Hole Notes

The Official Publication of the MGCSA

Seeing The Unseen: A Look Inside Your Trees

Vol. 53, No. 1 January February 2018

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February 23, 2018 Northwest Outreach, Crookston, MN, Host Kristie Walker

March 1, 2018 Assistants Professional Forum at Pinstripes in Edina

March 8, 2018 Day On The Hill

May 9 Affiliate Appreciation, Highland National, St. Paul, Host Jamie Bezanson

May 14 Badgerland Exposure Golf, Cumberland GC, Host Bryan Tahtinen

May 15 Southwest Exposure, Sleepy Eye GC, Host Carl Weiss

June 18 Northwest Exposure, Wildflower at Fairhills, Detroit Lakes, Host Tim Halvorson

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Presidential Perspective

by Brandon Schindele, Superintendent Edina Country Club

Wow is this a surreal feeling…. since 1998 I have read the Hole Notes magazine and it was always lead off with the Presidential Article and now I am responsible for writing them over the next year and everything else that goes with the position. YIKES!!! First of all, in all seriousness, I would like to thank the entire MGCSA for giving me the privilege to serve as your President in 2018 and giving me the opportunity to lead such an esteemed group of professionals for this year. It truly is an honor.

I have had a fair amount of you approach me and ask about the undertaking that being president is, but I have said my main focus for this year is to continue doing what the association has been doing and maybe just getting better at what we as a Board accomplish every year. The main emphasis would be however, to support our Executive Director, Jack MacKenzie, CGCS in every way possible. Jack is very talented at what he does and his passion for it is unwavering, but he can't do it alone, no one can. I am happy that under my predecessor's guidance and leadership, Erin McManus was able to make sure that Jack will be with us for the next five years as our E.D. Also, I am happy to report that Jack will have received his GCSAA award for Excellence in Government Affairs at the GIS show in San Antonio. Very deserving Jack!!!

We all need help or assistance in one way or another and the MGCSA is no different. You might be asking how can I help or provide assistance to the association. One of the best ways is through participation in events, this helps drive the motor of the MGCSA but it also gives you value as a member.

Recently, the MGCSA held its annual shop tours, originally it was

supposed to be on Monday, January 22nd, but due to an impending snow event it was postponed to the following Tuesday. Original sign up number was in the 50-attendee range but, due to the postponement, we climbed to over 90 attendees, the largest number ever for this event.

What I noticed at the event was the amount of networking was off the charts and sharing of ideas with longtime friends and new colleagues. I would hope everyone learned something or could bring an idea back to their course that made the registration cost a steal. A big thank you to Scott Thayer, The Legends Club, Wes Stonebeck, The Wilds, Pete Nolan, The Meadows at Mystic Lake, and Gaby Accad, Versatile Vehicles for hosting the event along with their respective staffs. Allowing all of us to get a small view into each of your operations was very valuable and I'm sure a little intimidating. Thank you again!!

Now we have another relatively big event on the horizon and a big ask from all of you. Golf Day on the Hill is scheduled for Thursday, March 8th, and we need as many of you as possible to attend, this might be one of the most important events we do every year. Now I know what most of you are thinking...most important, maybe, most fun, not even close.

True, but if we don't lobby for ourselves who else is going to do it? This is where Jack needs our help more than anywhere else. By simply providing your club and home addresses we hope to get in the door of every state senator and representative at the capital, but a constituent needs to be present to have that meeting and then others can attend with them. Don't worry, there is always someone that has done this before grouped with you if you are a rookie, but what an opportunity to showcase our talents to the leaders of the state and good practice for all of us to put on the suit and tie and advocate some diplomacy and enhance our speaking skills.

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For every aspiring Superintendent out there or the ones looking to refine their interview abilities, I can't think of a better way to practice an interview than sitting down with a stranger and attempting to make your case and getting them to think your way. Please consider signing up for this important event and supporting the industry that you have chosen to make a career out of. You also get to spend most of the time talking turf and shop with colleagues since there is a considerable amount of time waiting for your meetings.

Either way we need you there to help communicate the good work that has been done with our BMP bulletins and the good story of golf. I hope most of you haven't flipped the page and moved onto another article just yet.

How else can you support the association and get involved? Two of the biggest ways is to either volunteer for a MGCSA committee or run for the MGCSA Board of Directors; we need all of you to get involved and help. I know, I know, you are too busy right? Aren't we all busy? I said the same thing at one time, but I can say that being involved makes you a better manager of your time. I have a full plate of things going on at my own club, three kids at home, and helping coach my twin boys' hockey team. (Heck, having twin 5.5 year old boys, makes anything busy enough!!!)

I can honestly say since I got involved with the MGCSA it has made me become a better manager of my time at work and at home. Perhaps committees and Boards are not your thing, then how about try writing an article for the MGCSA Hole Notes? Everyone has a story, a project, and a hobby, something that we would all find interesting to read about. You might even win an award with a cash prize at the end of the year. That is not the worst thing in the world right? I hope with all of this you will all consider taking your involvement in the MGCSA to the next step.

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Flowers for Pollinators

Are annual flowers attractive to insect pollinators?

Julie Weisenhorn, Extension Educator, Horticulture; Mary Meyer, Professor and Extension Horticulturist; Jeff Hahn, Extension Entomologist; Steven Poppe, Research Scientist

University of Minnesota Extension

The issue

Bees and other insects play a critical role in sustaining our food system, plant diversity, and environmental health. Citizens are eager to plant pollinator-friendly gardens, but some may only have space suitable to annual plantings especially in urban landscapes, community garden plots and high-density housing as well as container gardens and some commercial ornamental landscapes. Annual flowers would fit the bill, but do they attract pollinators? They provide a wide array of colors, textures, patterns and forms in landscapes, but breeding ornamental qualities can result in flower stamens transformed into showy petals concealing flower parts, resulting in reduced insect interest/ ability to access food. Because of this, annual flowers are sometimes excluded from pollinator-friendly landscapes. However, we observe pollinator activity on various annual flowers and wonder if some are more attractive to pollinators than others. In growing seasons 2015-2017, we recorded pollinator insect activity on annual flower varieties selected for features known to be attractive to pollinating insects. We found *Cosmos* ranked high for bumble bees, *Salvia*, *Zinnia* and sunflowers were frequented by honeybees, and *Rudbeckia,* sunflowers, and *Salvia* attracted other native bees.

