



**Brackett's Crossing  
Country Club  
Home of  
The Wee One 2016**

# **Hole Notes**

**The Official Publication of the MGCSA**

**Vol. 51, No. 8 September 2016**





# Workman® GTX



## WORKMAN® GTX SERIES



The Workman GTX is adaptable for any task. Two or four-seat configurations come with bench or bucket seats. Front and rear attachment points for garbage cans, hose reels or walk spreaders free up the bed for more hauling capacity. 4 and 6-foot flat beds are also available.



MTI Distributing, Inc.  
4830 Azelia Ave. N  
Brooklyn Center, MN 55429  
1(800)362-3665  
(763)592-5600



# Thank You 2016 Annual MGCSCA Sponsors

## *Platinum Podium and Event Sponsor*



## *Gold Tee Prize and Event Sponsors*



## *Silver Tee Sign Sponsor*





An old school *problem*  
meets a new age *solution.*



From the Ryder Cup to  
the local scramble,  
we've got you covered.



Learn more at [www.duininckgolf.com](http://www.duininckgolf.com)



October 10

The Wee One  
Brackett's Crossing CC  
Host Tom Proshek

November 16th

Assistants Pro Forum  
Foley United  
Host Jim LeTourneau

November 17

Golf-centric  
Pesticide Recert Program  
Mendakota Country Club  
Host Winfield

November 29

Northern Outreach  
Northland Country Club  
Host Jake Ryan

December 7-8

The Mega Seminar  
The Minikahda Club  
Host Jeff Johnson





#### EDITOR

DAVE KAZMIERCZAK, CGCS  
DAVE@PRESTWICK.COMCASTBIZ.NET

# CONTENTS

Vol. 51, No. 8 September 2016

## Feature Articles:

- Just Chill! How Cold Hardiness Works In Trees** pages 14 - 21  
by Brabdon M. Gallagher Watson, Rainbow Tree
- UMN Snow Mold Trials** pages 22 - 31  
by Dr. Angela Orshinsky and Kurt Hockemeyer, UMN St. Paul
- UW Snow Mold Evaluations Marquette GC** pages 32 - 40  
by Dr. Paul Koch, Kurt Hockemeyer and Brent Schweiger, UW
- Member Driven Research: Moisture Meters** pages 42 - 53  
by Sam Bauer, University of Minnesota Turfgrass Extension

## Monthly Columns:

- Presidential Perspective** pages 6 - 8  
Dave Kazmierczak, CGCS
- In Bounds** pages 10 - 12  
Jack MacKenzie, CGCS
- Within the Leather** pages 62 - 64  
This Month's Guest: Matt Rostal

## Cover Shot:

*Join your peers at The Wee One to be played at Brackett's Crossing CC on October 10th A Great Cause!*

## Affiliate Spotlight: XGD Systems



## Member Driven Research: A Multitude of Moisture Meters Pages 42 - 53

## More Great Content:

- Picture Spread: The Scramble** page 54 - 55
- Picture Spread: Western Exposure** page 61

## Need Snow Mold Protection? Inside this issue: UMN and UW Snow Mold Field Trials

**Hole Notes** (ISSN 108-27994) is digitally published monthly except bimonthly in November/December and January/February by the Minnesota Golf Course Superintendents' Association, 10050 204th Street North, Forest Lake, MN 55025. Jack MacKenzie CGCS publisher. Please send any address changes, articles for publication, advertising and concerns to [jack@mgcsa.org](mailto:jack@mgcsa.org).



# Presidential Perspective

by Dave Kazmierczak CGCS, Superintendent at Prestwick Golf Club

I received our guest columnist Matt Rostal's offering, located on the back pages of this magazine a

couple days ago and he was moved to comment on the 15th anniversary of 9/11, the Colin Kaepernick national anthem controversy and how it made him realize how grateful he is for what he has. I encourage all of you to read it, and I will surmise most of you would feel the same way.

The column got me thinking, however, a little more closely about the whole national anthem protest by Kaepernick and now others, both in the professional ranks and now in amateur sports and I'm sure it will start bleeding into non-sport functions eventually. On the surface and initially, I was very offended by the gesture. I have a long history of military service in my family and my son will be serving shortly. The flag, the anthem and what they represent and how one should conduct

oneself during these presentations are something that every American should take seriously, if nothing else out of respect for the individuals who have labored and in many cases died defending all that is afforded us in this country.

Mr. Kaepernick, a professional athlete of mixed ethnicity, decided this was the vehicle to make his thoughts known about a serious issue in this country, saying that he could not stand for the flag that represents a country that "oppresses black people and people of color."

There is no doubt that this country has a race relation issue. The sad truth is it always has, and unless there is an amazing metamorphosis of thinking amongst the majority of the population, it always will. That doesn't mean that we stop trying to make things better, have dialogue and recognize that differences do not automatically equal roadblocks but create opportunities for understanding to try and rectify tensions. We just need to work on acceptable vehicles for that dialogue, especially Mr.



Keapernick. I am not a black man. I cannot fully grasp the feelings of black people or any ethnicity for that matter, on the issue of their oppression in this country. I don't feel it, I don't live it and I certainly have no basis for saying whether or not somebody is being oppressed.

But I do know whether it's something as horrific as shooting a random police officer, or shutting down a freeway in protest or even showing the flag and anthem disrespect, that there is an element to all these protests that run common and true, that the individuals doing these things are basically thinking of one person: themselves. Some may think they are doing it for the betterment of their cause, or championing a certain segment of society. Often times they are disguised in groups of people, but don't be fooled. The majority of these people are doing this either to fuel their passion just to be seen or heard. I have dubbed this phenomena the Cult of Me.

The Cult of Me has always been around, and is quasi-understandable. We all want to be important. We all want to matter. It is a basic human

trait I suppose to an individual, to be unique. We even encourage it in our children. However I believe society as a whole has passed the tipping point of being just a healthy individual. Fueled by the media the past 30-40 years, and exasperated by the proliferation of cell phones, the Cult of Me is growing exponentially.

There is an emphasis like never before on being "somebody." I give you the examples of: YouTube, Reality TV, Twitter, Snapchat and do I even have to mention the selfie? No, these avenues are not exclusively narcissistic black holes, I recognize that, but nobody can deny their contribution to the Cult of Me.

The Cult of Me can also manifest itself as a group. I am beyond sick and tired of hearing about this "community" or that "community" as if they are their own compartmentalized entity. You can't have peace, love and understanding if you are pigeonholed within your own "community." In my mind, it just doesn't work. You can't structure yourself as "community" then wonder why you are looked upon as different.

So what does this piece of social commentary have to do with the price of fertilizer or the availability of the course to airify next week? Well, like it or not Mr. or Ms. golf course superintendent, you are on the front lines of containing the Cult of Me, and you probably didn't even know it.

Ask any Superintendent worth a darn (unless consumed by, well, The Cult of Me), he or she will tell you that the course and the conditions are a total team effort. More than likely they will simply give all the credit straight to the crew, but the real truth is that every single individual contributes to the success of the entire venture and oftentimes when even one person is delinquent in their responsibilities the entire operation suffers. It is the superintendent that manifests this collection of individuals into a functioning unit that accomplishes the goal. The individuals are still individuals, from all age groups, ethnicities, genders, that work together for a common goal. Why then is it different when they leave the shop and head home?

As managers I feel it is our obligation to point this out to our employees. We accomplish that togetherness, that mind-set that if we all have a common goal, work together, respect each other, that great things can be done regardless of our backgrounds, interests or skin color. Keapernick, as a de-facto leader of the 49ers due to his position as quarterback, should be the first guy to realize that!

I had a conversation this morning with a very wise man who told me there is only one rule for healthy relationships: I count, you count and I will try to make room for you and hold a space for us to be. He said this applied to individuals, teams, families, organizations, anything really. We, as the managers of people are already creating that space, we already value our people, we just need to enlighten them and encourage them to take that concept with them into their other segments of life.

That would at least be a first strike at the Cult of Me.



# WEE ONE MINNESOTA GOLF OUTING AT BRACKETT'S CROSSING COUNTRY CLUB

Supporting those in need



MONDAY, OCTOBER 10, 2016

Lakeville, Minnesota  
HOST: Tom Proshek,  
Superintendent and the MGCSA



\$125 per Player / \$500 per Team

Four Person Scramble *only one MGCSA member per team necessary*

Great Golf Prizes. On course refreshments. Lunch on the course. Buffet immediately following golf with cash bar reception.

Enter Early. Field is limited to 30 teams (120 players).

Taco Bar @ Brats to go (lunch included in registration fee)

Country Club Attire – Collared Shirts. Soft spikes only.

10:00 - 11:00 a.m. Registration – Driving Range available

11:00 a.m. GOLF - Shotgun

4:00 p.m. Prizes and Buffet reception (cash bar).

Contests: Must be present at the reception to win.

Pro Shop Certificates 1<sup>st</sup> Place \$500, 2<sup>nd</sup> Place Draw \$300, 10<sup>th</sup> Place Draw \$160, 18<sup>th</sup> Place Draw \$160, 24<sup>th</sup> Place \$160 Draw

Gross Skins Game - \$20 per team The Rock "Go-Pro" Challenge Giant Putt Contest prior to shotgun for \$100

Mulligan Purchase: 4 for \$20 or 8 for \$40

Closest to the pin winners on the Par 3's will draw down for a set of irons.

Featured Raffle Prizes – \$5 for 5 tickets or \$20 for a LONG arm's length.

Green Egg Outdoor Grill, Golf Clubs, and MUCH MORE.

----- PLEASE FILL OUT COMPLETELY - THE DINNER COUNTS ARE IMPORTANT -----

Name: \_\_\_\_\_ Course/Company \_\_\_\_\_

Name: \_\_\_\_\_ Course/Company \_\_\_\_\_

Name: \_\_\_\_\_ Course/Company \_\_\_\_\_

Name: \_\_\_\_\_ Course/Company \_\_\_\_\_

REGISTER: \_\_\_\_ GOLFERS @ \$125 per Player / \$500 per Team (Golf, prizes, refreshments, lunch, hors d'oeuvres) Dinner only \$ 75

TOTAL ENCLOSED: \$ \_\_\_\_\_

PAYMENT METHOD: \_\_\_\_ Check \_\_\_\_ Credit Card: \_\_\_\_ VISA \_\_\_\_ MASTERCARD \_\_\_\_ DISCOVER

Name as it appears on credit card: \_\_\_\_\_

Credit Card Number: \_\_\_\_\_ Security Code: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

Make check payable to MGCSA and mail to: MGCSA, 10050 204<sup>th</sup> Street N., Forest Lake, MN 55025

REGISTRATION DEADLINE: SEPTEMBER 30, 2016



# In Bounds

by Jack MacKenzie, CGCS

It is official. The Minnesota Golf Course Superintendents Association is

now represented by a registered lobbyist, me.

Not that the association hasn't been supported visibly and vocally on relevant issues over the past few years, but now it is documented with our state Legislature. Truth be told, I have been your unregistered, although very active, amateur lobbyist for quite some time.

According to our Minnesota Statute 10A.01, a registered lobbyist is:

*Engaged for pay or other consideration of more than \$3,000 from all sources in any year for the purpose of attempting to influence legislative or administrative action, or the official action of a metropolitan governmental unit, by*

*communicating or urging others to communicate with public or local officials; or*

*Who spends more than \$250, not including the individual's own traveling expenses and membership dues, in any year for the purpose of attempting to influence legislative or administrative action, or the official action of a metropolitan governmental unit, by communicating or urging others to communicate with public or local officials.*

Recently I have learned that being or using a "lobbyist" shouldn't cause anyone a foul taste as professional lobbyists serve a very important function, and registration is the key to their influence.

State registration is a very good thing for professional exposure because members of



legislatures, seeking specific materials and relevant answers to current issues, have at their disposal a directory of registered professional representatives and lobbyists, and their associations including what their specific interests are. Lobbyists are more than just movers at the Capital; they are an incredible resource for Representatives and Senators to use as they seek industry answers. Now that the MGCSA is on “the list,” you can bet we will be called upon more often to provide our story- the good tale of golf.

Although not technically registered, you too can be an amateur advocate. Now is a great time for you to lobby your politicians on behalf of the golf industry. In fact, the election season is perhaps the very best time for advocacy as candidates seek individuals to bounce ideas and policy off of. As a constituent, you can turn this discussion around and plug your business, gaining insight

on how the prospective legislature will vote or react to the issues, while educating them on your specific issue and the concerns of the golf industry.

Here are a couple of tips:

**Never stretch the truth or worse yet, lie about an issue you feel strongly about or you will destroy your personal credibility and taint the broader issue.** Politicians never forget and because they are using your information as fact for their future discussions, repeated misinformation espoused as fact and discredited is an ostrich egg in the legislature’s face.

**Keep your information simple and to the point.** For example:

Golf is a \$2.3 billion dollar industry in the state of Minnesota.

Golf employees over 35,000 individuals annually.

Over 500 golf destinations in Minnesota provide pollinator

habitat and wildlife corridors.

As a communities largest rain garden, with potential for stormwater management, pollution mitigation and groundwater recharge, golf courses are concerned with the inequitable appropriation of water use permits and irrigation resources.

The above set of facts is engaging, clear and concise. While providing great sound bites, it also begs for more materials and discussion. Enter your registered lobbyist. On the industries behalf, I am available to pursue an even more in-depth dialogue with your legislature. You open the door and I will enter.

And that is another very KEY POINT. Typically, doors will remain locked and closed unless the legislature's constituent provides the key. They work directly on your behalf, not the associations or specific lobbyist. With an invitation from you personally, via phone call,

email or even snail mail, to meet with an industry representative, I can gain access, with your company at the first meeting of course, to further our cause. The wise politician will listen to their constituent and I believe the even smarter representative will appreciate the great story of golf, full of environmental and economic opportunities. It is in their best interest on multiple levels to allow more interaction with or without their constituent present. I just need to get their attention.

