

48th Annual Wisconsin Golf Turf Symposium Extreme Turf Management

By David Brandenburg, Golf Course Manager, Rolling Meadows Golf Course

A large crowd was on hand to open the 48th Golf Turf Symposium and it was a fitting time to award Danny Quast the WGCSA Distinguished Service Award for his many contributions to the WGCSA and the golf industry. Congratulations Danny!

I struggle with this review every year because I come home with 25-30 pages of notes and could fill an entire issue of *The Grass Roots* with information learned from the speakers. If you were not able to attend the symposium this year you missed another great educational opportunity. I will cover a couple things from each speaker but next year your best bet is to be in attendance.

Our Keynote Speaker Dr. Ed Hopkins, Assistant Wisconsin State Climatologist for the Department of Atmospheric & Oceanic Sciences University of Wisconsin-Madison opened with historical data and statistics about our "extreme" weather patterns.

"Weather" is a snapshot of the atmosphere at a given time and place.

"Climate" is the typical weather conditions that define character of an area or long term averages. Our current "normal weather" is the averages from 1981-2010. The normal changes every ten years.

Dr. Hopkins said "Climate is what you expect, weather is what you get."

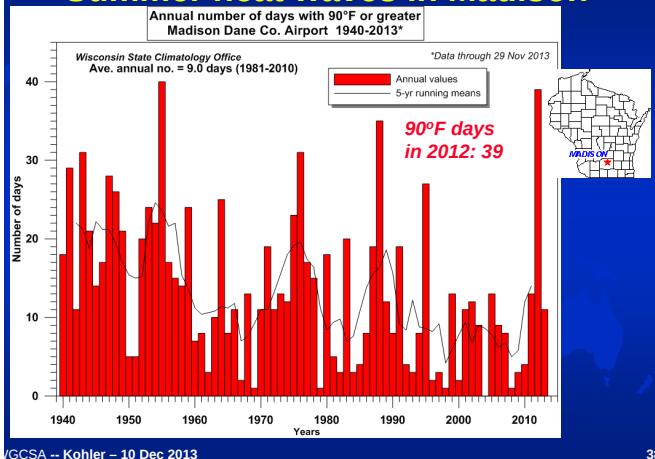
Extreme weather includes unusual, severe or unseasonal weather when compared to the normal and may occur up to 5% of the time. Extreme weather may evolve into changing climate over time.

Dr. Hopkins provided a lot of information and at one point said "I have enough statistics to be dangerous"! Extreme weather has always been present and is unusual, severe or unseasonal weather at the extremes of historical distribution.

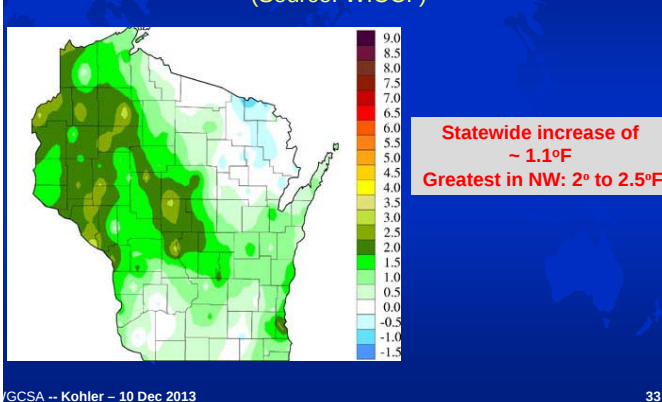
Ed expressed winters are clearly warmer than they used to be and this will result in a longer growing season, and changes in the USDA Plant Hardiness Zones. He gave no reason for this but added the weather has been variable for as long as there has been records.

Next up was Bob Small, Water Supply Specialist from the Water Use Section of the Wisconsin DNR discussing water use in Wisconsin. At first it seemed odd inviting the so called enemy to our symposium but it was quickly clear that Bob not only was a golfer but he was educated about golf course water use in part from work done by Dr. Doug Soldat.