Materials and methods

Flower seeds were selected and started indoors, and seedlings planted in masses after threat of frost had passed. During bloom time, each flower variety was observed for pollinator visits (insect landing on a flower) for one minute 1-2 times per week. Pollinators observed and recorded were bumble bees, honey bees, native bees, flies, butterflies/moths, beetles, wasps and others (ants, grasshoppers, stinkbugs, etc.). Time, date, and weather were also recorded.

2015: Student interns recorded pollinator activity at the Minnesota Landscape Arboretum, Chaska, MN, and in the U of M Horticulture display and trial garden, St. Paul, MN.

2016: Master Gardeners conducted the study as their 35th annual trial

- 70 participants recorded pollinators on 24 varieties of *Salvia, Zinnia*, *Rudbeckia*, sunflowers, marigolds and snapdragons. Most were grown in home gardens. Alyssum was used a control plant.
- Extension educators provided pollinator ID training and support.
- The project formed the basis of the 2017 educational theme, “Flowers for Pollinators”, developed by educators for Master Gardeners.

2017: Most visited plants were compiled from Y1 and Y2. We added *Cosmos*, dwarf sunflowers, and other varieties. Total: 30 varieties

- 3 sites: U of M Horticulture display and trial gardens, St. Paul and Morris; and Horst M. Rechelbacher Farm (HMR), Osceola, WI. St. Paul site was selected as a U of M Living Laboratory
- Data collection was conducted by Weisenhorn, Miller, and Knight
- Citizen science pollinator survey card was available on-site
- Survey “How pollinator-friendly is my landscape?” was developed

L – R: U of M St. Paul Horticulture Display Garden; HMR building, Osceola, WI; U of M Horticulture Display Garden, Morris, MN.

Honey bees on *Helianthus annus* ‘Music Box Mix’, one of the sunflowers studied

Results: Most visited flowers

- **2015:** *Helianthus amarum* ‘Dakota Gold’, *Agastache cana* ‘Heather Queen’, *Salvia coccinea* ‘Flare’ and *Melampodium paludosum* ‘Showstar’.
- **2016:** *H. annus* 'Lemon Queen' , *Tagetes* 'Bambino‘, *Rudbeckia* 'Irish Eyes' and 'Orange Fudge’, *S. coccinea* 'Coral Nymph‘, *Salvia horminum* 'White Swan‘, *Zinnia* 'Envy‘ and 'Pop Art Red & White‘.
- **2017:** Specifically visited most often by bees (top four plants each):
  - Bumble bees: *Cosmos* ‘Double take’, ‘Double click’, and ‘Capriola’, *Tagetes* ‘Ivory’
  - Honey bees: *Salvia* ‘White swan’, *H. annus* ‘Music box mix’, *Salvia* ‘Purple fairy tale’, *Zinnia* ‘Envy’
  - Other native bees: *Rudbeckia* ‘Prairie sun’, *Helianthus* ‘Elf’ and ‘Dwarf yellow spray’, *Salvia coccinea* ‘Coral Nymph’
- Citizen science survey: 14 people reported 90 insect visits between 7/8 – 9/8. Most visited: *H. annus* ‘Music box mix’, *Zinnia* ‘Envy’ and ‘Swirls’

Discussion

- Annual flower varieties can attract pollinators and should be used to support pollinators in landscapes.
- Annual flowers should be selected and used with special consideration toward providing continual bloom. Remove spent blossoms to promote repeat bloom.
  - Honey bees showed a preference to sunflower varieties until blooms faded after which they foraged on other varieties.
  - Features such as petal patterns, colors, size and shape may attract pollinators, but not conclusively.
  - Taller *Zinnia* varieties like ‘Envy’ were preferred over short varieties like ‘Zahara starlight rose’.

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This project was funded in 2017 by the Horst M. Rechelbacher Foundation through U of M PlantED.

In Bounds

by Jack MacKenzie, CGCS

While downloading a project to be copied from my computer to the server at my local Office Depot, the store manger looked upon my screen saver and said, "Alaska huh?" He was impressed with the picture of a fine chum salmon I had masterfully caught last summer on the Kelly River, in the Arctic Circle, the biggest trophy of the trip and another memory of a lifetime.

The young man, roughly thirty-five, went on about his own adventures taken on family trips as he growing up, and he bemoaned the fact that his current life was just too busy with work to allow him time away alone, much less with his two daughters and wife. Hmmm, this really hit a nerve as I recall many summers without vacations while I tended the turf upon my course.

Think about it, memories, are all you really have in life. Although not tangible in a physical sense, they bring a greater awareness than just a simple photograph.

Indeed I am remiss in not taking my gang away every summer for extended family breaks, but we sure made the most of MEA weekend, spring break and whenever the GCSAA hosted the national conference in Orlando. We created memories that I wouldn't trade for anything today.

"First flights" on a plane to visit my grandma in Connecticut, a long weekend shopping trip in Chicago, exploring Madeline Island, watching the fireworks over the Magic Kingdom, getting caught up in a herd of cattle in the Badlands of South Dakota, the solemnness of

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the Holocaust Museum and father/son and father/daughter trips to the BWCA have left me with a wealth of day dreams to reflect upon during moments of pause. Although I couldn't make much time, the moments my family and I had on vacations were indeed priceless.

I encourage any of our young association member to make time for memory building today and remind the older members of the association that it isn't too late.