Together, you and I, your registered lobbyist, can initiate conversation and make productive changes to benefit the golf industry. We can be a dynamic force of transformation. All it will take is a bit of initiative on your part. Acting today, prior to a crisis, is the time to begin discussions and formulate a plan of action with those who can make policy on your behalf, your legislatures.



**Setting the right course of action.**  
**That's intelligent.**



**Rain Bird Integrated Control (IC) System™ gives you flexibility for today and tomorrow.** In a class of its own and masterfully engineered with rapid two-way communication, real time diagnostics and centralized control, the fully underground IC System puts you in command of individual rotors from your central control computer, tablet, radio and smart phone. The IC System helps save costs using significantly less wire and material, making it easy to install, expand and adapt as your course grows and evolves. With the Rain Bird IC System, you're **setting a course of action.**



• Craig Vigen - CGCS  
Sales Representative  
701-205-8456

• Tom Bjornberg  
Inside Sales/Tech Support  
763-560-5200

• Scott Holmvig  
Sales Representative  
320-249-4130

• Steve Schifsky  
Inside Sales/Proj. Manager  
763-560-5200

Belfield, ND  
701-258-9700

• Bismarck, ND  
701-258-9700

• Blaine, MN  
763-560-5200

• DeKalb, IL  
815-756-2800

• Fargo, ND  
701-293-5511

• Madison, WI  
608-271-1770

• Superior, WI  
763-560-5200

[www.ferguson.com](http://www.ferguson.com)

# *Just Chill!*

## *How Cold Hardiness Works In Trees*

*By Brandon M. Gallagher Watson, Rainbow Treecare Scientific Advance-*

In the upper regions of Siberia, nearly 450 miles above the Arctic Circle, resides one of the world's toughest tree species. *Larix gmelinii*, known as the Dahurian larch, holds the distinct title of "World's Northernmost Tree Species." Living in this area, just above the permafrost layer, is not for the faint of sap. Air temperatures have been recorded at an astonishing -94°F (-70°C) during the winter and summer temps climb above the freezing point for just a few short weeks.

The growing season is less than 100 days long each year with polar night lasting from September to February. This species has adapted to low seed germination rates with the ability to sprout new trees off its root system, forming forest colonies of 'creeping larch'. This growth habit is common among hardwoods, like aspen, but uncommon amongst temperate conifers. Their tough wood and the extreme cold keep insect and fungal pests to a minimum and, of the 268 other organ-

isms that live on this tundra, there are no other tree species competing for sunlight. They can survive here for a long time. One individual was found to be 919 years old while the root system may be as old as several millennia. Despite these inhospitable conditions, the Dahurian larch thrives here.

The Dahurian larch endures the local climate with great success thanks to a fairly complex series of adaptations we generally refer to 'cold hardiness.' Hardiness is a measure of how well a plant can withstand adverse conditions and can include cold, heat, elevation, drought, flooding, and even wind. The lowest temperature that it can survive before freezing to death determines a plant's cold hardiness. The USDA has made recognizing this fairly simple by evaluating and categorizing landscape plants into Plant Hardiness Zones. Starting at the Canadian border, zones are assigned in 10° increments down to the Mexican border. Zone 1a plants



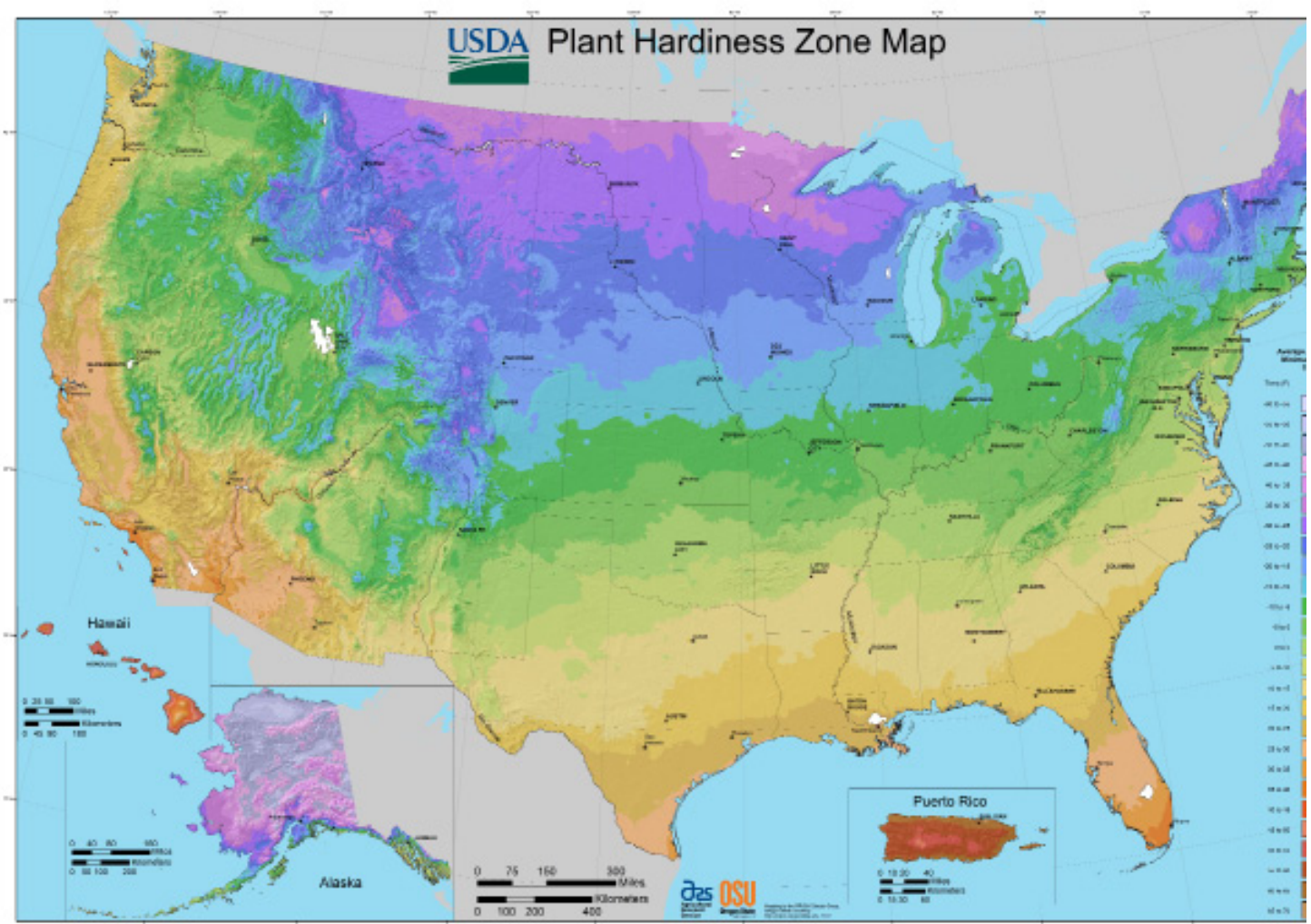


*Hardy trees withstand freezing temps for months*



need to be hardy down to  $-60^{\circ}\text{F}$ , while on the other end of the spectrum, Zone 13b plants are uncomfortably chilly at  $65^{\circ}\text{F}$  -  $70^{\circ}\text{F}$ . This helps provide some guidelines on what temps a plant may be able to tolerate, but it does not mean that they can tolerate it all the time. A paper birch may be able to survive through weeks of  $-40^{\circ}\text{F}$  in midwinter, but would likely die in 24 hours if exposed to those temps in midsummer. Plants must first acclimate to the cold before they can withstand it.

The process of getting ready for the coming winter begins with the shorter days and cooling temps of autumn. Chlorophyll production ceases, revealing the bright red, yellow, and orange pigments we all love so much. As this is going on, trees are actively moving carbohydrates into storage tissues in their trunks and roots and reallocating their moisture reserves as well. Water management is the biggest key to surviving subfreezing temperatures as trees are comprised primarily of water. Water, of course, expands





when it freezes and this expansion will rupture the walls of plant cells causing the death the cell, and if widespread enough, the death of the tree.

Plants all around the temperate world have evolved different approaches for surviving winter. Annuals survive winter by not surviving at all. They have developed a way to complete their lifecycle in a single season leaving only their more storage-friendly seeds to endure the off-season. Herbaceous perennials often have specialized

belowground structures that can store water and carbohydrates for the winter and can reactivate them in the spring. This includes familiar structures like the bulbs of a tulip, the tubers of a potato, and the taproot of a carrot. Hardy woody plants, such as trees and shrubs, do not have luxury of moving all their tissues into the soil, so they have developed a few different strategies for subzero temperature endurance, and it all starts with water management.

While trees appear solid to us,

## *Introducing the All New HR Series Mowers.*

The new Jacobsen HR Series of wide-area rotary mowers.

The HR Series sets a new industry standard for the most efficient use of power!

- Compact chassis design
- Less weight = more power for mowing
- Highest power to weight ratio in class
- Improved fuel economy



Adam Hoffman Ph: 612-802-3149 • Nick Sherer Ph: 612-308-0102 • Mitch Stewart Ph: 515-240-8874

# TurfWerks

JACOBSEN  
A Textron Company

RAIN BIRD

neary  
TECHNOLOGIES

STANDARD  
GOLF

PAR  
AIDE

VENTRAC

TURFCO

PROGRESSIVE  
TURF EQUIPMENT

Smithco

1710 Alexander Road • Eagan, MN 55121 • [www.Turfwerks.com](http://www.Turfwerks.com)





*Birch trees use deep super cooling*



their cells are comprised primarily of water and what they do with that water in the winter determines their survival. One mechanism involves pumping sucrose and the amino acid proline into the cell. This acts essentially like salting your sidewalks in winter by lowering the freezing point of the solution inside the cell to remain liquid. Just like salting the sidewalk, however, this is only effective for combating 'warmer' freezing temps of about 20°F -32°F.

This is due partly to the effects of osmotic pressure; you could keep increasing the quantity of dissolved solutes to continually lower a cell's potential freezing point but at a certain concentration the increased volume of 'stuff' inside the cell begins to build pressure that increases its likelihood to rupture. Other plants take it one step further and undergo a process referred to as 'deep super cooling.' Deep super cooling is a way to keep a liquid in a liquid state well below its freezing point. To do this, these plants produce a special protein to prevent freezing. These are conveniently known as 'anti-freeze proteins' or AFPs and they are pumped into the spaces between

the cells during the fall acclimation period. AFPs work not by lowering the freezing point, but by inhibiting the reformation of ice crystals. They also function at very low concentrations, which means they do not have the same issues related to increasing the osmotic pressure as other methods do.

Deep super cooling also has its range limits but will allow species such as oak, elm, maple, beech, ash, walnut, hickory, rose, rhododendron, apple, pear, and stone fruits to survive temps down around -40°F. While that number seems ridiculously cold to our tropical-loving bodies, that is still only about half as cold as the Dahurian larch can endure.

Trees, such as paper birch, redbud dogwood, willow, quaking aspen, and, of course, the Dahurian larch survive the damaging crystallization effects of freezing water by trying to rid themselves of as much water as possible. Rather than pumping more items into their cells, these plants spend the autumn pumping the water out of their cells. The water still freezes but the crys-

tallization occurs in the cytoplasm within the intercellular spaces which has much less damage potential than freezing inside the cell membranes. Additionally, removing water from the cell increases the concentration gradient of solutes within the cell, which in turn lowers the freezing point of the cell, similar to the mechanisms we discussed above. The species that can best perform these tasks are those that are considered the most cold hardy and come with the reward of being able to thrive in areas unsuitable for most other living things.

Even the most cold hardy spe-

cies will suffer damage from the cold if they do not acclimate to it properly. Even though water is the most damaging thing plants confront once the temps drop, it is vital to their preparation. Keeping trees well watered up until the ground freezes is one of the best ways to help them survive the coming winter. Given the proper care in autumn, and if the temps do not drop below a tree's minimum comfort range, they should be able to resume activity in the spring. If only surviving the winter was as easy for us humans...



**HARTMAN**  
Golf Course Construction  
& Renovation

*Quality since 1971...*

Specializing in...

Bunkers • Tees • Laser Leveling • Green Drainage • Irrigation • Design • Pump Station Upgrades

8099 Bavaria Rd.  
Victoria, MN 55386  
952.443.2990

info@hartmancompanies.com  
www.hartmancompanies.com





*Water trees after leaf drop for better hardiness*



# 2015 to 2016 Snow Mold Field Trials - Fairways

Dr. Angela Orshinsky and Kurt Hockemeyer  
Department of Plant Pathology  
University of Minnesota, Saint Paul, MN

**Objectives.** To identify fungicide treatments with the highest efficacy in managing snow mold fungi (*Microdochium nivale*, *Typhula incarnata*, *T. ishikariensis*, and *Myriosclerotinia borealis*).

**Materials and Methods.** Fungicides were applied on fairways known to have outbreaks of snow molds on October 26, 2015 (Giant's Ridge Golf and Country Club, Biwabik, MN), November 3, 2015 (Cragun's Legacy, Brainerd, MN), and November 6, 2015 (Medina Golf and Country Club, Edina, MN). Prior to application, turf quality ratings were taken on all plots.

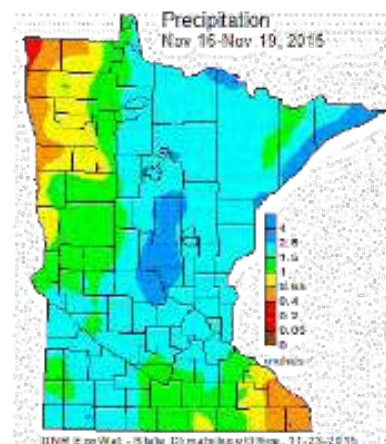
All applications were made creeping bentgrass (*Agrostis stolonifera*) fairways on 1.5 m x 1.5 m plots arranged in a randomized complete block design. Fungicides were applied with a CO<sub>2</sub> pressurized backpack sprayer at 40 psi on a custom boom with two XR Teejet 8004 VS nozzles. Fungicides were applied in 2 gallons water per 1000 ft<sup>2</sup>.