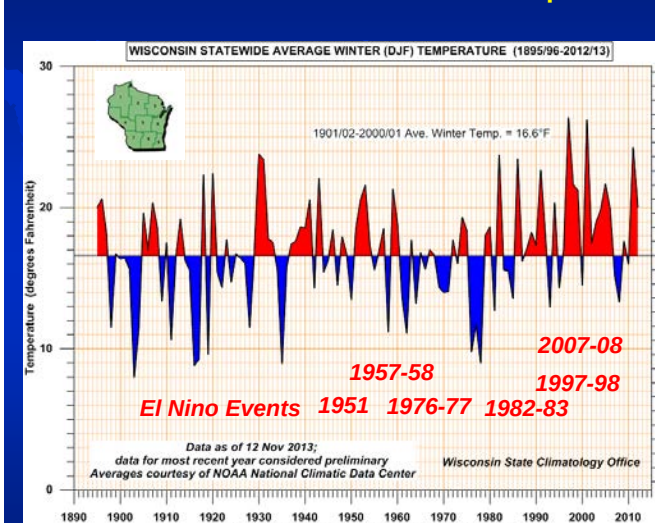
Summer heat waves in Madison



Change in Statewide Annual Average Temperature (°F) from 1950 to 2006 (Source: WICCI)



Trends in Wisconsin's Winter Temperature



Top Right: Annual number of days in Madison above 90.

Center: Dr. Ed Hopkins

Center Right: Change in statewide annual average temperature from 1950 to 2006

Bottom: Trends in winter temperatures from 1895 to 2012/13

Water withdrawal is defined as taking water from a surface or ground water source and making it unavailable for other purposes, even if only temporarily. Systems with a capacity to withdraw 100,000 gallons per day need to report.

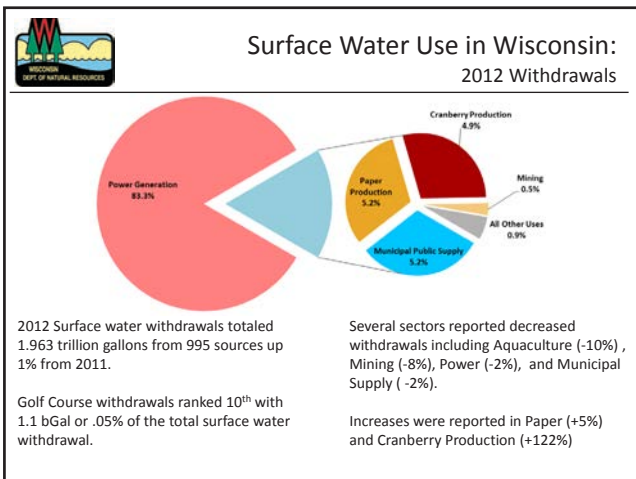
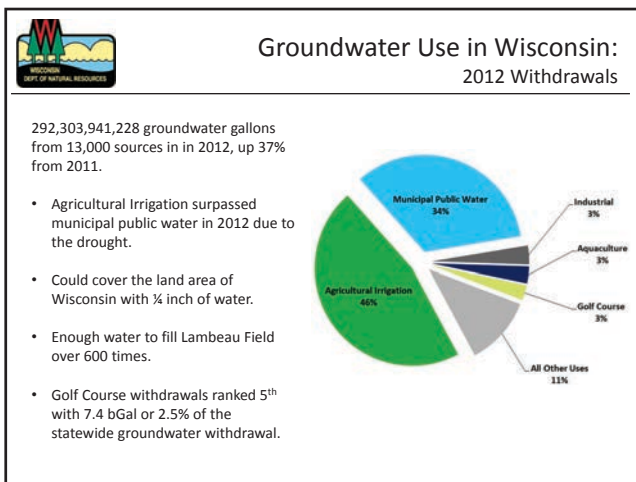
49 Wisconsin golf courses report surface water and 390 report ground water use. Bob would like to improve the annual reporting rate because 91% of golf courses reported in 2012 compared to a statewide average of 95%. Other goals include:

- Improve registrations to include both original sources and irrigation system withdrawals to account for wells that pump into surface water. (Will count only larger of the two.)