As a segue to this theme consider this, at the prime age of fifty-eight, I have a toddling grand daughter whom I love dearly, another on the way, and hopefully even more to grace "Grando and Grandma's" house in the future. She brings a smile to my face and is filling my mental portfolio with memories. In recent weeks I haven't been much of a hugging type grand parent but hope to soon as my shoulder recovers from rotator cuff and decompression surgery.

An old injury, caused when I rolled a three-wheeler back in 1983 damaging my right shoulder, had been a chronic pain for a long, long time. On good days it only impacted my sleep cycle, and on bad days it screamed painfully at me when I over extended my reduced capabilities. My once fastball was pretty pathetic and soon put on the shelf. Fishing, a passion, no longer romanced me as I suffered following as few as two-dozen casts. Golf? Well, now I had an excuse for my limited game.

In my gut, I know many of you suffer from a chronic pain. Well, guess what? There are medical procedures available to remedy many issues and thus allow you to lead a healthy and normal life. Because I thought I didn't "have the time to be incapacitated", nor the money available, or the patience for recovery, I lived with an unnecessary physical challenge on good days and severe agony on others. Quit toughing it out, you really deserve quality of life.

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Immediately after surgery I no longer had the throb in my shoulder. Nothing, nada, zip, zilch, diddlysquat, squat! Even through recovery, my suffering has only been in the form of aggressive physical therapy and expected pain from the surgical procedure. But you know what? Mentally, I'm pissed that it took over three decades for me to hop off the stupid train and fix something that had been controlling my life.

So why did it take so darn long? Just like most guys, I became used to the pain and worked with it. My body made physical adjustments to accommodate the flaw and I lived with very little bitching, because who really cared anyway. The catalyst was my left eye retinal tear experienced last August, of which exploited my insurance deductible due to the mandatory emergency repair. That financial outlay suddenly made the expensive shoulder "fix" very reasonable.

One common thread while visiting the orthopedic surgeon on several occasions was the inquiry if I could, "just live with it?" Of course I could, I wasn't going to be hitting any pro circuit soon and it really only flared up on occasion. So yes, of course I could live with it. And I did for a very long time, likely impacting my family life along the way.

Soon this 'cat' is going to be the very best at giving my grand kids a quality grand parent. Piggyback rides, hog piles, camping, catch, fishing (of course) and just screwing around without fear of more damage. I can hardly wait for the A-Okay from the orthopedic surgeon to get on with my life.

With excitement I look forward to being physically fit and renewed to make a mess of memories with my kids, their kids and even cut out some more "me time".

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WINTER KILL - Its Cause and Cure

REPRINT: Dr. Elliot C. Roberts
Iowa State University, Ames, Iowa

Winter kill is a broad term which is used to describe injury to turfgrass during the winter period. Most often the condition is noted in late winter or early spring about the time that growth normally begins. There are five causes of winter injury. These may be listed and discussed as follows: 1. Desiccation, 2. Suffication of roots from excess moisture, 3. Suffication of the plant from carbon dioxide, 4. Scald from light reflection through ice crystals and 5. Snow Mold disease. Very often a combination of all five causes results in a single case of winter kill. Turf which has been weakened by disease or chemical or mechanical injury during the previous growth season is often more susceptible to winter kill.

DESICCATION: Turf which is not protected during the winter from strong dry winds may dry out and perish from lack of moisture. Even though turf is dormant and is not producing foliar growth it still has a minimum water requirement. Under normal conditions where snow covers the turf and protects it from drying out or where other vegetative wind breaks shelter the turf injury from desiccation is not common. It is most often noted on putting greens, on new or thin stands of turf and on elevated areas exposed to strong air currents such as greens and tees. This type of winter injury is caused by the loss of moisture from the frozen soil. Ice crystals change into water vapor through a process of sublimation and thus soil moisture is lost and carrieoff by strong winds. The depletion of moisture levels under a turf may be great enough to cause injury to the plants.

Protect against this type of winter damage by use of snow fences or other types of artificial or natural vegetative barriers to protect turf which is subject to winter desiccation. Encourage snow to collect on these areas. Where an open winter without snow is encountered it may be necessary to water the turf at infrequent intervals. This may be successfully done by using a large tank type sprayer on a day when temperatures are above freezing. The amount of water applied need not be large as long as the surface of the turf and soil is moistened.

SUFFICATION FROM EXCESS MOISTURE: During winter months ice may collect in low spots or hollows which do not drain. As temperatures rise in late winter and early spring water collects under the ice and above the frost l er It may become trapped in this position long enough to sufficate the grass as it starts its first spring growth. Oxygen is required for the growth of all turfgrasses. It must be present in the soil or the roots fail to develop and may die. It has been noted that grass which has entered the winter in an over stimulated condition is more susceptible to this type of injury. Over stimulation is most often due to excessive amounts of available nitrogen in the soil.

To prevent this type of winter injury: (1)Topdress regularly to keep depressions which may collect excess moisture from forming. (2) Reconstruct areas of unstable turf to remove hollows and to improve sur.face drainage. (3) Aerify greens which are subject to winter injury late in the faland leave aerifier holes open. (4) Remove a strip of sod from pockets in a green where water collects. Continue these strips out to the edge of the green. Deepen the channel by removal of soil so that water will drain from the low spot within the green to the edge of the green and off into the fairway. Place the sod strips roots down on the grass next to the green. Keep them from drying out during the winter. Replace them in the green after all danger of winter injury has passed in early spring. (5) Where the frost layer is thin puncture it several times with a crowbar or other pointed implement to allow water to drain out

of low spots in early spring. (6)Break up ice and remove large amounts of snow from turf which is subject to winter injury. This should be necessary only during late winter or early spring accumulations.

SUFFICATION FROM CARBON DIOXIDE ACCUMULATION: Injury to turf occurs at times before ice melts and frost starts to leave the ground. In this case a suffication of the plant from excess water in the rootzone cannot be responsible for the injury. It has been noted that a solid ice cover is always found over the injured turf. The ice may be covered with snow so that it is not visable but it is always present. It is known that as turf over winters even in a dormant state there is a certain amount of respiration taking place. A by-product of respiration is carbon dioxide. Since the plant is not growing it cannot use this in photosynthesis, thus it accumulates under the ice. At the same time oxygen is depleted. A toxic concentration of carbon dioxide is believed responsible for some turfgrass failures during late winter periods. A cracking of the ice to allow the carbon dioxide to escape is the only way to prevent this type of injury.