Plots were evaluated after March snow melt. Turf quality was rated on a scale of 0 – 9 where 0 is completely dead grass, 6 is acceptable, and 9 is uniform, dense and dark green in color. Disease was assessed as percent diseased area of the turfgrass. Results were analysed directly in ARM 9.0 software to establish treatment differences. Means reported in each table with the same letter are not significantly different ( $P < 0.05$ )

**Results.** The 2015 to 2016 winter was the 8<sup>th</sup> warmest winter on record in the state of Minnesota (Table 1). Additionally, record rainfalls occurred between November 16 to November 19 throughout the state (Figure 1), with an accumulation of more than 4 inches rain in a three day span across the Twin Cities and surrounding areas.

**Table 1:** Ten warmest winters on record in Minnesota

Rank	Avg. Winter Temp	Winter Year
1 (tie)	23.4°F	2001-2002
1 (tie)	23.4°F	2011-2012
3	23.2°F	1881-1882
4	23.0°F	1997-1998
5	22.7°F	1930-1931
6	22.2°F	1986-1987
7	21.5°F	1920-1921
8	20.9°F	2015-2016
9	20.0°F	1918-1919
10	19.9°F	1982-1983



**Figure 1:** Pattern of precipitation in Minnesota November 16 to 19, 2015.





*Ouch! Test plots at Giants Ridge*

## Cragun's Legacy Golf Course

The average temperature at this location was 37 F (45 max, 29 min temperatures) from November to March. Only 3.65 inches of precipitation that did not last throughout the winter. The plots were evaluated on March 18, 2016. Treatment differences existed for both percent disease and turf quality (Table 2).

c	Treatment Name (Rate)	Initial Turf Quality (0-9)	March 18 Turf Quality (0-9)*	March 18 Percent Disease
1	Untreated	8	3.0 d	12.1 a
2	Daconil WS (5.5 fl oz/1000 ) Interface (6 fl oz/1000) Mirage (2 fl oz/1000)	8	5.3 a	0.6 ab
3	Daconil WS (5.5 fl oz/1000) Tartan (1 fl oz/1000) Interface (3 fl oz / 1000) Mirage (2 fl oz/1000)	8	5.4 a	0.0 b
4	Instrata (11 fl oz/1000)	8	3.5 bcd	0.9 ab
5	Interface (4 fl oz/1000) Mirage (2 fl oz/1000)	8	4.3 a-d	0.4 b
6	Interface (4 fl oz/1000) Mirage (1.5 fl oz/1000)	8	4.8 abc	0.6 ab
7	Concert II (8.5 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	8	4.0 a-d	0.6 ab
8	Concert II (8.5 fl oz/1000) Banner Maxx (1 fl oz/1000) Ambient (0.37 fl oz/1000)	8	4.3 a-d	1.2 ab
9	Concert II (8.5 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	8	4.5 a-d	0.9 ab
10	Concert II (8.5 fl oz/1000) A19188A (1 fl oz/1000) Ambient (0.37 fl oz/1000)	8	5.3 a	0.2 b
11	Headway (3 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	8	5.0 ab	1.2 ab
12	Headway (3 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	8	4.8 abc	0.2 b
13	Insignia (0.7 fl oz /1000) Trinity (1 fl oz/1000) Daconil Ultrex (5 oz/1000) Turficide (8 fl oz/1000)	8	3.0 d	3.5 ab
14	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26 GT (4 fl oz/1000) Turficide (8 fl oz/1000)	8	3.0 d	5.1 ab
15	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26GT (4 fl oz/1000)	8	3.3 cd	5.2 ab





# Precisely Blended Soils

## *Delivered or Mixed On-site*

Topdressing Sands  
Bunker Sands  
Green Colored Topdressing  
Black Dirt & Peat  
Horticultural Mixes

As the Midwest's leading golf course supplier, consistent product quality is critical. We carry a full line of topdressing sands and mixes containing top-grade Minnesota peat. For special needs such as increasing CEC ratio, we custom blend topdressing with fertilizer or humates using our computerized **Accublender™**.

Call our technical service team for soil testing or soil mix recommendations. Visit our website to view the full product offering.

Landscape Rock & Mulch  
Retaining Walls & Pavers  
Field Stone Boulders  
Construction Sand  
Cart Path & Road Base

THE SOIL EXPERTS.



**Plaisted  
Companies**  
INCORPORATED

	Daconil Ultrex (5 oz/1000)			
16	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000)	8	3.8 a-d	1.9 ab
17	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Daconil WS (4 fl oz/1000)	8	3.8 a-d	1.9 ab
18	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Secure (0.5 fl oz/1000)	8	3.8 a-d	0.6 ab
19	Concert II (8.5 fl oz/1000) Turfside (8 fl oz/1000) Foursome (0.5 fl oz/1000)	8	4.0 a-d	1.5 ab

The only snow mold fungus found at the Cragun's Legacy site was *M. nivale* (pink snow mold). If acceptable levels of snow mold disease on fairway turf are considered to be less than 5 % area, all treatments except for the untreated control and treatments 14 and 15 had acceptable levels of control. In terms of turf quality after snow melt, treatments 2, 3 and 10 performed the best.

#### *Medina Fairway Trial*

The trial was applied on November 6, 2015. The average temperature from November to March was 42 F (max 49 F, min 34 F). There were only 3.85 inches of precipitation from November 16 to November 19 and with snow accumulation  $\leq 1$  inch at any point in the season.

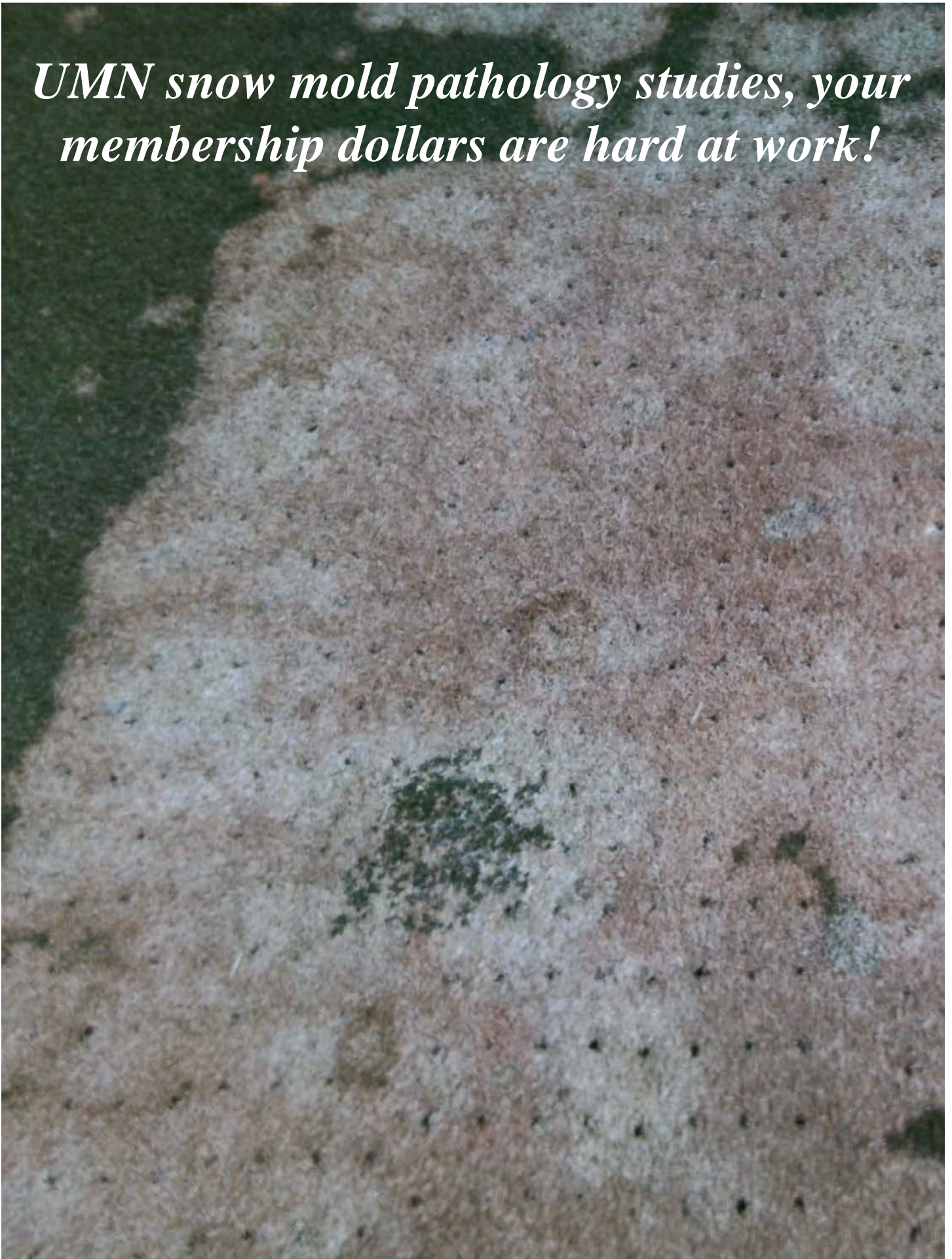
Treatment number	Treatment Name (Rate)	Initial Turf Quality (0-9)	March 14 Turf Quality (0-9)*	March 14 Percent Disease
1	Untreated	6.8	5.8	0.0
2	Interface (6 fl oz/1000)	7.0	5.8	0.0
3	Tartan (2 fl oz/1000) Daconil WS (5.5 fl oz/1000)	7.5	5.8	0.0
4	Instrata (11 fl oz/1000)	7.3	5.8	0.0
5	Daconil WS (5.5 fl oz/1000) Interface (6 fl oz/1000) Mirage (2 fl oz/1000)	7.0	5.3	0.0
6	Daconil WS (5.5 fl oz/1000) Tartan (1 fl oz/1000) Interface (3 fl oz/1000) Mirage (2 fl oz/1000)	7.3	5.5	0.0
7	Instrata (11 fl oz/1000)	7.0	5.3	0.0
8	Interface (5 fl oz/1000)	7.5	5.3	0.0
9	Interface (5 fl oz/1000)	7.0	6.3	0.0
10	Tartan (1 fl oz/1000) Interface (3 fl oz/1000)	7.5	5.5	0.0
11	Instrata (7 fl oz/1000)	7.0	5.3	0.0
12	Interface (4 fl oz/1000) Mirage (1.5 fl oz/1000)	7.0	5.0	0.0
13	Interface (4 fl oz/1000)	7.8	4.5	0.0



	Mirage (2 fl oz/1000)			
14	Concert II (8.5 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	7.0	5.5	0.0
15	Concert II (8.5 fl oz/1000) Banner Maxx (1 fl oz/1000) Ambient (0.37 fl oz/1000)	7.0	5.3	0.0
16	Concert II (8.5 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	7.3	5.8	0.0
17	Concert II (8.5 fl oz/1000) A19188A (1 fl oz/1000) Ambient (0.37 fl oz/1000)	7.5	6.0	0.0
18	Headway (3 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	7.5	5.5	0.0
19	Headway (3 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	7.3	6.0	0.0
20	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) Daconil Ultrex (5 oz/1000) Turficide (8 fl oz/1000)	7.5	5.8	0.0
21	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26 GT (4 fl oz/1000) Turficide (8 fl oz/1000)	7.5	5.5	0.0
22	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26GT (4 fl oz/1000) Daconil Ultrex (5 oz/1000)	7.3	5.3	0.0
23	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000)	7.3	5.0	0.0
24	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Daconil WS (4 fl oz/1000)	7.0	5.3	0.0
25	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Secure (0.5 fl oz/1000)	7.0	5.3	0.0
26	Concert II (8.5 fl oz/1000) Turficide (8 fl oz/1000) Foursome (0.5 fl oz/1000)	7.0	5.3	0.0

No treatments in this study were significantly different at the Medina golf courses. This is due to lack of conditions favoring snow mold disease. This is in contrast to previous years when there were severe outbreaks of both pink and speckled snow mold disease. The general lack of snow cover in this record warm year likely contributed to this lack of disease on untreated plots.

*UMN snow mold pathology studies, your membership dollars are hard at work!*





## *Giant's Ridge*


The trial was applied on October 26, 2015. The average temperature from November to March was 34 F (max 43 F, min 25 F). This location did not experience the heavy rainfall that the rest of the state experienced from November 16 to 19. Snow cover was consistent throughout the winter season  $\geq 1$  inch.