- Improve registration accuracy.
- Integrate DNR reporting with UW Turf-grass irrigation research.
- Coordinate with WGCSA and USGA to determine if and how data can be put to best use.
- Identify other potential collaborators.

Golf Courses may want to hide our numbers but accurate reporting and data is important to prove the value of our use and the actual conservation efforts golf courses use to reduce water use. Bob expressed golf courses use less water than many other land users.

Expect to see more from Bob in these pages in the future as he works with Dr. Soldat to gather accurate data on golf course use and conservation.



Top Right: Bob Smail, Water Supply Specialist

Middle: Ground water use withdrawals show golf courses ranked 5th with 2.5%

Bottom: Surface water use withdrawals show golf courses ranked tenth with .05%



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Dr. Karl Danneberger was next with a talk titled "High Temperature Stress Management". Stress is defined as anything that subjects the turfgrass plant to hardship. Temperature stress of turfgrasses occurs when the plants are exposed to temperatures above or below their optimum range.

High temperature stress is closely related to light, light quality, light wavelength, light duration and the light saturation point of the specific plant. In cool season grasses the stomates close as the plant reaches the light saturation point.

On a clear summer day sunlight is direct and of high quality leading to only 2% of solar radiation being used for photosynthesis. The rest is heat that needs to dissipate through absorption or reflection.

Dr. Danneberger presented three scenarios of turf canopy temperatures given all have adequate moisture for transpiration.

1. With a temperature of 90 degrees with clear skies and a wind greater than 5 mph the canopy temperature will be 90 degrees.
2. With a temperature of 90 degrees with cloudy skies the canopy temperature will also be 90 degrees.
3. With a temperature of 90 degrees and clear skies and little to no wind the surface canopy temperature will rise to 105 degrees.

This example shows the value of tree removal to allow natural winds to blow across the green to easily cool the surface. Indirect heat stress will cause a depletion of carbohydrates in the plant and a decline in the root system. Direct or acute heat stress will cause a disruption in the membranes, a degradation of the plants



**Dr. Karl Danneberger from
The Ohio State University**



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proteins while cell function shuts down leading to plant death. When moisture stress is coupled with heat stress death can come quickly.

Karl's research has shown that high soil temperatures are more detrimental than air temperatures. Soil temperatures greater than 70° can cause a 50% reduction in root growth but if aerification is done before the soil temperatures reach 70° turf managers can reduce the stress period due to air exchange.

His work also shows that plants can and need to acclimate to high temperatures. Plants have the ability to protect themselves from lethal temperatures so we need to avoid doing stupid things while the plants are acclimating.

Dr. Danneberger also discussed Systemic Acquired Resistance (SAR) where products such as phosphites or acibenzolar are used to keep the plant healthier. He was concerned that it is possible to overdo the use of these products and have the plant constantly working harder.

Karl's take home point was to measure soil and canopy temperatures and respond with proper management practices to reduce plant stress.

Dr. Doug Karcher from the University of Arkansas finished up the first day with "Wetting Agents". He started with a little history and stated that since 1883 there have been 1,200 publications on hydrophobic rootzones with a huge increase since 1964 when sand based putting greens became popular.

Localized dry spots are caused by organic coatings on soil particles causing water repellency. The coatings were originally blamed on fungi but are now considered to come from waxes from leaves, plant root exudates, decomposing organic matter and fungal hyphae and exudates.

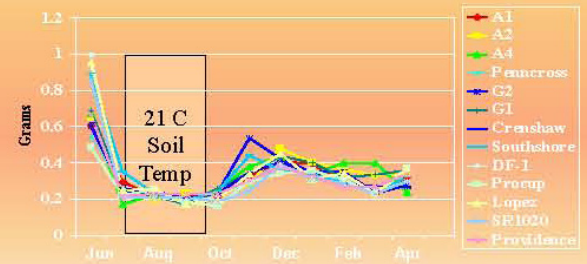
Wetting agents are used to act as a bridge between waxy coatings and water droplets. However all wetting agents leach or are decomposed by microbes so they are a temporary fix.