SCALD: Thin sheets of ice may be so formed that lenses develop within the ice that are responsible for turfgrass injury. The sun's rays may be so magnified by the ice that the turf heats up underneath. This may initiate growth at an unfavorable time from the standpoint of soil moisture conditions and soil aeration. Leaves may actually be scalded or become wilted from such conditions. This type of injury may be controlled by breaking up the ice to allow air circulation underneath it. This moderates growth conditions so that the turf may make a more natural start during early spring.

SNOW MOLD: The activity of fungi (Typhula and Fusarium species)on the dormant turf may cause disease injury during the winter and early spring. As a rule these pathogens are most active at temperatures from 40 degrees to 60 degrees F. They develop readily in areas along the receding edge of snow banks and under the snow where footprints, ski tracks and other forms of traffic have compacted the snow. Injury is not noted until the snow has melted and by this time it is too late for effective use of fungicides. Injury may be reduced by brushing the turf to break up the fugus organism and thus let air and light into the sod. Recovery will be speeded by applications of a little extra soluble or inorganic fertilizer applied early in the spring.

Where snow mold is noted regularly such as on putting greens and on bentgrass tees and lawns a preventative chemical treatment should be applied in early winter before the first snow and again in mid winter (during a January thaw). Mercury chlorides, phenyl mercury, thiram and cadmium compounds have been used effectively for this prupose.

SUMMARY: It is often assumed that there is little need for turfgrass managers to be concerned with the grass during the off season (periods of late fall and winter and early spring) All too often golf courses are understaffed at this time of year. If winter injury is to be prevented, particularly on putting greens, there is a time consuming job to be done in checking the condition of the dormant turf. Where winter injury occurs frequently major reconstruction or renovation may be necessary to improve over-all growth conditions for the grass.

The preceding article was found in the November 1976, Hole Notes magazine and is a reminder that some issues stay the same. Each month, in the next several current issues of Hole Notes, there will be a "blast from the past" of concerns that really never go away. Enjoy!

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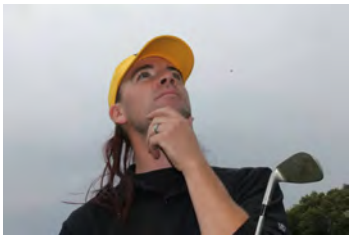
thick-skinned: sam bauer

interview by matt cavanaugh



adjective

insensitive to criticism or insults.
"you have to be thick-skinned to work in the turf industry"
synonyms: insensitive, unfeeling, tough, hardened, callous.

It's never easy to hear that you may have some pitfalls. For example, I recently purchased a shirt that I saw during the super bowl halftime show that had a majestic elk on the front. My wife asked, "what the heck is that." I replied, "my new shirt, Justin Timberlake had one." To which she said, "it's hideous and you're not Justin Timberlake." I was initially angry because I thought I was cool. However, after the initial shock of the constructive criticism she provided, I saw the benefit of her insight. The shirt is in fact hideous and I'm not Justin Timberlake.

I'm a firm believer that we all need to be more open to constructive criticism while at the same time be willing to provide constructive criticism when warranted. The fact remains, we don't know what we don't know and you may need to be thick-skinned to hear it.

The one simple thick-skinned question:

Sam, you visit with and have many conversations with golf course superintendents and assistants. Based on the current facts, research and knowledge, what is one thing you see that we as turfgrass managers could change to help improve turfgrass decisions?

Sam: *"I continually encourage the use of control plots (i.e. areas left untreated) with every spray application. I'm surprised at how little control plots are used. There are so many products to use and test now days that the use of a control plot can provide a huge opportunity to learn how the products we spray are impacting our turf."* Sam discussed how over the growing season changing weather conditions, stress levels and player traffic can change how products perform. The use of a control plot will help you see how your spray programs perform over time and with changing conditions. Sam said, *"Turfgrass managers are missing learning opportunities by not using control plots with spray applications"* and one of the best times to learn is with a new product.

thick-skinned: Would you use the same control plot location for each spray or move the location?

Sam: *"Move it each time and mark off the area. This will allow you to look at single applications."* Sam also goes on to state that for the next application the last control plot can also give you information on the most recent spray. *"I would also recommend that if someone is resistant to using a control plot, at least do one for your snow mold application."* Sam added that if you have an issue in the spring with your snow mold application, a control plot may be the only way to know if it was product related or not and this information could be critical.

thick-skinned: What size do you recommend for the control plot?

Sam: *"The bigger the better. This will also be a great tool to help educate your members or superiors on why we spend money on plant protectants and fertilizer."* It is probably most important to pick a size that can easily be handled and fit on the spray unit.

thick-skinned: A control plot could also be an opportunity to see if an application was even needed and you could gain some historical knowledge. For example, you may learn over time that you could skip an early spring fungicide application because your control plot never revels any disease pressure. To which Sam responded *"absolutely, so much can be learned over time by using a control plot, both good and bad."*

thick-skinned: Are there other ways that control plots are beneficial?

Sam: *"I feel that turf managers can be a little risky with the product combinations that are put in the spray tank. I've certainly killed some grass in my career and admittedly that has made me more conservative with these mixture combinations."* Sam elaborated by discussing that control plots can be beneficial in evaluating what occurs when one product or more is taken out of a complicated tank mix. Sam and I discussed how Aaron Patton at Purdue University has some great recommendations for tank mixes. If products are not meant to end up in the same place, then they should not go in the spray tank together. So, mix soil/root products with other soil/root products and mix foliar products with other foliar products. Sam discussed an example of putting a wetting agent and foliar fertilizer together. *"A wetting agent is a surfactant (and designed to work in the rootzone) and we don't know how much this will change the uptake of a foliar product."*

thick-skinned: Sam understands it can be easy for him to make recommendations such as this, but the use of a control plot provides continuous and historical knowledge of how your products are impacting the turf, especially as the number of products in the tank increases.