<b>Treatment number</b>	<b>Treatment Name (Rate)</b>	<b>Initial Turf Quality (0-9)</b>	<b>April 4 Turf Quality (0-9)*</b>	<b>April 4 Percent Disease</b>
1	Untreated	7.5	1.0 g	96.7 a
2	Daconil WS (5.5 fl oz/1000 ) Interface (6 fl oz/1000) Mirage (2 fl oz/1000)	6.8	4.3 b-f	6.3 c-f
3	Daconil WS (5.5 fl oz/1000) Tartan (1 fl oz/1000) Interface (3 fl oz / 1000) Mirage (2 fl oz/1000)	6.8	4.5 a-e	3.9 def
4	Instrata (11 fl oz/1000)	7.3	3.8 c-f	12.8 bcd
5	Interface (4 fl oz/1000) Mirage (2 fl oz/1000)	7.0	4.3 b-f	9.3 bcd
6	Interface (4 fl oz/1000) Mirage (1.5 fl oz/1000)	7.8	3.8 c-f	11.9 bcd
7	Concert II (8.5 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	7.5	3.0 ef	18.7 bc
8	Concert II (8.5 fl oz/1000) Banner Maxx (1 fl oz/1000) Ambient (0.37 fl oz/1000)	7.0	2.8 f	30.1 b
9	Concert II (8.5 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	7.3	3.0 ef	26.5 bc
10	Concert II (8.5 fl oz/1000) A19188A (1 fl oz/1000) Ambient (0.37 fl oz/1000)	7.3	3.3 def	15.9 bcd
11	Headway (3 fl oz/1000) A18126B (0.16 oz/1000) Ambient (0.37 fl oz/1000)	6.5	3.3 def	19.6 b
12	Headway (3 fl oz/1000) Secure (0.5 fl oz/1000) Ambient (0.37 fl oz/1000)	6.8	4.0 c-f	11.1 bcd
13	Insignia (0.7 fl oz /1000) Trinity (1 fl oz/1000) Daconil Ultrex (5 oz/1000) Turfside (8 fl oz/1000)	7.8	5.8 a	1.2 f
14	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26 GT (4 fl oz/1000) Turfside (8 fl oz/1000)	7.8	5.3 abc	1.7 ef
15	Insignia (0.7 fl oz/1000) Trinity (1 fl oz/1000) 26GT (4 fl oz/1000)	7.5	4.0 c-f	7.7 b-e

	Daconil Ultrex (5 oz/1000)			
16	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000)	7.5	4.0 c-f	7.7 b-e
17	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Daconil WS (4 fl oz/1000)	7.3	4.8 a-d	3.9 def
18	AMV4820G (8 fl oz/1000) Foursome (0.5 fl oz/1000) Secure (0.5 fl oz/1000)	7.5	3.8 c-f	7.9 b-e
19	Concert II (8.5 fl oz/1000) Turfside (8 fl oz/1000) Foursome (0.5 fl oz/1000)	7.5	5.5 ab	1.9 ef


Giant's Ridge golf course was evaluated on April 4, 2016. There were large differences between treatments. Both pink and speckled snow mold were prevalent on this trial. In terms of turf quality, treatments 3, 13, 14, 17 and 19 provided the best results. The best treatments in terms of disease suppression were 2, 3, 13, 14, 17 and 19 – very much the same as turf quality results.

# Two Keynotes in 2017!



## NORTHERN GREEN


WHERE OUTDOOR PROS CONNECT + GROW



**Eric  
Chester**

**January 11, 2017: Eric Chester**  
*Chester's passion and relevant content will blow you away.*

Eric Chester is a leading voice and a trusted source in the global dialogue on employee engagement and building a world-class workplace culture. Eric has an esteemed history of helping thousands of business leaders create passionate teams throughout their organizations from the emerging generation to those approaching retirement. He has authored four books for employers and co-authored seven others preparing youth for this thing called "work." His most recent book, titled "On Fire at Work: How Legendary Leaders Ignite Passion in Their People without Burning Them Out," will be THE definitive resource business leaders and managers on every level in every industry will turn to for highly applicable and very relevant ideas and strategies for developing a world class workplace culture that engages employees and improves performance and retention.



**Dr. Jermaine  
Davis**

**January 12, 2017: Dr. Jermaine Davis**  
*Davis' high-energy message will motivate you to organizational excellence with teamwork, leadership and communication.*


As an award-winning communications professor and leadership expert, Dr. Jermaine helps teams, associations and organizations thrive and succeed through his highly requested and interactive presentations. Dr. Jermaine helps leaders and frontline employees increase their morale, motivation and momentum by teaching them how-to build a healthy work climate and culture through proactive communication, cooperation and collaboration. Prestigious organizations like 3M, American Express, Best Buy, Boston Scientific, Caterpillar, Enterprise Rent-A-Car, Medtronic, Prudential, Wells Fargo, and West Point Military Academy regularly seek out Dr. Jermaine's expertise in the areas of leadership, employee engagement, motivation, teamwork, and overcoming workplace burnout.

COMPELLING  
CONTENT

UNPARALLELED  
NETWORKING

INNOVATIVE  
INSPIRING  
INCLUSIVE  
INTERACTIVE

CONNECT  
+ GROW



CHOOSE  
YOUR OWN  
ADVENTURE





*Thanks for you support Dr. Orshinsky*

The advertisement for Kabuto fungicide features a samurai warrior in traditional armor riding a red and white golf cart on a green golf course. The warrior holds a long sword aloft in his right hand. In the background, there is a line of trees and a body of water under a blue sky with clouds. To the right of the warrior, the text 'YOU'LL LOVE THE NEW GUY.' is written in large, bold, white capital letters. Below this, 'INTRODUCING KABUTO™: THE DOLLAR SPOT WARRIOR.' is written in smaller white capital letters. Further down, a paragraph of text describes the product's benefits against Dollar Spot. Below the text is a white plastic bottle of Kabuto fungicide. At the bottom right, the PBI/Gordon Corporation logo is displayed, along with contact information and a disclaimer.

**YOU'LL LOVE THE NEW GUY.**

**INTRODUCING KABUTO™: THE DOLLAR SPOT WARRIOR.**

Dollar Spot is persistent, resistant, and costs more to control than any other turf disease in the United States. **New Kabuto™ Fungicide SC** is here to end its grip on your turf and your budget.

University research and end-user trials show new Kabuto provides both preventative and curative control of Dollar Spot. And Kabuto can be applied up to eight times per year as part of a resistance management program.

► For more information, visit [GordonsProfessional.com](http://GordonsProfessional.com) or contact Jeff Schmidt at 952.237.0160.

**pbi / Gordon CORPORATION**  
An Employee-Owned Company

Always read and follow label directions. Pending state registrations. Gordon's® is a registered trademark of PBI-Gordon Corp. Kabuto™ is a trademark of Ishihara Sangyo Kaisha, Ltd. 2/16 04268



## 2015-2016 Snow Mold Control Evaluation Marquette Golf Club – Marquette, MI

Kurt Hockemeyer, Bruce Schweiger, and Paul Koch, Ph.D  
Department of Plant Pathology  
University of Wisconsin-Madison

### OBJECTIVE

To evaluate fungicide efficacy for the control of speckled snow mold (*Typhula ishikariensis*), gray snow mold (*Typhula incarnata*), and Microdochium patch (*Microdochium nivale*) on golf course turfgrass.

### MATERIALS AND METHODS

This evaluation was conducted at Marquette Golf Club in Marquette, MI on a creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) golf course fairway maintained at a height of 0.5 inch. Individual plots measured 3 ft x 10 ft (30 ft<sup>2</sup>), and were arranged in a randomized complete block design with four replications. Individual treatments were applied at a nozzle pressure of 40 p.s.i using a CO<sub>2</sub> pressurized boom sprayer equipped with two XR Teejet AI8004 VS nozzles. All fungicides were agitated by hand and applied in the equivalent of 1.5 gallons of water per 1000 ft<sup>2</sup>. All applications took place on November 3<sup>rd</sup>, 2015. The experimental plot area was not inoculated. There was consistent snow cover on the experimental area from late December until mid-March and then again until mid-April, a total of approximately 90 days. Disease severity, turf quality, and turf color were recorded on March 31<sup>st</sup>, 2016. Disease severity was visually rated as percent area affected, turfgrass quality was visually rated on a 1-9 scale with 6 being acceptable, and Normalized Difference Vegetative Index (turfgrass color) was rated using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc. (Aurora, IL). During data collection the NDVI meter stopped working and a few treatment means for NDVI are based on three replications, not four replications. Treatment means were analyzed using the Fisher LSD method and are presented in Table 1. In addition, surface temperature on the research plot was recorded using a Spectrum Watchdog® data logger and is presented in Figure 1.

### RESULTS AND DISCUSSION

Disease pressure was very high at Marquette GC in 2015-2016, with non-treated controls averaging 84% disease. Microdochium patch was the primary disease observed in the experimental area (75%), though gray and speckled snow mold were also observed. Despite this intense pressure, all but one treatment provided significant disease suppression relative to the non-treated control and 17 of those provided excellent suppression under harsh conditions (<5%). Nearly all of these treatments contained at least three active ingredients, with some treatments containing four or even five active ingredients. Turf quality closely mirrored disease severity and 27 treatments provided a mean quality rating of 6 or higher. Phytotoxicity was not observed with any treatment.



**Table 1: Mean snow mold severity, turf quality, and turf color assessed on March 31<sup>st</sup>, 2016 at Marquette Country Club in Marquette, MI.**

Treatment	Rate	Application Timing <sup>a</sup>	Disease Severity <sup>b</sup>	Turf Quality <sup>c</sup>	Turf Color <sup>d</sup>
1 Non-treated control			83.8a	1.8m	0.4603p
2 Fame T	0.44 fl oz/1000 ft2	Late	8.8u-y	5.3b-g	0.6638a-d
3 Fame T	0.67 fl oz/1000 ft2	Late	2.8y	6.8a	0.6745abc
4 Fame T	0.89 fl oz/1000 ft2	Late	3.5y	6.5ab	0.6704abc
5 Fame SC	0.36 fl oz/1000 ft2	Late	41.3e-n	3.8h-l	0.509k-p
6 Fame SC Tourney	0.36 fl oz/1000 ft2 0.44 oz/1000 ft2	Late	5.5wxy	6.3abc	0.6594a-d
7 Fame SC Tourney	0.18 fl oz/1000 ft2 0.44 oz/1000 ft2	Late	2.3y	6.8a	0.662a-d
8 Fame SC Tourney	0.36 fl oz/1000 ft2 0.37 oz/1000 ft2	Late	2.3y	6.8a	0.6907a
9 Tourney	0.44 oz/1000 ft2	Late	62.5bcd	3j-m	0.5863b-l
10 Fame C	6.0 fl oz/1000 ft2	Late	18.8o-y	4.8d-h	0.6824ab
11 Fame C Chipco 26GT	6.0 fl oz/1000 ft2 4.0 fl oz/1000 ft2	Late	18.8o-y	5c-h	0.615a-j
12 Adjuvant UW2015-114	8.0 fl oz/1000 ft2 1.93 fl oz/1000 ft2	Late	81.3ab	1.8m	0.4625op
13 Banner MAXX II UW2015-114	2.0 fl oz/1000 ft2 1.93 fl oz/1000 ft2	Late	46.3d-l	3.8h-l	0.5538f-n
14 Insignia SC Trinity Daconil Ultrex Turfside	0.7 fl oz/1000 ft2 1.0 fl oz/1000 ft2 5.0 oz/1000 ft2 8.0 fl oz/1000 ft2	Late	1.8y	6.8a	0.6583a-d
15 Insignia SC Trinity Chipco 26GT Turfside	0.7 fl oz/1000 ft2 1.0 fl oz/1000 ft2 4.0 fl oz/1000 ft2 8.0 fl oz/1000 ft2	Late	4.3xy	6.3abc	0.677abc
16 Insignia SC Trinity Turfside	0.7 fl oz/1000 ft2 1.0 fl oz/1000 ft2 8.0 fl oz/1000 ft2	Late	6.8v-y	5.8a-e	0.6715abc
17 Insignia SC Trinity Chipco 26GT Daconil Ultrex	0.7 fl oz/1000 ft2 1.0 fl oz/1000 ft2 4.0 fl oz/1000 ft2 5.0 oz/1000 ft2	Late	1.8y	6.8a	0.6675abc
18 Concert II A19188A Par WIN15008	6.375 fl oz/1000 ft2 0.75 fl oz/1000 ft2 0.37 fl oz/1000 ft2 10.0 fl oz/A	Late	18.8o-y	5c-h	0.665abc
19 Chipco 26GT Daconil Weatherstik	4.0 fl oz/1000 ft2 5.5 fl oz/1000 ft2	Late	26.3l-w	4.5e-i	0.5627d-n
20 Chipco 26GT Secure	4.0 fl oz/1000 ft2 0.5 fl oz/1000 ft2	Late	51.3d-i	3j-m	0.51k-p

<sup>a</sup>All fungicide treatments applied Nov. 3<sup>rd</sup>, 2015.

<sup>b</sup>Mean percent diseased area assessed on March 31<sup>st</sup>, 2016.

<sup>c</sup>Quality was visually assessed where 1 = dead, 6 = acceptable, 9 = dark green.

<sup>d</sup>Color was assessed using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc.



**NORTHERN GREEN**  
WHERE OUTDOOR PROS CONNECT + GROW

# REGISTRATION PACKAGES

OPTIONS & FEATURES	3-Day Pass (Tue–Th)	3-Day Pass + CEO Track on Wednesday	3-Day Pass + Interactive Track on Thursday	2-Day Pass (W–Th)	2-Day Pass + CEO Track on Wednesday	2-Day Pass + Interactive Track on Thursday	Trade Show Only (W–Th)	Student (W–Th)
<b>PRE-REGISTER</b> (ON OR BEFORE DEC. 30, 2016*)	\$299	\$378	\$378	\$149	\$228	\$228	\$35	\$40
<b>PRE-REG. NON-MEMBER</b>	\$319	\$398	\$398	\$169	\$248	\$248	\$40	\$40
<b>REGISTER ONSITE</b> (JAN. 10-12, 2017)	\$379	\$458	\$458	\$229	\$308	\$308	\$45	\$50
<b>REG. ONSITE NON-MEMBER</b>	\$399	\$478	\$478	\$249	\$328	\$328	\$45	\$50
Choice of 1 Tuesday Master Class (formerly Super Tuesday)	✓	✓	✓					
Wednesday Concurrent Educational Sessions	✓	✓	✓	✓	✓	✓		✓
Thursday Concurrent Educational Sessions	✓	✓	✓	✓	✓	✓		✓
Access to Tuesday's Trade Show Preview Party <b>NEW!</b>	✓	✓	✓	✓	✓	✓		✓
Access to 2 keynote speakers <b>NEW!</b>	✓	✓	✓	✓	✓	✓		✓
Access to 2 Days of Free Lunch on the Trade Show floor** <b>NEW!</b>	✓	✓	✓	✓	✓	✓	✓	✓
Campfire mini sessions on the trade show floor	✓	✓	✓	✓	✓	✓	✓	✓
All exhibits/trade show pass	✓	✓	✓	✓	✓	✓	✓	✓
Access to sandbox competition and show floor demos <b>NEW!</b>	✓	✓	✓	✓	✓	✓	✓	✓
Access to sessions in Innovation & Inspiration Theater <b>NEW!</b>	✓	✓	✓	✓	✓	✓	✓	✓
Morning Coffee	✓	✓	✓	✓	✓	✓	✓	✓
Career Central	✓	✓	✓	✓	✓	✓	✓	✓
Networking	✓	✓	✓	✓	✓	✓	✓	✓
CEO Lounge <b>NEW!</b>		✓			✓			
CEO Track Premium Content <b>NEW!</b>		✓			✓			
Interactive Track Exclusive Content <b>NEW!</b>			✓			✓		

\*Name badges will be mailed to those who register by December 9<sup>th</sup>...no waiting in line!

