18th Green with the clubhouse in the background.

WISCONSIN STATE OPEN

Left: The deep bunkers protecting the 18th Hole.

Below: Fog rises from the pond protecting the Par 3 12th hole.

Chenequa Country Club Hosts WTA Golf Outing

By David A. Brandenburg, Editor, The Grass Roots

Chenequa Country Club was a perfect host for the 2017 Wisconsin Turfgrass Association Golf Outing Fundraiser. The original 9 was designed by Tom Bendelow in 1911 and in 1963 Larry Packard came in to design the new 9 of the course set next to beautiful Beaver Lake .

Our host Jim Shaw has served the membership at historic Chenequa for 42 years. The course was fantastic and challenged all of the players. I had the honor of playing with Josh Lepine and Jens Arneson and we laughed at each other as we putted off the tricky 9th green.

To go along with the golf course Chenequa offers a large tennis program with clay and asphalt courts along with picklball and heated platform tennis courts to allow winter play.

Our day started and ended in the clubhouse with lunch to start and hors d' oeuvres to finish the day while the results were tabulated.

Bruce Schweiger led the presentations to thank our hosts and give a history of the WTA and the O.J. Noer Center. Bruce also thanked the WTA Board Members for their help bringing together the golf event.

Some of the flag event winners included Rick Weiterman, Long Drive Senior Division, Phil Davidson and our host Jim Shaw took home long putt prizes while Tim Schmidt had a closest to the pin.

Oddly or luckily depending on your point of view in the big raffle Chad Grimm won the top prize of a Yetti Cooler and then pulled his other card to win a Echo Dot.

Again this year every participant had a chance to win a prize with a great selection of items including a bike, golf clubs, tools, clothing along with a large selection of different craft beers.

Thank you to Bruce and the WTA Volunteer Board for putting this all together and to Jim and the rest of the staff at Chenequa for allowing us to play and invade the clubhouse for a day.

Left: The Par-3 3rd hole offers multiple tees and angles to play downhill to a well protected green.

Below: Our host Jim Shaw has been at Chenequa since 1975.

Top Left: The Par-3 15th plays 192 yards from the back tees

Left: The Par- 4 5th plays 398 yards to a difficult green.

Above: Bruce Schweiger thanks Rob Johnson for his work in attracting door prizes.

Below Left: The driving range offers members a great opportunity to work on their game.

Bottom Left: The 17th green is one of 2 original Bendelow surfaces.

The Season Of Growth

By David A. Brandenburg, Editor, The Grass Roots

What a different year we have had. A wet cool spring followed by a wetter than normal summer and now a wet fall.

Part of the state had a dry spell in late September but in the Fond du Lac area we have mowed rough every week since May. I do not remember a year where at least some turf did not go dormant from drought.

As I write this on October 19th highs are in the 70's and we are still mowing on a summer schedule despite our fall sized staff. The turf is healthy and growing like gang-busters while leaves have barely started falling.

We blow out our irrigation system next week so I hope it cools down and dries out a little so we can finish up a couple projects before the snow flies.

Best of luck to you, your clubs and your staffs as fall turns to winter. Remember to enjoy the many gifts we are shown each day.

****

Dr. Wayne Kussow passed away quietly on October 7th. His family reported he was at peace his end was near. Wayne grew up on a dairy farm near Oconto and earned his degrees from the University of Wisconsin Madison finishing with his Phd in Soil Chemistry in 1966.

In his early career Kussow was involved in international agriculture development leading to 5 years living in Brazil and participating in the creation in M.S. degrees at the federal university in Porto Alegre. His second tour in Brazil Dr. Kussow helped revitalize the country's agricultural research system and served as rice research team leader in Goiania.

In 1984 Wayne joined the UW Madison Soil Department where he served as coordinator of the Turf and Grounds Management Program. In that role Wayne taught 3 soil science classes and developed a course in turf grass nutrition management.

Dr. Kussow did research on everything from putting greens to athletic fields and home lawns. For 20 active years and years after Wayne filled these pages with his research results. Most of his results are still relvant today and can be found online at the Turfgrass Information File at Michigan State. (access to the TGIF portal can be found on the WGCSA and GCSAA websites.)

Wayne's work had a major impact on golf in Wisconsion and througout the midwest for his 20 years in the soils department as it will for decaes to come.

Wayne was never more than a phone call away to help a superintendent and many of those reading these pages are former students of his.

Dr. Kussow is survived by his wife Carol and three sons, Jeffrey, Timothy and David and their families. Dr., Kussow was certainly one of the good guys and will be missed by many.

EDITOR'S NOTEBOOK

Left: Wayne and Carol Kussow at Wayne's retirement party held at Blackhawk Country Club in 2005.

Right: Dr. Kussow receives the Distinguished Service Award from WGCSA President Mark Kienert. Kussow was just the 10th recipient of the award.

Event Schedule!

November 4 (Saturday) Couples Dinner - Harley Davidson Museum, Milwaukee
November 29 & 30 (Wednesday / Thursday) Golf Turf Symposium, American Club, Kohler
January 9 (Tuesday) Turfgrass Research Day and Webinar
February 3-8 Golf Industry Show, San Antonio, Texas
February 7 (Wednesday) Wisconsin Room at GIS
Febraury 20 (Tuesday) Assistants Seminar
February 27 (Tuesday) Spring Business and Education Meeting.
March 7 (Wednesday) NGLGCSA Educational Conference

Visit our website at www.WGCSA.com for the most up to date calendar and registration forms.

Wisconsin Chapter GCSAA

52nd Annual

WISCONSIN GOLF TURF SYMPOSIUM

NOVEMBER 29TH & 30TH | THE AMERICAN CLUB - KOHLER, WI

Something for everyone at the Turfgrass Management Buffet

Registration packets are included in this issue of Grass Roots. You can also register for the symposium at **www.wgcsa.com**