Sam Bauer is an Extension Educator in Turfgrass Science at the University of Minnesota. Sam can be reached at sjbauer@umn.edu or @urbanturfmn. If he cannot be reached he may be out doing a little fishing for 71-pound blue catfish.

Matt Cavanaugh is an Assistant Superintendent at Rush Creek Golf Club in Maple Grove, MN.

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

Doug Soldat, Ph.D. Dept. of Soil Science
Univ. of Wisconsin-Madison

Photo: Herald Business Weekly

Golf carts represent a major source of revenue for golf courses and many golfers in the US will only play golf when carts are allowed for use. Therefore there is a strong desire by owners to open the course to golf cart traffic as soon as possible following a rain event. Golf course superinten-

dents are often making difficult decisions that balance soil compaction with revenue and customer satisfaction, among other considerations. In addition, the precise impact of cart traffic on soil properties has not been well studied. There is a need to develop data that demonstrates the impact of golf cart traffic on a variety of soil types under a variety of moisture levels.

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

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

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

undergraduate whose father, Dave, is a golf course superintendent in Minnesota who recently served as the MGCSA President and provided us a sample from his course (Prestwick Golf Club in Woodbury, MN).

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

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

vehicles for the large majority of the year. Managing that compaction remains as important as ever.

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

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

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

Editors Note, The MGCSA would like to thank our friends at the WGCSA and their Grass Roots publication editor David Brandenburg for permission to reprint this article which first appeared in the September/October 2017.

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8:30 - 9:00	Assistant Certificate Program, Shelia Finney, GCSAA
9:00 - 9:45	Bunker Renovation/Liners, Judd Duininck, Duininck Golf
9:45 - 10:00	Networking Break
10:00 - 11:00	US Open Erin Hills, 2017 Reflections, Bob Vavrek, USGA
11:30 - 12:00	On-Sight Member Initiated Research, Sam Bauer, UMN
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On July 5, 2013 a woman walking her dog in a Minnesota park was tragically killed when a large branch from a linden tree fell on her. The branch failure happened not during a violent thunderstorm, but during the middle of a sunny day. It was windy – weather records show gusts that day up to 25 mph, but hardly the type of wind that would rip apart an otherwise healthy tree. Inspections on the tree revealed

Seeing the Unseen: Technology That Allows Us to Look Within The Tree

Brandon M. Gallagher Watson Rainbow Treecare Scientific Advancements

extensive decay through the trunk and into several of the main canopy limbs, including the one that failed. This terrible tragedy lead many of the local media outlets to run, "How safe are our city trees?" stories and several reached out to our company to get the 'experts' opinion on the matter. I, by either good or bad fortune depending on your feelings about the media, was one of the arborists interviewed for the

local news. During the interview, the reporter asked me, "Well, why is decay so hard to detect? Don't we have scanners or something that can tell you?" My answer was something like, "Um, well, yeah…kinda, but probably not like you are thinking."

While my answer made a weak sound bite that, needless to say, did not make the news that night, it is fairly accurate response. While there are not the Star Trek-style tricorder scanners that diagnose and prescribe at the touch of a button, there are technologies that allow us to get a look at what's going on under the bark. In fact, there are several different types of devices available that utilize a wide range of techniques to achieve the goal of assessing the presence or severity of decay. The different techniques have their own advantages and disadvantages and all of them must be performed on an individual tree. Thus the 'decay scanner' the reporter asked about really does exist, but someone would have to have been looking for it already for these tools to be useful. Much like an MRI can detect a brain tumor, one has to get into an MRI machine to obtain the data. Using decay sensing technology on every tree in the urban forest is simply not feasible, but there are times where having this information would be useful.

Even though we look at trees everyday as professional arborists,

decay remains difficult to accurately assess. Unless there is an exposed cavity where you can peer in, much of the decay occurs out of sight under the bark. That's where these various tools come in. The decision of which technology is the best will depend on a number of factors, from cost to the type of data you require. If you just need to know that cavity exists then tapping with a plastic mallet may suffice. If you need to know the proportion of sound wood to decay then more sophisticated measurements may be warranted. The US Forest Service's 'rule of thumb' is that 25 mm ring of sound wood is required for every 150 mm of stem diameter at any point on the stem. If the proportion of decay to sound wood is higher than that, steps should be taken to mitigate the hazard.

So what are some situations where bringing in decay sensing technology might be justified? Often times, they are brought in to confirm or refute an existing assessment. I naively assumed that it was more common for this technology to be employed to condemn a tree by showing that the sound wood ratio justified its removal, but talking with arborists and researchers from around the country, I learned it was the exact opposite. For example, a private golf course in California had a massive coast live oak in front of the clubhouse. The club managers notified the members that the tree would be removed soon because the extensive decay had created a hazard. The members, who were enamored with the iconic tree, brought in a consulting arborist who utilized one of these technologies to show the decay had not yet reached to the threshold that warranted removal. The tree will be closely monitored going forward but the use of this technology likely extended the tree's service life by a decade or more.

Let's take a look at types of decay sensing technologies that are currently available and look at the pros and cons of each type.

Plastic Mallet

Easily the lowest low-tech technology on this list, but that doesn't mean it's not valuable. A few raps on the bark with a plastic mallet can often tell you just what you need to know.

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Setting up a PICUS Sonic Tomograph.

It takes a little experience to know what to listen for but with a few practice taps on a tree with a known cavity and a tree with known solid wood you can start to hear the differences. It may not tell you much about the specifics of the decay, but for $15 or less, it is maybe the best starting place you should consider.

PROS: Low cost and low tech. Can be used in any weather and be used quickly. **CONS**: Gives only a yes or no answer about decay and can be deceiving when used on lager diameter trees.