**NEW!** Those who register between December 10<sup>th</sup> and 30<sup>th</sup> will receive an email with their badge information. Bring the emailed badge information with you to the show and visit one of our new **Self Check-In** kiosks in the Registration Center.

\*\*Available to the first 2,000 attendees Wednesday and Thursday.

More information coming throughout the year and at  
[WWW.NORTHERNGREEN.ORG](http://WWW.NORTHERNGREEN.ORG)

JANUARY  
10-12,  
2017

MINNEAPOLIS  
CONVENTION  
CENTER

CHOOSE  
YOUR OWN  
ADVENTURE



# SUPERCHARGED BENTGRASS

 **BENGAL**

 **PENNEAGLE II**

 **PENNWAY**  
FOR FAIRWAY USE

 **PENNACROSS  
BENTGRASS**

 **PennLinks II**

 **PENNTRIO**  
CREATING CREATING CREATING VALUE

 **CRYSTAL  
BLUELINKS**  
PREMIUM CREEPING BENTGRASS

 **PURE DISTINCTION**  
CREEPING BENTGRASS

 **Nu-Penn**  
CREEPING  
BENTGRASS  
**BLEND**

 **PENN  
A1/A4**  
CUSTOM  
MIXTURE

 **PURE SELECT**  
CREEPING BENTGRASS

 **SEASIDE II**  
CREEPING  
BENTGRASS

 **PENN  
A-1**  
CREEPING  
BENTGRASS

 **PUREFORMANCE**  
FAIRWAY BLEND

 **PENN  
A-4**

 **BARKING**

 **HERIOT**  
COLONIAL BENTGRASS

The Best Seed  
Optimized to  
Outperform



**YELLOW JACKET**  
ENHANCED SEED COATING

## Bentgrass Enhanced for Ultimate Performance from the Start

Supercharged Bentgrass combines top-rated bentgrass varieties with Yellow Jacket® seed coating. The result is a supercharged seed that germinates and establishes better while reducing water consumption and establishment costs. Yellow Jacket acts like a sponge around the seed, holding water and nutrients for the seed to draw on as needed for germination. Supercharged Bentgrass also contains APRON® XL which provides the seedling increased disease protection during establishment.

### Experience the Yellow Jacket Advantage

- ▣ Provides moisture during seed germination
- ▣ Improves rooting and establishment
- ▣ Absorbs and releases nutrients to seedlings
- ▣ Reduces need for frequent watering during establishment
- ▣ Improves handling and visibility of seed



Call your local Tessman location for seed orders:

Tessman (St. Paul) ..... (651) 487-3850

Tessman (Fargo) ..... (701) 232-7238

Tessman (Sioux Falls) ..... (605) 368-2586

 **BARENBRUG**

Great in Grass®

[www.barusa.com](http://www.barusa.com)







**Table 1 (cont): Mean snow mold severity, turf quality, and turf color assessed on March 31<sup>st</sup>, 2016 at Marquette Country Club in Marquette, MI.**

Treatment		Rate	Application Timing <sup>a</sup>	Disease Severity <sup>b</sup>	Turf Quality <sup>c</sup>	Turf Color <sup>d</sup>
21	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>	Late	47.5d-k	3.8h-l	0.5757c-m
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
22	Turfcide	12.0 fl oz/1000 ft <sup>2</sup>	Late	20o-y	4.8d-h	0.6293a-h
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
23	Turfcide	16.0 fl oz/1000 ft <sup>2</sup>	Late	35h-q	4.3f-j	0.5405h-p
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
24	AMV4820-G	8.0 fl oz/1000 ft <sup>2</sup>	Late	33.8h-r	4.3f-j	0.612a-j
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
25	AMV4820-G	8.0 fl oz/1000 ft <sup>2</sup>	Late	16.3p-y	5.3b-g	0.651a-f
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
	Daconil Weatherstik	4.0 fl oz/1000 ft <sup>2</sup>				
26	AMV4820-G	8.0 fl oz/1000 ft <sup>2</sup>	Late	10u-y	5.3b-g	0.6675abc
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
27	AMV4820-G	8.0 fl oz/1000 ft <sup>2</sup>	Late	22.5n-y	4.8d-h	0.6503a-f
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
	Secure	0.5 fl oz/1000 ft <sup>2</sup>				
28	AMV4820-G	10.0 fl oz/1000 ft <sup>2</sup>	Late	18o-y	5.5a-f	0.6225a-i
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
29	AMV4820-G	10.0 fl oz/1000 ft <sup>2</sup>	Late	8.8u-y	5.5a-f	0.6493a-f
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
	Daconil Weatherstik	4.0 fl oz/1000 ft <sup>2</sup>				
30	AMV4820-G	12.0 fl oz/1000 ft <sup>2</sup>	Late	18.8o-y	5c-h	0.6405a-g
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
31	AMV4820-G	12.0 fl oz/1000 ft <sup>2</sup>	Late	5.5wxy	6a-d	0.6894a
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
	Daconil Weatherstik	4.0 fl oz/1000 ft <sup>2</sup>				
32	Interface	5.0 fl oz/1000 ft <sup>2</sup>	Late	5.5wxy	6a-d	0.6317a-h
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
33	Interface	5.0 fl oz/1000 ft <sup>2</sup>	Late	22.5n-y	5c-h	0.644a-g
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
34	Concert II	8.5 fl oz/1000 ft <sup>2</sup>	Late	19.3o-y	5.5a-f	0.658a-e
	Banner MAXX II	1.0 fl oz/1000 ft <sup>2</sup>				
35	Concert II	5.5 fl oz/1000 ft <sup>2</sup>	Late	4xy	6.5ab	0.6578a-e
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
36	Concert II	8.5 fl oz/1000 ft <sup>2</sup>	Late	4.8xy	6.3abc	0.659a-d
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
37	Insignia SC	0.7 fl oz/1000 ft <sup>2</sup>	Late	21.3n-y	5c-h	0.6405a-g
	Trinity	1.0 fl oz/1000 ft <sup>2</sup>				
38	Insignia SC	0.7 fl oz/1000 ft <sup>2</sup>	Late	10u-y	5.3b-g	0.6373a-g
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				

<sup>a</sup>All fungicide treatments applied Nov. 3<sup>rd</sup>, 2015.

<sup>b</sup>Mean percent diseased area assessed on March 31<sup>st</sup>, 2016.

<sup>c</sup>Quality was visually assessed where 1 = dead, 6 = acceptable, 9 = dark green.

<sup>d</sup>Color was assessed using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc.

**Table 1 (cont): Mean snow mold severity, turf quality, and turf color assessed on March 31<sup>st</sup>, 2016 at Marquette Country Club in Marquette, MI.**

Treatment		Rate	Application Timing <sup>a</sup>	Disease Severity <sup>b</sup>	Turf Quality <sup>c</sup>	Turf Color <sup>d</sup>
39	Torque	0.6 fl oz/1000 ft <sup>2</sup>	Late	12.5s-y	5.3b-g	0.6528a-e
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
40	Torque	0.9 fl oz/1000 ft <sup>2</sup>	Late	27.5k-v	4.5e-i	0.6544a-e
	Turfcide	8.0 fl oz/1000 ft <sup>2</sup>				
	Foursome	0.5 fl oz/1000 ft <sup>2</sup>				
41	Concert II	8.5 fl oz/1000 ft <sup>2</sup>	Late	6.8v-y	5.8a-e	0.6777abc
	A18126B	0.16 oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
42	Concert II	5.0 fl oz/1000 ft <sup>2</sup>	Late	8.8u-y	5.5a-f	0.6663abc
	A18126B	0.16 oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
43	Concert II	8.5 fl oz/1000 ft <sup>2</sup>	Late	3.5y	6.5ab	0.6615a-d
	A18126B	0.16 oz/1000 ft <sup>2</sup>				
	Medallion SC	2.0 fl oz/1000 ft <sup>2</sup>				
44	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	9.3u-y	5.5a-f	0.6753abc
	Concert II	8.5 fl oz/1000 ft <sup>2</sup>				
	Secure	0.5 fl oz/1000 ft <sup>2</sup>				
45	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	16.8p-y	5.5a-f	0.6754abc
	Concert II	5.0 fl oz/1000 ft <sup>2</sup>				
	Secure	0.5 fl oz/1000 ft <sup>2</sup>				
46	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.5a-f	0.659a-d
	Concert II	8.5 fl oz/1000 ft <sup>2</sup>				
	A19188A	1.0 fl oz/1000 ft <sup>2</sup>				
47	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	9.3u-y	5.8a-e	0.645a-f
	Concert II	5.0 fl oz/1000 ft <sup>2</sup>				
	A19188A	1.0 fl oz/1000 ft <sup>2</sup>				
48	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	20.5n-y	5.3b-g	0.6733abc
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
	A18126B	0.16 oz/1000 ft <sup>2</sup>				
49	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	27.5k-v	5c-h	0.6135a-j
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
	A19188A	1.0 fl oz/1000 ft <sup>2</sup>				
50	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.5a-f	0.6548a-e
	Headway	3.0 fl oz/1000 ft <sup>2</sup>				
	A18126B	0.16 oz/1000 ft <sup>2</sup>				
51	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	13.8r-y	5.3b-g	0.6707abc
	Headway	3.0 fl oz/1000 ft <sup>2</sup>				
	Secure	0.5 fl oz/1000 ft <sup>2</sup>				
52	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	10u-y	5.5a-f	0.6044a-k
	Concert II	8.5 fl oz/1000 ft <sup>2</sup>				
	Banner MAXX II	1.0 fl oz/1000 ft <sup>2</sup>				
53	Par	0.37 fl oz/1000 ft <sup>2</sup>	Late	25m-x	4.5e-i	0.5795c-l
	Renown	2.5 fl oz/1000 ft <sup>2</sup>				
	A18126B	0.16 oz/1000 ft <sup>2</sup>				

<sup>a</sup>All fungicide treatments applied Nov. 3<sup>rd</sup>, 2015.

<sup>b</sup>Mean percent diseased area assessed on March 31<sup>st</sup>, 2016.

<sup>c</sup>Quality was visually assessed where 1 = dead, 6 = acceptable, 9 = dark green.

<sup>d</sup>Color was assessed using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc.



# A TOAST, IN APPRECIATION OF YOUR BUSINESS. HERE'S TO YOU.

At Par Aide, we'd like to raise a paper cup to you, our valued customer. Because it's your unyielding dedication to the course that inspires us to keep building the industry's most innovative products. So from Par Aide, we salute all you do. Cheers.



*Wherever golf is played.*



PAR AIDE IS A PROUD SPONSOR OF  
MCCSA, GCSAA, THE FIRST TEE  
AND THE WEE ONE FOUNDATION.

**Table 1 (cont): Mean snow mold severity, turf quality, and turf color assessed on March 31<sup>st</sup>, 2016 at Marquette Country Club in Marquette, MI.**

Treatment		Rate	Application Timing <sup>a</sup>	Disease Severity <sup>b</sup>	Turf Quality <sup>c</sup>	Turf Color <sup>d</sup>
54	Renown	2.5 fl oz/1000 ft <sup>2</sup>	Late	13.8r-y	5.3b-g	0.6608a-d
	A19188A	1.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
55	Renown	2.5 fl oz/1000 ft <sup>2</sup>	Late	57.5c-f	3.3i-l	0.5213j-p
	Secure	0.5 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
56	A21664	0.8 fl oz/1000 ft <sup>2</sup>	Late	28.8j-u	4.5e-i	0.584c-l
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
57	A21664	0.8 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.3b-g	0.6417a-g
	A17856	1.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
58	A21664	0.8 fl oz/1000 ft <sup>2</sup>	Late	4.3xy	6.3abc	0.6598a-d
	A17856	2.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
59	A21664	0.8 fl oz/1000 ft <sup>2</sup>	Late	10.5t-y	5.5a-f	0.6737abc
	A13705	2.6 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
60	A18126B	0.164 oz/1000 ft <sup>2</sup>	Late	6.8v-y	6a-d	0.6905a
	A13705	2.6 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
61	A17856	1.0 fl oz/1000 ft <sup>2</sup>	Late	27.5k-v	4.8d-h	0.5934a-k
	A19188A	1.0 fl oz/1000 ft <sup>2</sup>				
	Banner MAXX II	2.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
62	A19188A	1.0 fl oz/1000 ft <sup>2</sup>	Late	8.8u-y	5.5a-f	0.643a-g
	A13705	2.6 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
63	A19188A	1.0 fl oz/1000 ft <sup>2</sup>	Late	16.3p-y	5c-h	0.677abc
	A17856	2.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
64	A18126B	0.164 oz/1000 ft <sup>2</sup>	Late	12.5s-y	5c-h	0.654a-e
	A17856	2.0 fl oz/1000 ft <sup>2</sup>				
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
65	Instrata	9.0 oz/1000 ft <sup>2</sup>	Late	15q-y	5c-h	0.6508a-f
	Par	0.37 fl oz/1000 ft <sup>2</sup>				
66	Interface	6.0 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.3b-g	0.6687abc
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
67	Interface	4.0 fl oz/1000 ft <sup>2</sup>	Late	21.5n-y	4.8d-h	0.5997a-k
	Mirage	1.4 fl oz/1000 ft <sup>2</sup>				
77	26GT Xtra	5.0 fl oz/1000 ft <sup>2</sup>	Late	3.5y	6.5ab	0.683a
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
78	26GT Xtra	6.0 fl oz/1000 ft <sup>2</sup>	Late	8u-y	6a-d	0.6594a-d
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				

<sup>a</sup>All fungicide treatments applied Nov. 3<sup>rd</sup>, 2015.