One challenge for turf managers is wetting agent classifications are not standardized universally but are used more as advertising words. In research the benefit of wetting agents becomes more apparent the lower the soil moisture is kept.

Dr. Karcher also provided research that shows various wetting agents alone provided no difference in green speed, surface hardness or ball mark depth but did provide quicker recovery from ball marks during dry periods especially later in the season.



Seasonal Rooting of Creeping Bentgrass Cultivars - 1997 - 1998



LDS on Sand Based Greens

- Water repelled by "waxy" coatings on sand grains
- Water drop penetration time: 5s >10m



Irrigation threshold = 6% soil moisture (< 1 / wk)



Top: Dr. Danneberger shows creeping bentgrass roots do not recover from summer stress until October

Middle: Dr. Karcher shows how to conduct a drop test to measure water repellency

Bottom: Plots kept at 6% soil moisture show the value of wetting agents

Bottom Left: Dr. Doug Karcher, University of Arkansas

Doug finished up with showing that most wetting agents tested reduce localized dry spots and improve moisture uniformity without adversely affecting moisture content while appearing to have little effect on putting surface performance.

He urged attendees to get and use a moisture probe to measure moisture content and uniformity to reduce irrigation frequency. With proper soil moisture content for your site turf managers can reduce summer stress, surface matter organic content, summer diseases, moss, algae and their water budget. In his experience the TDR probe is easy and accurate.

After Wednesday's breakfast buffet Dr. Zach Reicher joined us to discuss "Poa Annua Management". Poa annua can provide a fine playing surface because it is fine bladed, tolerant of low mowing and recovers quickly from seed.

Even though poa makes up the primary plant on many greens, tees and fairways poa is still considered a weed. Poa annua is apple-green in color, seeds in late spring and often again in fall. Poa is susceptible to snow molds, winter-kill, ice cover, heat, water stress and often widespread death.

It is considered one tough plant as it can be found from the equator to the Arctic Circle and can produce 360 seeds per plant per year. Seeds are viable in the soil for 6 years and can germinate in darkness. Seeds on a green can germinate immediately and on fairways after only 4 months or a chilling period.

Although many manufactures claim they can control poa annua few have had good long term success. Dr. Reicher expressed that multiple control measures are needed and often required forever or minimum of the 6 years the seed is viable in the soil. Before control should be attempted turf managers should receive support from the clubs decision makers while being honest about expectations.

Due to the genetic diversity of poa control can be limited and the weed has shown resistance to numerous herbicides. Any successful program will need a multi pronged attack with various chemical and cultural practices. Considering Primo promotes poa health it should not be used as part of a poa annua control program but is valuable for promoting quality poa.

As part of the multiple faceted plan phosphorus needs to be limited all season and late season applications of Nitrogen. On a scary note no fungicides labeled for summer patch or anthracnose should be used and clippings should be collected during seedhead formation.

Considering aerification brings up poa annua seeds from the soil profile courses looking to promote poa should aerify in fall when germination is peaking while courses that are looking to reduce poa annua should aerify in the summer. On sand based greens or greens with a layer of sand with no significant organic or thatch layer can forego aerification all-together.

As shown in the slide to the right Dr. Richer showed the best option for poa control is to kill off the existing turf and start over with a more competitive grass.

To give the bentgrass a competitive chance the best time to seed is shown to be before mid-August and preferably in early July.

In the end Zach taught us the road to poa elimination is long and expensive and the road to promoting poa as a major part of greens, tees and fairways is wrought with failures due to environmental stresses.