Ultrasonic

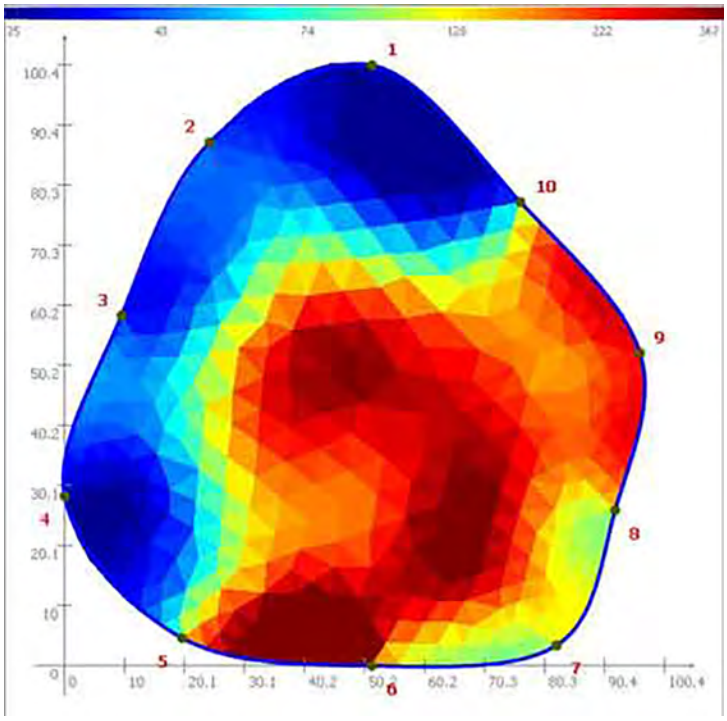
There are several types of ultrasonic sensing devices available that give varying degrees of detail on the shape and extent of decay. Ultrasonic devices use sound waves produced on one side of the tree and a receiver on the other end. Sound waves travel faster through sound wood than through air, thus by measuring the time it take a sound wave from one side of the tree to another one can put together a conclusion

about the volume of sound wood to cavity. Some devices are only able to measure one reading at a time, so a complete picture requires measuring, then moving the monitors to a new site, and measuring again. Some devices, such as the PICUS Sonic Tomograph, combine up to a dozen sensors at the same time. When this data is brought into a software program that can analyze the speed of sound through all the combinations of sensors it can provide an image, known as a tomograph. The tomograph gives you a sense of what the tree looks like in cross-section from the point it was measured at. Measurements can be taken from the image to calculate the sound wood/cavity ratio to determine the extent of the decay.

PROS: When multiple measurements are combined ultrasonic devices can give an image of decay that is easy to translate to a layman and the results are reliable. **CONS**: Cannot be used on trees larger than 32" DBH. A bark plug must be removed to get an accurate reading.

Stress Wave Timer

Stress wave timer (SWT) devices utilize sounds waves similar to the ultrasonic devices, but by using lower frequency waves they can be



Above left an acacia tree and right, an EIT-tomograph image.

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used on larger diameter trees. Just like their ultrasonic cousins, SWT measurements can be combined to create a two-dimensional image of the tree's decay column.

PROS: Can provide a tomograph cross-sectional image of the tree. Can be used on larger diameter trees. **CONS**: They are not as accurate for detecting early stages of decay in trees. Some devices use screws that must penetrate the bark for measuring the sound waves.

Radar

Similar to the sonic-based devices above, radar based technology utilizes waves and the time it take for them to travel through different mediums to assess changes in the structure. In radar, high-frequency electromagnetic waves are sent out and then reflected off an object back to the source. Arborists can utilize radar in both decay sensing in woody material as well as in ground penetrating radar devices that can determine the location of root systems.

PROS: Radar can provide a tomographic image of the shape and extent of a decay column without the need to penetrate the bark at all. Setup and scans take just minutes to perform. **CONS**: Bumpy or thick bark can cause inaccurate readings. Can be difficult to determine the extent of early decay symptoms.

Microdrill

Microdrill devices measure variances in the amount of effort it takes for a small diameter drill bit to penetrate wood. Handheld devices, such as IML's Resistograph, use a rechargeable electric drill with a specialized drill bit that can be up to a meter long. At the point of suspected decay, the operator drills into the wood and applies even pressure. The device provides a readout in the form of a line graph that sort of resembles a human heart's EKG reading. The jumps in the squiggly line indicate changes in the wood's density as the drill bit was moving through. Often, multiple measurements are made around the tree. Looking at the readout and the depth the changes in density occurred at, one can put together a sense of the amount tree's decay to sound wood.

PROS: These can sense early stages

An arborist demonstrates a resistograph

of decay better than sound wave technology can. Readings can be taken fairly quickly with limited setup time. **CONS**: Drilling is a invasive process and should be used sparingly. The accuracy of the measurements can be dependent on the operator's ability to apply even pressure and drill speed. The long drill bits can be fragile and broken easily.

Electrical Resistance

When wood begins to decay, the tree's damaged cells release metal ions. This changes the speed at which an electrical current will flow through the wood, thus by measuring the electrical resistance between two nodes, the presence or absence of decay can be determined. The Father of CODIT himself, Alex Shigo, developed one of the first devices of this kind. The aptly named Shigometer used a drill to make two holes in the area of suspected decay. A probe with two prongs was insert into the holes and an electrical current is emitted and measured at 1 cm increments along the probes. As decayed wood has a lower electrical resistance than sound wood,

differences in measurements could be attributed to decay. More accurate technologies, known as electrical impedance tomography (EIT), have been developed since that utilized the same concept of measuring the electrical resistance difference between decay and sound wood that generate tomographic images from multiple readings.

PROS: Better at determining the extent of early decay than other methods. EIT images can be created for larger diameter trees than ultrasonic devices. **CONS**: The Shigometer is only capable of giving information from where the probes are inserted. All methods that utilize electrical resistance can produce inconsistent readings when the wood's moisture content is low, such as during prolonged dry periods.