<sup>b</sup>Mean percent diseased area assessed on March 31<sup>st</sup>, 2016.

<sup>c</sup>Quality was visually assessed where 1 = dead, 6 = acceptable, 9 = dark green.

<sup>d</sup>Color was assessed using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc.



**Table 1 (cont): Mean snow mold severity, turf quality, and turf color assessed on March 31<sup>st</sup>, 2016 at Marquette Country Club in Marquette, MI.**

Treatment		Rate	Application Timing <sup>a</sup>	Disease Severity <sup>b</sup>	Turf Quality <sup>c</sup>	Turf Color <sup>d</sup>
79	26GT Xtra	8.0 fl oz/1000 ft <sup>2</sup>	Late	4.8xy	6.3abc	0.6614a-d
	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
83	Compass	0.2 oz/1000 ft <sup>2</sup>	Late	43.8d-m	3.8h-l	0.5955a-k
84	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	16.3p-y	5c-h	0.6515a-e
	Exteris	4.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
85	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	12.5s-y	5.3b-g	0.6715abc
	Exteris	5.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
86	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.5a-f	0.6904a
	Exteris	6.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
87	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	4.8xy	6.3abc	0.6515a-e
	Interface	6.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
88	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	6.3wxy	5.8a-e	0.6555a-e
	Interface	3.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
	Proxy	5.0 fl oz/1000 ft <sup>2</sup>				
	Tartan	1.0 fl oz/1000 ft <sup>2</sup>				
89	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	5.5wxy	6a-d	0.669abc
	Interface	3.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
	Tartan	1.0 fl oz/1000 ft <sup>2</sup>				
90	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	7.3v-y	6a-d	0.6644a-d
	Interface	6.0 fl oz/1000 ft <sup>2</sup>				
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
92	Exteris	6.0 fl oz/1000 ft <sup>2</sup>	Late	61.3b-e	2.8klm	0.6055a-k
93	Instrata	11.0 fl oz/1000 ft <sup>2</sup>	Late	11.3t-y	5.3b-g	0.6378a-g
94	Interface	1.57 fl oz/1000 ft <sup>2</sup>	Late	48.8d-j	3.3i-l	0.5848b-l
95	Daconil Weatherstik	5.5 fl oz/1000 ft <sup>2</sup>	Late	18.8o-y	4.8d-h	0.582c-l
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
96	Interface	4.0 fl oz/1000 ft <sup>2</sup>	Late	12.5s-y	5c-h	0.6528a-e
	Mirage	1.5 fl oz/1000 ft <sup>2</sup>				
97	Interface	4.0 fl oz/1000 ft <sup>2</sup>	Late	15q-y	5.3b-g	0.65a-f
	Mirage	2.0 fl oz/1000 ft <sup>2</sup>				
98	Interface	4.0 fl oz/1000 ft <sup>2</sup>	Late	17.5p-y	5c-h	0.5795c-l
	Mirage	1.5 fl oz/1000 ft <sup>2</sup>				
	Proxy	5.0 fl oz/1000 ft <sup>2</sup>				
100	Mirage	1.0 fl oz/1000 ft <sup>2</sup>	Late	61.3b-e	3j-m	0.5605e-n

<sup>a</sup>All fungicide treatments applied Nov. 3<sup>rd</sup>, 2015.

<sup>b</sup>Mean percent diseased area assessed on March 31<sup>st</sup>, 2016.

<sup>c</sup>Quality was visually assessed where 1 = dead, 6 = acceptable, 9 = dark green.

<sup>d</sup>Color was assessed using a FieldScout TCM 500 NDVI Turf Color Meter from Spectrum Technologies, Inc.

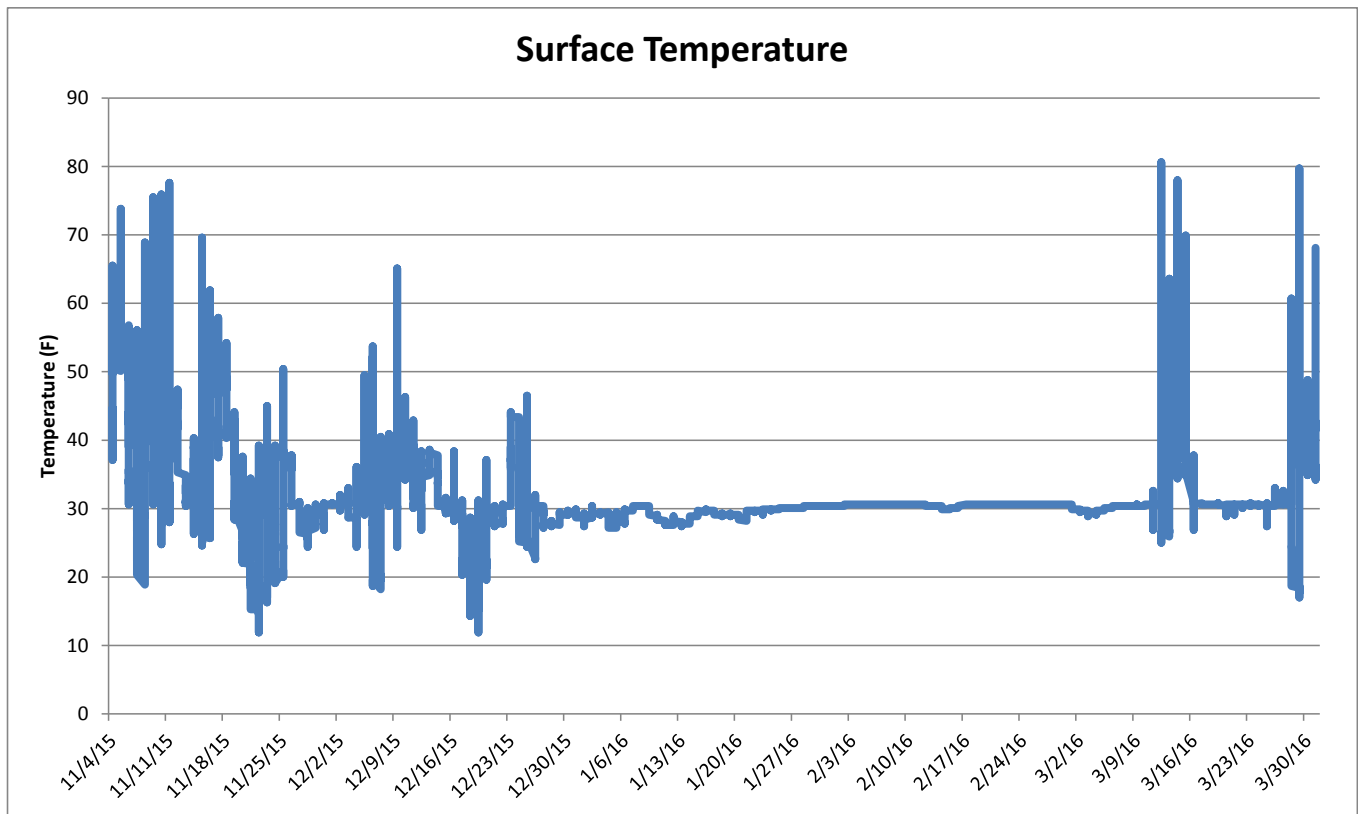


Figure 1: Surface temperature at Marquette Country Club in Marquette, MI during the winter of 2015-2016.



**HERFORT □ NORBY**  
**G o l f   C o u r s e   A r c h i t e c t s**

Phone: 952.361.0644   Fax: 952.361.0645  
e-mail: [golfnorby@earthlink.net](mailto:golfnorby@earthlink.net)   web: [www.herfortnorby.com](http://www.herfortnorby.com)



*The MGCSA thanks Dr. Paul Koch,  
Bruce Hockemeyer, Bruce Schweiger  
and the Plant Pathology Department at  
the University of Wisconsin-Madison  
for their continued support of turf  
pathology research in the upper  
midwest.*



INNOVATORS IN  
**IMPERMEABLE**  
WINTER PROTECTION

Helps prevent  
Ice Damage  
Crown Hydration  
Desiccation  
Temperature Fluctuations  
Low Temperature Kill



Learn more! Find 20 Years of Research  
at [GreenJacket.com](http://GreenJacket.com) or call 888-786-2683

patented in U.S. and Canada

Actual spring photo by a Superintendent — not retouched!

# *Member Driven Research Information Ready For Your Use*



## *A Multitude of Portable Moisture Meters*

*By: Sam Bauer, Assistant Extension Professor  
University of Minnesota Extension*

Water management is considered one of the most important day to day practices on a golf course and for good reason. Firm and fast is the name of the game today for playability, and from an agronomic standpoint moisture has a direct

impact on turf health and rooting. In recent years, we have witnessed a steady increase in the number of golf courses that are purchasing and using soil moisture meters to aid in managing water. This article is meant to summarize the moisture

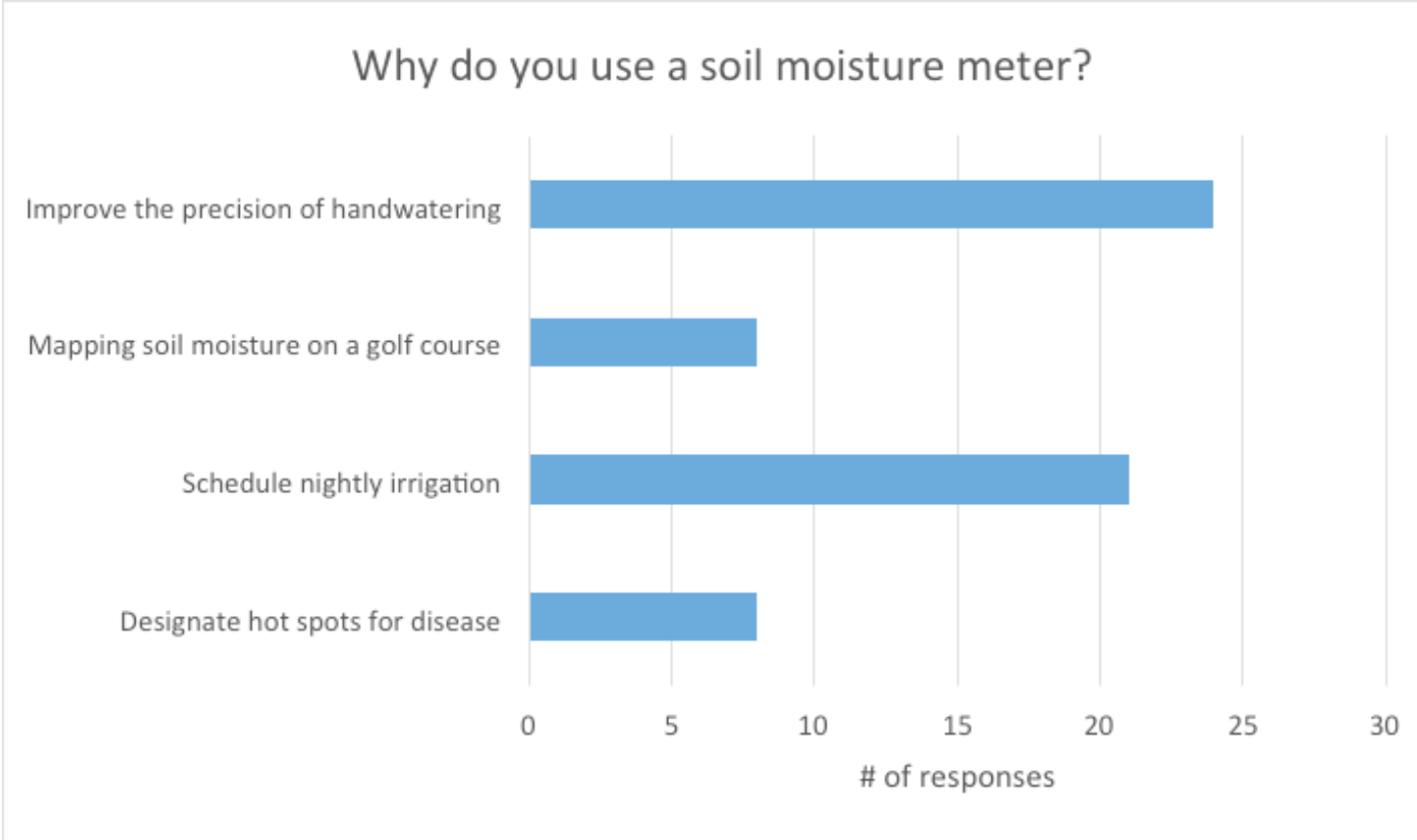


meter options available and to provide insight into the various features available today.

I was first introduced to soil moisture meters by a U of M Master’s student, Jon Sass, in 2004. Jon was using the Spectrum TDR 300 portable meter and the Decagon ECH2O in situ meter to measure water use by creeping bentgrass grown on a sand-based green. Initially, I was amazed at the ease of use with the portable system and I quickly purchased one to begin some investigation. I found that

having a reference number for when to water greatly improved the performance of my turf and also allowed me to sleep well at night without hitting the start button on my irrigation programs. Hand watering quickly became easier and much more efficient, as did my conversations with other staff members about moisture levels across the golf course. Fast forward twelve years later and moisture meter use in the turf industry has increased rapidly.