Annual bluegrass biology

- Adaptable: Equator-Arctic Circle
- *Poa annua annua* - winter annual
 - Lighter green, wider leaves, more seedheads
 - Can flower within 45 days of germination
 - More common in lawns, fairways, "rough type"
- *Poa annua reptans* - perennial
 - Dark green, thin leaves, few seedheads
 - Most do not flower until spring after overwintering
 - More common in greens
- Continuum: true annual through long-lived perennial
- Probably millions of biotypes in between

Annual bluegrass seed bank

- Can produce 360 seeds/plant/year
- Six years+ viability in seed bank
- Seed bank:
 - 110 viable seeds/in² greens
 - 70 viable seeds/in² fairways
 - Seeding rate = ~ 12-15 seeds/in²
- Seeds viable within 24 hours of pollination
- 80% of seed in greens can germinate immediately
- Seed in fairways requires 4 months or chilling
- Can germinate in darkness
- Maryland golf course rough (Kaminski, et al):
 - 76% germinates from late-Sep to mid-Oct
 - 24% germinates from Nov to May

Best option for Poa control

- Start over
- Roundup, Basamid, methyl bromide
- Pick the most competitive grass
- ✳ **Seed early to maximize time for establishment prior to Poa germination** ✳
- ✳ **Aggressive Poa control after seeding** ✳

Top: Annual Bluegrass Biology

Middle: Annual Bluegrass Seedbank

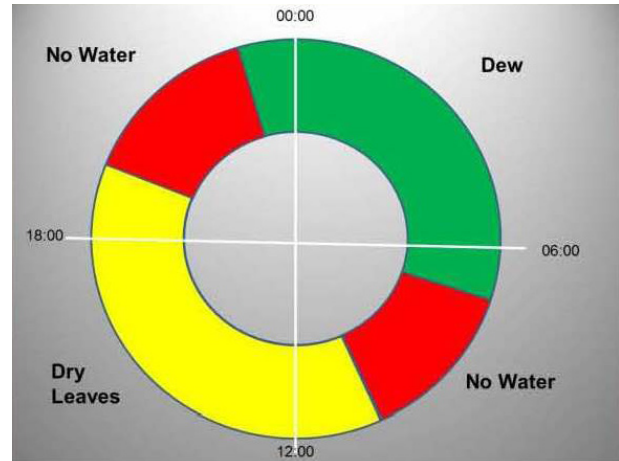
Bottom: Best Options for Poa Control

Bottom Left: Dr. Zach Reicher, University of Nebraska - Lincoln

Dr. Danneberger returned to discuss "Irrigation During Summer Stress" and provided a multitude of pictures showing various kinds of turf stress and damage from earthquakes, volcanic ash, winter dessication and shade.

Karl discussed the value of reducing the wetness window and removing morning dew through dragging, whipping, mowing or rolling. Dew can be 77% sugar that should be removed or diluted when possible.

Dr. Danneberger also discussed the benefit of green and fairway topdressing to promote surface firmness by reducing thatch. If a club is looking to go to the next level, topdressing fairways is the next level. Once a 5-6" layer of sand is built up even a saturated profile will still provide a solid and stable surface.



Above: To promote plant health avoid extending the period of leaf wetness by avoiding watering during the period right before or after dew formation.

Left: Can topdressing fairways take your club to the next level?