Technology is grand and always moving forward to give us better data to base our decision making on. The thing to remember with all of these devices and measuring techniques is that they are providing just one piece of information. An assessment of a tree's structural integrity or hazard level cannot be simply ascertained by the push of a button, but this single data point can be very useful in certain situations. The cost of these devices and the time required to use them is a key roadblock to their use by the general

Above, renown tree scientist Dr. Alex Shigo demonstrate his invention the Shigometer at a seminar in 2006.

arborist. Basically, many of these devices are expensive to purchase and time consuming to use. Due to this, they are often only employed in cases of high profile trees, trees with a legal case around them, or trees with passionate advocates for either their removal or protection.

So, to better answer the reporters question on whether decay scanning technology existed that could have prevented a tragic death – the answer is still "Sort of." Yes, the technology currently exists to determine the extent of decay but it still requires a person looking for the possibility a risk, using one of the technologies we discussed to measure it, then taking that information along with their skills and experience as an arborist to take steps to mitigate that risk. The truth doesn't always make a great sound bite.

The MGCSA wishes to thank Brandon M. Gallagher Watson of Rainbow Treecare Scientific Advancements for his contribution to the Hole Notes magazine. This article first appeared in the MNLA *Scoop* dated June 2017.

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GOLF INDUSTRY DAY ON THE HILL

Starts at 7:30 a.m.
Thursday, March 8, 2018
Cedar Street Armory, St. Paul

The golf industry in Minnesota has a track record to be proud of. Besides hosting numerous national golf events including the PGA Championship, both Men's and Women's Opens, and the Ryder Cup, the business of golf annually generates over 2.3 billion dollars in revenue and employs 35,000 individuals in the state. Do you want to help ensure our industry remains strong and vital in the future? Attend the 2018 Golf Industry Day on the Hill!

Golf Industry Day on the Hill is your chance to **tell your elective officials your story** about the issues you face every day. Recently, the golf industry has been involved in conversations regarding phosphorous fertilizer, a license plate initiative, and limiting unfair taxation. We need YOU to be part of the conversation!

This day will focus on telling the good story of the golf industry including a request to support a Bill providing equitable water allocation upon golf courses in exchange for conservation and drought management efforts.

What key messages will we deliver to legislators?

- Economic Impact of Golf in Minnesota: The golf industry has a $2.3 billion annual economic impact to the state's economy and sustains 35,000 jobs.
- Event Economic Impact: The Ryder Cup, the largest sporting event to be held in Minnesota, was watched by 500 million people and generated an economic impact of over $140 million dollars locally.
- Environmental Stewardship: Golf helps to create and steward 21,000 acres of pollinator habitat, wildlife corridors, native plant areas, natural water features and wetlands.
- Green Space: Green space on golf courses increases carbon sequestration, generates oxygen, provides sound abatement and solar/ glare reflection as well as dust collection.
- Stormwater Management: Golf courses provide for communities' largest rain gardens, pollution abatement, ground water recharge and erosion control.

To register, fill out page 2 of this form. Please reserve your spot by February 22nd for the March 8th event.

Questions about the topics?
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Great Cultu

By Chris Tritaba

The ultimate goal toward which Hazeltine turfgrass staff and I work each day is providing our members and their guests with the very best golf course possible. No matter what type of course you manage, you'll need people to accomplish your goals. Over the years, I've found that while it is the ultimate goal, creating the very best golf course possible is not what motivates our staff to do the great work required to meet our goal.

We've all experienced those mornings when the alarm clock goes off, and we are so excited for the day we can't help but jump out of bed. This is the feeling we try to create for our staff every day. As a group, we work together, striving to create an environment that makes people feel inspired and excited. They feel this way because they know they'll spend each day working outside, and having fun with friends, all while creating something

ure = Great Golf Course

augh, Superintendent at Hazeltine National Golf Club

of which they can be proud.

Creating such an environment does require some work and it requires guiding principles by which everyone should work. Once a culture based on guiding principles is developed, keeping a positive environment requires routine maintenance, more so than complete overhaul. The following are our guiding principles.

Our Guiding Principles

- Safety-Protect yourself and your teammates, always work in a safe manner and make sure others are doing so as well.

Working on a golf course is great fun, but no one should lose part of their body because of it. Ears, eyes and extremities all need to be protected and it's everyone's duty to make sure we are all being safe.

- Teamwork-Be kind to each other, work as a team to have fun and create something worth being proud of.

Almost all of the work we do is done in teams. Working in a group enhances the fun factor and the sense of accomplishment. One of the great motivating factors in any job is accomplishing, or completing something. Take the task of raking bunkers. Completing the bunkers on one hole and moving on to the next hole gives a sense of accomplishment. When working together, these accomplishments are easier and happen more rapidly, making any task less burdensome and more rewarding.

- Commitment-Complete every job at the highest level possible. Create something you and your teammates can be proud of.

No matter the job, commit to doing it to the best of your ability. If someone is part of the bunker crew on Friday and they don't commit to doing a great job, then you've let down those who've done the job on previous days.

- Initiative-Take the initiative to do more than asked.

It's not my job, is not a phrase we endorse, and it's not an attitude we have problems with. Doing something as simple as stopping to blow a clump of clippings from a mower helps to make us all better. Initiative and teamwork go hand in hand.

- Openness-If you do something wrong, tell someone. Mistakes happen and admitting one is far better than hiding one.

Admitting an error will often avoid another error down the road. We can learn from our mistakes and use them to become better.

- Innovation-Never assume the way we do it is the best way. Always look to create continuous improvement through innovation.

If I were to hand a new employee a bunker rake and a photo of how a completed bunker should look, but offer them no training, their last bunker would look far better than their first bunker. Obviously this is not a tactic we use, but it's an example of the inherent nature people have to innovate. Demanding a task be completed in a certain manner limits one's natural desire to find a better way. We allow our employees to constantly innovate the manner in which we maintain the golf course.