In the spring of 2016, we conducted a survey of MGCSA mem-



**Figure 1. Superintendent responses to the question, “Why do you use a soil moisture meter?” (n=31)**

bers asking questions related to moisture meter use and the results are fairly interesting. Almost 60% of the respondents (n=54) indicated that they use a soil moisture meter in some capacity. Spectrum Technologies TDR 300 is the meter in use by most, but multiple respondents indicated using the POGO meter by Stevens Water. No other meter brands were mentioned by the 31 respondents who used meters. From the survey, the main reasons for using moisture meters include to improve the precision of hand watering and to schedule nightly irriga-

tion (Figure 1).

Moisture meters come in all shapes and sizes (Image 1), and they have various features from WiFi technology and cloud based software, to smart phone mapping systems. With all of the different features, the world of moisture meters can get confusing really quickly. We were curious to know what features are most important to you as a manager of turf. Based on your responses, quick measurement was the most important feature, followed by affordability (Figure 2).

**DO MORE WITH YOUR MOWER!**

Visit us at  
**GIE+EXPO**  
THE GREEN INDUSTRY & EQUIPMENT EXPO  
INDOOR BOOTH  
**#8054**  
OUTDOOR BOOTH  
**#6017D**

With a single mount bar, you can add on any JRCO attachment!

**Jrco**  
Heavy-duty Attachments  
for Commercial Mowers

AERATOR    DETHATCHER    BLOWER BUGGY    LEAF PLOW    SPREADER

(866) 537-6231 | [JRCOINC.COM/HNM](http://JRCOINC.COM/HNM)    MADE IN THE USA





***Image 1: A variety of portable soil moisture meters. From left to right- Spectrum Economy Soil Moisture Tester, Turf-Tec Digital Moisture Sensor, Spectrum FieldScout TDR 300 w/ GPS, Delta-T TH2O Soil Moisture Meter, Stevens Water POGO, Campbell Scientific Hydrosense II***

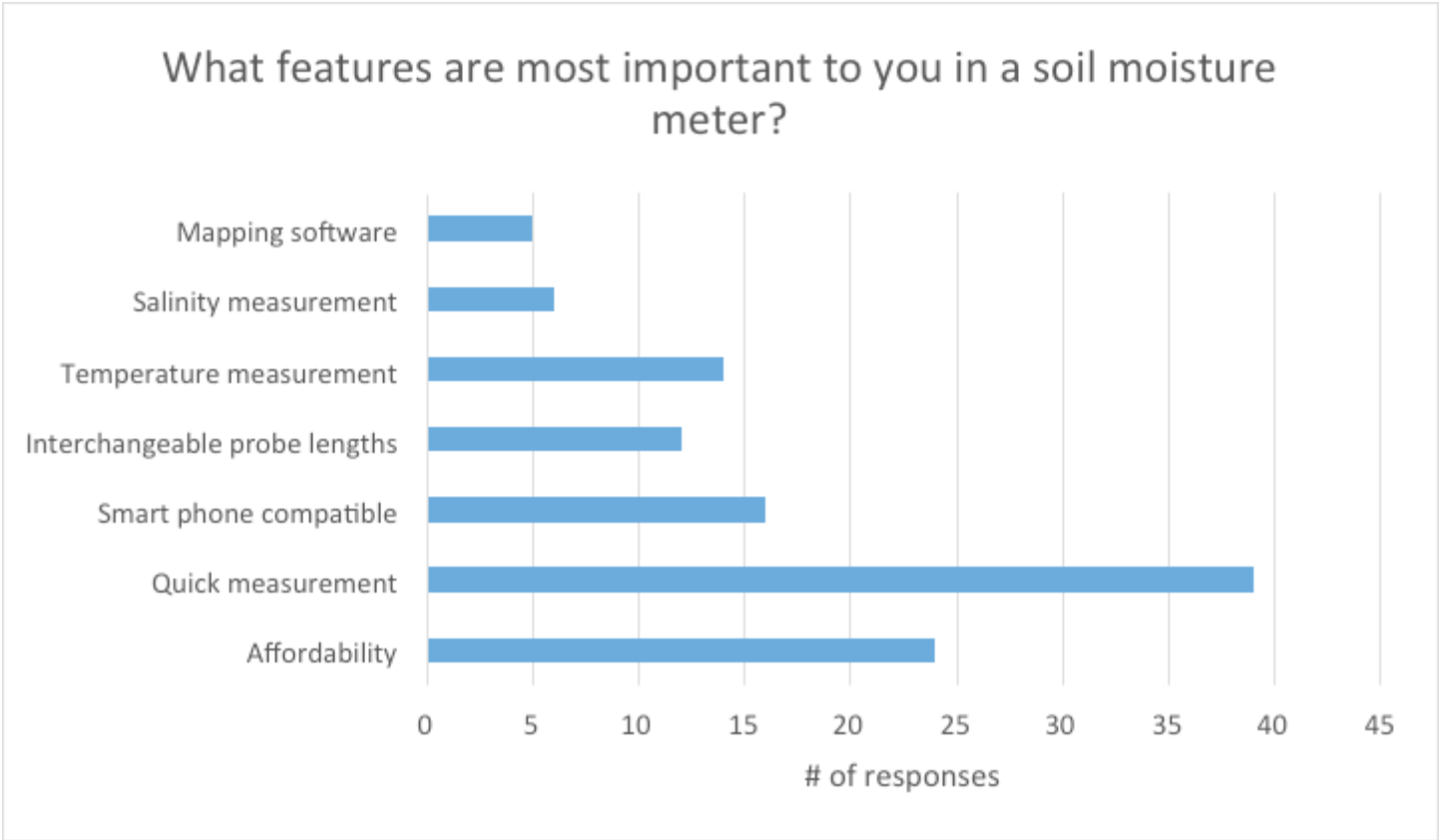
Surprisingly, mapping software ranked lowest in importance and this is likely a reflection of the fact that most use these tools for hand watering and nightly scheduling. Perhaps soil water auditing will start to catch on in the future through the use of soil moisture meters, and many researchers and turf managers are already talking about this.

**Portable meter options:**

*(Authors note: this is not a comprehensive list of all portable soil mois-*

*ture meters available. The author acknowledges that there are other portable moisture meters available and apologizes if your moisture meter was unintentionally omitted from this list).*

Portable soil moisture meters offer the flexibility to rapidly sample multiple locations and correct moisture deficiencies accurately. They can also record and store measurements to create maps and share data with colleagues. Outlined below are six soil moisture meters cur-



**Figure 2. Superintendent responses to the question “What features are most important to you in a soil moisture meter?” (n=50)**



rently used by the turf industry.

### ***Spectrum FieldScout TDR 300***

(~\$1,100)- Currently the most popular meter in use on golf courses in Minnesota, the TDR 300 utilizes time-domain reflectometry, converting an electrical signal to a percentage of moisture in the soil. This stand-up version of the TDR 100 costs roughly \$300 more than its counterpart and allows the user to take measurements in as standing position. Interchangeable probes allow for measurements at rooting depths of 1.5, 3.0, 4.8, or 8.0 inches (\$59 for one set of two probes).

Some turf managers like to change measurement depths throughout the season based on the seasonal root growth; deeper in spring/fall and shallower in summer. I prefer to stick with one probe length throughout the growing season and simply increase moisture thresholds to account for the summer reduction in root depth, if required. This is only a personal preference, but it helps to keep reference moisture percentages consistent.

The TDR 300 measures volumetric water content (VWC) with a setting for either Standard or Hi-Clay soils.

 **JOHN DEERE**



Its Your Time to...  
**EXPLORE YOUR FRONTIER!**

  
John Deere 9009A

  
John Deere 7500A

  
John Deere 2030A

  
Wiedenmann Super 500

Cannon Falls, MN  
(507) 263-4238

Rosemount, MN  
(651) 423-2274

Hastings, MN  
(651) 437-7747

New Richmond, WI  
(715) 246-6565

Osceola, WI  
(715) 294-2191

Turtle Lake, WI  
(715) 986-4403













**EXPLORE YOUR FRONTIER**

You can calibrate these instruments specifically for your soils, but this is often unnecessary once you find your reference percentages for wilting point, field capacity and saturation. These reference percentages will often hold true for turf built on similar soils, such as putting greens and fairways, assuming the grass species and rooting depth are consistent.

The TDR 300 also has a setting to measure relative water content (RWC) on a scale of zero to 100, which can be useful for calculating irrigation requirements. In RWC mode, the user must define upper and lower soil moisture reference levels, and the amount of water required to restore soil moisture levels is calculated. Add-ons to the TDR 300 include a portable GPS logger (Garmin \$230, GPS mounting bracket \$149, GPS cable \$39) and Bluetooth phone compatibility (\$249 for Bluetooth module). You would choose either the GPS or the Bluetooth option to create moisture distribution maps through the SpecMaps ProTurf software (\$299 annually, [specmaps.com](http://specmaps.com)). A subscription to SpecConnect Pro (\$249 annually, [specconnect.net](http://specconnect.net)) allows

you to upload data with GPS coordinates through your smartphone. Reported accuracy of the Spectrum TDR technology is  $\pm 3.0\%$  VWC in soils with an electrical conductivity (EC) of  $< 2$  mS/cm; TDR technology is influenced by salinity and this is a limitation with the technology. A reading of 10% VWC with the TDR probe means that moisture values may actually be in the range of 7-13%. The meter displays VWC units to a resolution of 0.1% VWC. Measurement is almost instantaneous and you can map an entire putting green in a matter of 5-10 minutes.

For more information, visit: [specmeters.com](http://specmeters.com)

### ***Stevens Water POGO (~\$2,200)-***

The POGO meter has recently been gaining popularity in the soil moisture meter world by offering many features that other meters do not. The POGO meter built its platform by combining three measurement devices into one tool: VWC, EC, and canopy temperature. This tool is constructed with the Stevens Hydra Probe II, utilizing dielectric impedance measurement, which is often less sensitive to soil



salinity and temperature than TDR technology and it does not require calibration for different soils. The four tines used for measurement are fixed at a depth of 2.2 inches and the depth of measurement cannot be changed by the user. From the company's website, the reason for the fixed depth is: "The predominant moisture and salinity exchange with the root system of all types of turf occurs in the top 2" to 2.5" of the root system. This is why POGO was designed to measure the top 2.2" inches for moisture and salinity.

When the sensor is measuring too deep, you are diluting the measurement outside of the most influential region" (pogoturfpro.com, frequently asked questions).

The POGO meter does not have a digital display, rather, measurements are taken by the use of the free POGO Turf Pro app, which is compatible with iPhones, iPads, and Android devices. This app allows you to connect your smartphone or tablet with the WiFi enabled GPS POGO meter to take and store measurements. Measurements



*Above, the University of Minnesota Extension Education and Yrufass Science Team who conduct Member Driven Research.*

are stored on the POGO Turf Pro cloud system (Free 90 day trial, \$1,499 annual subscription), which can then be used to create maps of moisture distribution throughout a property; including marking locations of turf perimeters, irrigation heads, hole locations, and other landmarks. The measurements of EC and canopy temperature can be used to create leaching program maps or syringing maps, which can aid in improving turfgrass health during stressful times.

Accuracy of the POGO is reported at  $\pm 1.5\%$  VWC,  $\pm 0.3$  degrees C canopy temperature, and  $\pm 0.02$  S/m, with moisture and temperature measurements to 1/10th and EC measurements to 1/100th.

For more information, visit: [pogo-turfpro.com](http://pogo-turfpro.com)

### ***Campbell Scientific HydroSense II (~\$1,250)-***

Like Spectrum's FieldScout, the Hydrosense II uses TDR technology to measure volumetric water content in turfgrass rootzones with either a handheld or standup version. The 3" LCD display allows you to create specific zones of

measurement by using the device's internal GPS logger. Up to 1000 measurements can be stored and uploaded via Bluetooth to a PC, where moisture maps can be created and overlain on a Google Earth map of the property. Two versions of this device allow the user to select measurement depths of either 4.7 inches or 7.9 inches; probes are not interchangeable between devices. The Campbell Scientific PC software is provided with the device and in addition to creating maps, allows you to download data as tables and make edits to zone positions and sizes.

There is no app or smartphone compatibility with this device.

Accuracy of the Hydrosense II is comparable to the FieldScout, at  $\pm 3\%$  VWC in soils with an EC of  $< 4$  mS/cm. This device can also be programmed to measure RWC for up to ten different soil types, allowing the user to water based on a moisture deficient from 0 to 100%. For example, a sand-based soil with a wilting point of 6% VWC and field capacity at 12% VWC, will display a RWC content of 67% when VWC is equal to 10%. Irrigating to achieve a RWC of 100% means that the soil is back to field



capacity of 12%. Generally speaking, watering programs should be targeted at bringing soils to near field capacity (100% RWC) and allowing them to dry down, irrigating again before reaching the wilting point (0% RWC). This is a feature that I rarely see utilized by superintendents, however there is value in considering managing your water this way.