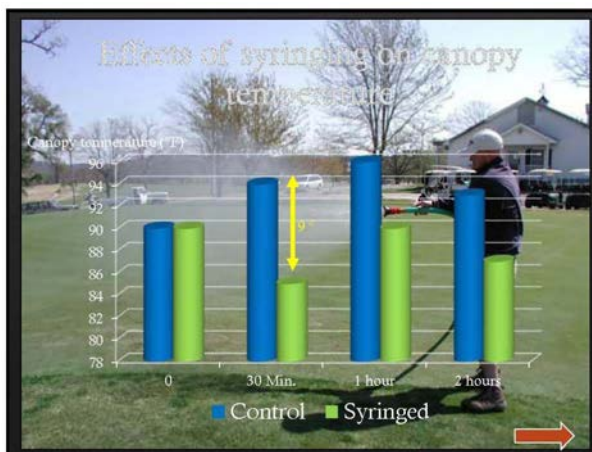


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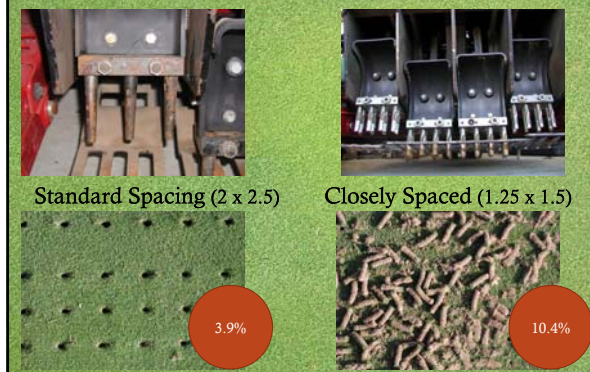
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Excessive Rootzone Moisture

- ◆ Leaching
- ◆ Anoxic rootzone
- ◆ Shallow rooting
- ◆ Denitrification
- ◆ Thatch accumulation
- ◆ Algae
- ◆ Moss
- ◆ Black layer
- ◆ Poor stress tolerance
- ◆ Poor quality playing surface (ball marks)
- ◆ Disease (pythium blight, brown patch, and others)
- ◆ Waste of water (\$\$\$\$\$)



Managing OM in Sand-Based Rootzones: Advances in Cultivation



Top: Dr. Karcher shows the evils of too much rootzone moisture.

Middle: Dr. Karcher shows the benefits of a quick syringe on a hot day.

Bottom: Dr. Karcher shows more holes are better for organic material removal.

Dr. Karcher returned to present “Putting Green Summer Stress - What To Do and What Not To Do.” He got right to the point and discussed excessive rootzone moisture and the many problems it causes.

Black layer is often diagnosed as a problem with weak turf when it is the result of wet soils causing anaerobic conditions.

Evaporation and transpiration are the best ways to dry out greens but air movement is key to that process. Fans have become popular to move air across the surface and reducing turf stress. Dr. Karcher presented fans can reduce canopy temperatures by as much as 14 degrees. Fan placement is key as the effects of the fan is lost the further you move away. When monitoring wind speeds it is important to take measurements at the surface not head high. Doug recommended tree removal when possible over the installation and expense of fans.

Organic matter management is extremely important and many of the new grasses provide for a denser surface and increased organic matter. This organic matter increases water in the profile and reduces infiltration and air/gas exchange.

Dr. Karcher expressed more is better when it comes to aerification and mechanical thatch removal. The thicker the verticut blade or the more aerification holes the more thatch is removed. From the photo on the left you can see a closer spacing greater increases the amount of the green affected.

The research also shows that an aggressive verticutting with a Graden at 3mm, 2mm or 1mm removed up to 20% of surface organic matter while the most aggressive aerification removed less than 5% surface organic matter.

At the same time surface healing time increased with the more aggressive treatments.

Doug then turned to show the benefits of rolling in addition to or in substitution of mowing. The 24 plot study showed how rolling could allow turf managers to reduce mowing frequency or raise height of cut without reducing green speed. Repeated rolling did not improve turf quality in this study but it did not statistically reduce quality.

Dr. Karcher finished up with information on the benefits of moisture management and the process to calibrate a moisture probe during spring or fall to different greens construction methods. Once the number is found for your site he recommended to not take greens to the wilt point during the stress times of the year. The purpose of finding the wilt point during mild conditions is to avoid stress the rest of the year.

Dr. Reicher finished up the morning with the talk “Extreme Weed Management - New Solutions for New Problems.” He started with his old friend *Poa Annua* and reiterated thoughts from his earlier talk. *Poa* management needs a multi pronged approach with multiple products forever. He is cautiously optimistic regarding the new *poa* cure product but stressed it will not be a stand alone product and resistance to it will come in time. Costs should be near \$5,000 per acre and for many golf courses they need to figure out how to spray a round green with a square sprayer.