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- Admiration-Never be afraid to admire and share the work you've done.

Taking photos, humble bragging and sharing on social media are all forms of admiration. Employees who are encouraged to admire their work will naturally be inspired to create something worthy of admiration.

- Have fun!

I'll never forget how much fun I had in my early days working on a golf course. Fun is far better than not fun.

When the staff gathers each morning, we plan our day and discuss our work in reference to these guiding principles. It's easy and tempting to reference our work in regard to producing a great course, but through experience, we know having a team full of people who enjoy their work will lead to positive results.

Having principles of this nature are all well and good, but if the

Photo, Matt Cavanaugh, Assistant Superintendent at Rush Creek GC

team doesn't have awareness, or isn't actively working to the principles, they are only as good as the paper on which they are printed. How does one get their team to not only work towards the guiding principles, but also help and support each other in doing the same?

Every season, part of the turfgrass staff uniform is a hat. This season, I wanted to create something unique, and designed something similar to the gray Team USA hats from the Ryder Cup. I wore my gray hat the entire Ryder Cup week and it is one of my most treasured keepsakes from the event. I vividly remember standing in the merchandise tent looking at the team hats and wanting one of each; I had to talk myself out of buying all of them. As I thought about our team hats for the season, I remembered that thought of wanting one of each. I thought to myself; "wouldn't it be cool to create an atmosphere in which the feeling of wanting one of each was able to be used as a motivating factor for the team?" At the beginning of the season, every team members was given a gray hat, but if you want more than one, you'll need to earn it.

Enter the #hatnomination.

After introducing the team to our guiding principles, we put forth the blue hats as awards for those individuals showing special commitment to the guiding principles. Using a group messaging app, team members are able to nominate fellow team members for a hat reward. If one team member feels another has taken extra initiative, shown strong commitment, or come up with a particularly special innovation, they send a message putting forth a #hatnomination for their fellow employee(s). This initiative has proven an excellent way to have the entire team thinking and working in the same manner. Nominating a fellow team member has proven to be almost as rewarding, or even more rewarding, than being nominated. We all think about the right manner to work and we are all on the lookout for others working in the right manner. The results of which are the creation of a positive, enjoyable, self-maintaining environment.

Our staff shows up on time, works hard and has fun, and by concentrating on the creation of a great work environment, we've been able to realize our ultimate goal of providing a great golf course.

Congratulations Glen Rasmusson, third from the lft, for your 55 year membership service recognition award. The membership respetcs your years of support.

Within the Leather

by James Bezanson
Superintendent at Highland National Golf Course

A Knight in Shining Armor- is a person who comes to the aid of another in a gallant and courteous manner. Yes it's a phrase used to describe a warrior or solder in medieval times that comes to save a damsel in distress. The image that it brings to mind was created by Victorian novelists and painters who were captivated by the ideals of high nobility and royalty and was in fact polished and shiny. I'm going to attempt to make the knight's shiny armor relatable to managing people.

Knight and shining armor is a metaphor for how we may perceive someone or ourselves. Our armor is our emotional, mental, and social wall. It's our beliefs, thoughts, opinions, feelings and attitude. It's our comfort zone or defense and everyone has their own way to protect themselves. No one's armor is perfect and all armor has its own strengths and weaknesses. For most people, having their armor (character or beliefs) challenged is very uncomfortable and may cause anxiety and tension, so it is avoided and people surround themselves with people that have similar beliefs.

Meeting someone for the first time can be exciting, nervous and uncomfortable. When we meet someone and have not been pre-disposed to anyone else's opinion of that person, they may have a knight and shining armor perception. Their armor may be rusty and dented or they may not be wearing any armor at all. They have never given you a reason to be cynical towards them or there is no reason to doubt their moral character.

However, it is human nature to judge and your first impression is

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very important. How you perceive someone else will be your opinion of them until you start to get to know them and peel back the layers of their personality. Your first impression will either be validated or transformed as you develop that relationship. The one thing that everyone needs to remember is that first impressions are a two way street; the person you are meeting is judging you as well.

Hopefully, you have met someone and as you got to know them your first impression was altered in a positive way. Sometimes, because I think I'm a pretty good judge of character, I'll quote the late Football Coach Dennis Green, "They are who we thought they were", and it's not a relationship you want to invest in. As we get to know someone, that once shiny armor may become tarnished, dented, scratched or it even possibly rusted away until they are curled up in ball, naked and bare and have no armor at all. This may happen for a number of reasons; they may not follow through with something they said they would or that person may be habitually late. They may lie to you or share something that wasn't meant to be shared. Whatever the reason may be, individuals always have the opportunity to pound out the dents, polish up the armor and bring back the shine. As human beings,

one thing that makes us great is that we are resilient and have the ability to redeem ourselves through changing our actions.

As Superintendents we are in a position to help people customize their armor so they can bring it with them wherever life takes them. We have the responsibility to be critical as well as the obligation to coach and share knowledge. Some of the most rewarding employees are the ones that show up unarmed and we work together to build their armor through constructive criticism, diligence and praise. Some of the toughest people are the ones that show up in military tactile, fully equipped and ready to go to battle. Hopefully you never have to go nuclear to break down someone's armor, but with some people it may be the only way to get the message across. It takes time to establish relationships so sometimes a lot of patience is required.

If your working environment allows you to feel valued, safe and trusted, the need for armor becomes less important. Sometimes you have to be the first to remove that armor and show your vulnerability and humility. When I'm around people and we both can relax without armor, I consider those people my friends.

I enjoy sharing the dumb things I've done so everyone can learn from my mistakes. I don't like spending time pounding out dents and polishing my armor but who does?

Editor's Note: Everyone has something to say and almost everyone is willing to listen. Please take the time and write a column for your peers to consider. Humorous, serious, educational or just for fun, your message will be sure to inspire others in the golf course management industry. Wish to know how? Contact me, James Bezanson, at: jamie_honda@yahoo.com

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