For more information, visit: [campbellsci.com](http://campbellsci.com)

Delta-T TH2O (~\$1,300)- Delta-T is a company based out of the United Kingdom that distributes soil moisture meters in the United States through Dynamax. Delta-T offers a wide range of soil moisture meter tools, and perhaps the TH2O would

be the most applicable tool for the turf industry. The TH20 is a stand-up version that uses a ML3 ThetaProbe (dielectric constant “theta” measurement) which is unaffected by salinity and temperature, much like the POGO, and uses four fixed 2.375 inch probes. The ML3 probe connects to a HH2 meter display, which allows the user to quickly and accurately measure VWC in most soils to a reported accuracy of  $\pm 1\%$ ; RWC and water deficient can also be set and measured by the user. One benefit of this tool is that in addition to portable moisture measurement, it can also be installed in a specific location can connected to a data logger for continuous readings of soil moisture. There are no



**Superior Tech Products®**

Leading Edge Turfgrass Solutions  
Golf Courses | Sport Fields | Parks

952-546-3678

[www.stproots.com](http://www.stproots.com)  
[stp@stproots.com](mailto:stp@stproots.com)



- \* Liquid & Granular Fertilizers
- \* Organic Fertilizers
- \* Post Patent Pesticides
- \* Aerification Tines & Bedknives
- \* Natural & Artificial Turf grooming equipment.



mapping features available with this tool, but the included software does allow the user to download up to 1,100 stored measurements.

For more information, visit: [delta-t.co.uk](http://delta-t.co.uk)

### ***Turf-Tec Digital Moisture Sensor (~\$600)-***

This unit from Turf-Tech measures soil moisture based on the percentage of air space in the soil. A reading of 0% indicates that all of the pore spaces are filled with air, and at 100% all of the pore spaces are filled with water (saturation). Calibration to your particular soil is a must with this unit and an adjustment screw allows for user friendly calibration. The scale reads values from 0 to 199% and any reading over 100% indicates that recalibration is required. With neither fixed probe lengths or interchangeable probes, the Turf-Tec tool uses fixed probes that can be adjusted to depths of 1, 2, 3, and 4 inches, allowing a superintendent the option to measure moisture at various depths without changing probes. There are no mapping software or data storage options with this device.

For more information, visit: [turf-tec.com](http://turf-tec.com)

### ***Spectrum Economy Soil Moisture Tester (~\$122)-***

The only analog meter on the list, the Economy meter measures moisture levels on a scale of 0-10. The unit can be easily calibrated with an adjustment screw and it is available in both 9 inch and 24 inch versions. This unit is geared more towards garden plants, fruits and vegetables, however it is a valid option if budgets are tight and if your staff is currently using the “brown = dry” approach to hand watering. For more information, visit: [spec-meters.com](http://spec-meters.com)

## **Final thoughts**

As you can see, the soil moisture meters available today come in many shapes and sizes and offer a multitude of features that may or may not be important to you. This article only scratched the surface of moisture meter options and I encourage you to do some investigation on your own into the meters that were mentioned in this article and other meters that you come



across at conferences and trade shows, in literature, or from recommendations by colleagues. As part of the Member-Driven Research Initiative, we have purchased and

are evaluating all of the moisture meters mentioned in this article and you can expect to hear about them in MGCSA Outreach Events this fall/winter.



*Thank you Sam for your hard work on the MGCSA Member Driven Research.*

NATURAL ARTESIAN WATER

**McCARTHY**

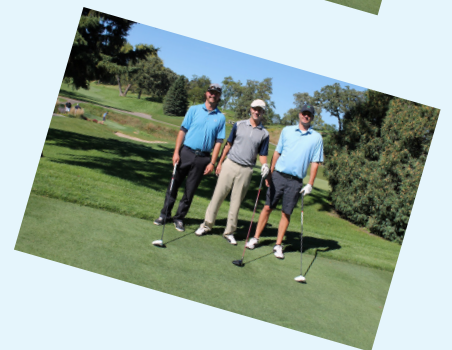
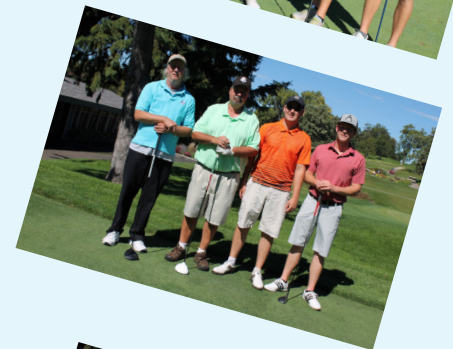
WELL COMPANY

SINCE 1860

888-854-5333



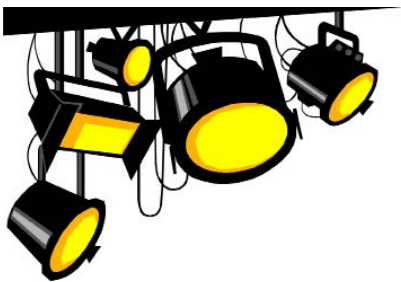
*The Scra  
Scholarship a  
Town and Co  
Host William  
Thank You  
and Pl*





*umble for  
and Research  
ountry Club  
Larson CGCS  
Sponsors  
layers*





# *Affiliate Spotlight:*



## **The Evolution of XGD Systems**

Formerly known as TDIGolf, then formerly known as Turf Drain Inc., the firm was incorporated in Guelph, Ontario in 1988. Turf Drain Inc. was formed as a golf/sports-field drainage company focused on installing 4" or greater, agricultural drainage tubing to the golf and sportsfield industry solely.

After a few years of modest success in the early days, along with accruing more contacts in the golf industry, we were approached by a client with the query: "Do you know anyone with a bulldozer who can push that pile of dirt around and shape us up a rear tee for extra distance?" Well, we did know another contact in the industry and sub-contracted a shaper for that golf facility and built our first golf tee box. This extremely minor project was really the birth of a new golf renovation division

under the Turf Drain Inc. umbrella.

The renovation division grew quickly and within two years had overtaken the drainage division in sales. At that time, clearly it seemed the golf renovation market was something to focus on, as the drainage division was experiencing a "levelling off" of sales. Also, that early drainage division bares little resemblance to XGD Systems of today. While 4" or greater mainline installations, are similar to todays XGD model, Turf Drain Inc. was then installing 4" laterals at 20-25' spacings, at a depth of 2-3', modelled after our experience in the agricultural drainage market. Typical agricultural drainage installations back then and today, utilize 20-30' lateral spacings, dependent on soil types, and were plowed in 4-5' deep complete with automatic laser grade control. Of note as well, all ag drain installations are with native soil backfill.



This was totally unheard of in the golf drainage market as everyone was backfilling with 3/8" washed peastone at the time, and usually right to the surface with an open trench.

sometimes more than once.

With our well-known drainage installation background, renovation clients began approaching us with the following query: "We have some

Initially, it took several successful projects with the native soil backfill process to turn the many skeptics into believers. While we experienced modest success, we also had one major flaw in the early installations. That flaw being that we



could not mechanically compact the 4" perforated fairway drainage laterals, due to the fact that mechanical soil compaction efforts completely destroy the soil structure. Obviously this method, while hugely successful from a drainage standpoint, was flawed because the finished product settled out quite a bit leading to unhappy clients, and us returning to golf facilities to "top up" trenches,

really poorly draining greens, and we don't have the funds to rebuild to USGA specifications and/or we don't want to destroy our famous architects original intent." Initially, we told these clients that they needed to come up with the money somehow, and only then we could help them out. Of course we were met with some resistance, and the calls for an alternative to the expensive rebuild

of greens kept coming in.

So, we began internally discussing how we could accomplish draining an old soil pushup green. Drawing on our fairway and ag drainage



background we decided on a 6-8' spacing with a 2.5" perforated pipe available at the time in Canada. Although, the larger issue for us was how do we complete such an installation and return the green to play in a timely manner. Back then, we had ample time in the winter months and we reached out to some golf drainage contractors in the United Kingdom, with their heavy precipitation events more commonplace then

North America. They did not see us any competition, and were quite giving with their information and especially pictures. Those pictures illustrated the use of an 18" sodcutter, a small trencher on plywood, a 3-4" perforated pipe, and an organic sand backfill. Exactly the information we needed.

Our first green drainage installation took place at York Downs G&CC in Markham, ON, a suburb of Toronto. The

installation involved an 18" power Ryan sodcutter, the smallest Vermeer trencher available, cutting a 3.5" wide trench, a 2.5" perforated pipe with a filter sock needed for the direct sand backfill as the 2" ADS micro-slit pipe we presently use was unknown to us at the time. As you can imagine the proper care and handling of 18"x18" greens sod squares was truly cumbersome, but we still achieved a decent finished



product. The larger issue was the unavailability of 2.5" tees as this ag pipe was predominantly used in orchard applications and was always tied in to 4" mains or greater with a cordless drill holesaw. We were adamant against the use of 4" mainlines on greens as this necessitated the cutting of a 6" wide trench, which we knew was unnecessary given the low volume of water exiting a typical 5000SF green, coupled with the likely probability of the greensmix backfill drying out quickly above it. So, we used 2.5" ABS plumbing tees on those first installations, and a fair bit of duct tape to seal the drainage fittings. Lastly, we did use an 80:20 greensmix backfill on that initial green, which took a few years to stop being a minor headache for that GCS from a rapid dry down basis.

But, the new drainage characteristics of this formerly problematic green were immediately tremendous. Gone were the days of this GCS not being able to mow after a heavy rain and generally babysitting the green back to health during a hot, wet golf season. Several more greens were completed at this

facility, as well as full course greens drainage treatments at Barrie CC, and Cherry Hill CC, an untouched Walter Travis gem that is hosting a Canadian PGA Tour event this summer, a full 20 years after the installation. One of the many true testaments to the longevity of our careful, positive grade installations.

Around this time 20 years ago, the Turf Drain Inc. renovation division began evolving to border states in New York and Michigan, as we incorporated TDIGolf in the US. This exposed us to a huge market of pushup greens lacking internal greens drainage. Early single green projects at Oak Hill CC, NY and Oakmont CC, PA really kick started the greens drainage division of TDI-Golf.

XGD Systems quickly grew from 1-2 installation crews from 12 years ago to six install crews about eight years ago. Indeed, it was around 2008 when sales began to level off with the greens drainage division and we had already begun to take on fairway projects involving our precision 2-inch pipe installations. As we began completing these "slit"

drainage fairway projects we quickly became known for our high quality installs leaving little or no "footprint," just like our greens drainage projects. Shortly thereafter, the fairway division of XGD Systems was busy enough to dedicate 1-2 specialized crews throughout the season and we were able to acquire specialized tractor/trenchers to automatically load dump trailers with trench spoils to truly mechanize the fairway operations.

As our parent firm has always provided turn-key renovation projects, XGD recognized the need for "light-duty" bunker restorations. Light duty refers to any bunker renovation projects not including any major shaping or bunker construction from scratch applications. XGD specializes in a bunker renovation effort from bunker sand removal and installation of fresh bunker sand all the way up to Better Billy Bunker and Capillary Concrete hard liner installs. Aligning with these

bunker projects, XGD has always dabbled in the use of our 2" pipe in bunker bottoms as an alternative to traditional 4" bunker drainage with peastone backfill. We find that with the extra 2" piping in the bunkers, the water table is controlled much more evenly across the entire bunker leading to more consistent bunker sand moisture, and a much more enjoyable golfer experience in these bunkers.

In summary, XGD Systems has really evolved from a single service provider (greens drainage), to really a multi service provider of services that are all closely related, with similar fundamental principles. So, in essence we might be known as "TDI light," a lighter, more mobile version of the parent outfit, with a greater emphasis on quality golf restoration efforts involving more labour focused projects leaving a much lighter footprint on the golf course as we leave it.

**Hey Affiliate Members! Want a bit of "Spotlight" time? Contact Jamie Bezanson with promotional information about your company, how it developed and expectations for future development.**



Western Exposure  
Oxbow Country Club  
Host David Wood  
An Exceptional Day!!

Superior Turf Services, Inc.

HEALTHY PONDS®  
by Bioverse®

WINFIELD™



# Within the Leather

by Matt Rostal, Superintendent at Interlachen Country Club

## Feeling Grateful!!!

As I write this column today, September 11, 2016, the fifteen-year anniversary of the horrific attack on our country, I feel grateful. I love my family, friends, the United States of America, the flag, our freedom, and my right to protect all of the above. I for one will never

take a knee, sit, or refrain from shedding a tear and getting a little choked up during the National Anthem or, in particular, America

the Beautiful. Too many have sacrificed too much for all these freedoms. I do not take them for granted! So, today I feel even more grateful for what I have!

I am grateful for my

family. I have an incredible wife who sacrifices so much for our family. She keeps us organized and on track



in our daily lives. She also puts up with me and I can tell you that is not an easy task as I work too much, (as all of you do in this industry) and I continuously test her patience



with my childish adventures. I can't say enough about my three kids ages 14, twelve and ten. They are all smart, funny, compassionate and just good kids; hopefully that will continue into adulthood. I am grateful for my friends. I have a core group of best friends which I grew up with

would do anything to help each other in tough times.

I also have a great group of friends which I met through my kids. We all have children the same age, in the same schools and activities. These friends are a wonderful support group of the daily



in Middle and High School. They all are spread out across the country but when we get together it seems like we have never been apart and we

grind of life with kids.

I am grateful for my employer Interlachen Country

**Club. They gave me a chance when I thought it was impossible to make that next step to Golf Course Superintendent. It was a core group of influential members who supported me and gave me the chance to prove myself on a one year trial (I still believe every year is a one year trial). George Carroll, the general manager also supported me with his guidance, experience and advice. I am grateful he was my GM for my first 14 years as Superintendent.**

**I am grateful for all my staff through my career as Superintendent. I have had some incredible staff members and some staff members who needed improvement (some needed a lot of improvement). I take every new staff member as their own individual. I**

**know with past experience I can grow them into a good employee but more important prepare them for being successful in life.**

**I am grateful for every Golf Course Superintendent. I have called on many over the years and everyone readily shares their successes or failures to make my job easier. Our Minnesota Golf Course Superintendent Association also supports me and everyone involved in maintaining a golf course, even if you are not a member of the MGCSA. It is a very special group of professionals!**

**So, I thank all of you for being my associate and my friend. I would also challenge you to think why you are grateful and to thank those people who have helped you become the person you are.**