Velocity has shown promise on reducing annual bluegrass populations in creeping bentgrass and perennial rye fairways. Prograss can also work on perennial rye fairways but it usually requires the help of a harsh winter to take out the *poa*.

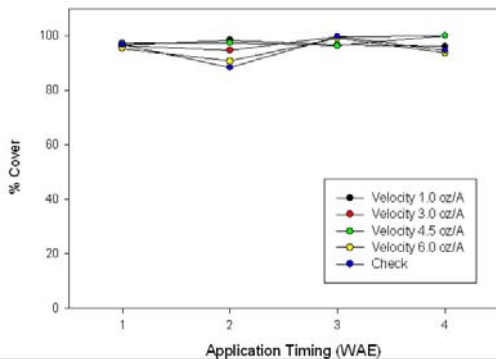
On Kentucky Bluegrass fairways Tenacity has shown it can be effective under the right conditions. Tenacity is safe on perennial rye seedlings but not the mature plants.

Dr. Reicher finished up with taking weed problem challenges from the crowd and doing his best to give a solution to various pesky weeds.

KBG Fairways: Tenacity?

- **Tenacity is not labelled for *Poa annua***
- Very safe on KBG including seedlings and also PRYE **seedlings**
- Three applications at 5.3 oz/A 7-10 days apart is typical
- More frequent applications improve control
- Include 0.25% v/v NIS + 2.5% v/v UAN (urea-ammonium nitrate 28% N)
- 20 GPA most effective
- 1.0 lb N/1000 w/urea shortly after applications start
- Fall applications effective, but inconsistent with only 3 fall +/- 1 spring applications
- Control from fall apps are equal to or better than Progress
- Univ of Illinois:
 - >70F or hotter
 - 5 apps @ 3.2 oz/A applied 1- 2X/week

Safety of Velocity 17.6SG when applied over newly-seeded L93 creeping bentgrass. Regardless of rate or timing, Velocity had no effect on cover by 8 weeks after emergence (WAE) (Purdue 2007).



Top: Dr. Reicher shows a reliable Tenacity program on kentucky bluegrass fairways.

Center: Dr. Reicher shows the safety of Velocity on creeping bentgrass seedlings.

Bottom: The panel discussion included Jim Vanherwynen, Mark Storby and Jon Canavan

After lunch we gathered for the panel discussion moderated by Robert Vavrek. Jim Vanherwynen, South Hills Country Club, Mark Storby, Oneida Country Club and Jon Canavan, Milwaukee County discussed a variety of questions from Bob and the audience.

Staffing, staff motivation and staff retention were key topics along with mowing and rolling patterns, mower technology and budget constraints. Overall the three provided insight into what works at their facilities.

Before the annual Roundup from USGA Green Section Agronomist Bob Vavrek there were a couple announcements.

Shelly Mazurek with Milorganite will retire before the next symposium and was recognized by the WGCSA and attendees for her service to the event. Shelly has been involved since 1980 and works behind the scenes organizing the event, making speaker travel arrangements, setting up rooms and ensuring the symposium committee stays on track. Through Shelly's work and Milorganite's sponsorship of speaker and room costs the symposium stays a low cost educational opportunity for attendees. Any profits from the event are donated to the O.J. Noer Foundation.

The second announcement was a gift from Dr. Danneberger as Jaime discussed how "back in the day" the old timers including O.J. Noer himself would sit around and talk turfgrass while enjoying some whiskey. To continue that tradition Jaime and Shelly handed out a shot of whiskey to those in attendance. So not only do we have great speakers and education at a great facility while donating money to the O.J. Noer Foundation but we have whiskey also. The Wisconsin Golf Turf Symposium is truly the best educational event anywhere.





Shelly Mazurek shown with WGCSA President Chad Harrington and USGA Agronomist Bob Vavrek was honored for working with the symposium for 34 years.



Our hosts, Shelly Mazurek and Jaime Staufenbeil

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