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ABOUT THE COVER

Landscape artist Jennifer L. Samerdyke has captured both the sense and beauty of spring in Wisconsin with her cover for this issue. Her subject is the perennial bed of spring blooming bulbs near the second tee at the Serendipity Golf Club in southwest Wisconsin.

"Over the land freckled with snow half-thawed
The speculating rooks at their nests cawed,
And saw from elm-tips, delicate as flower of grass,
What we below could not see, winter pass."

- Edward Thomas

THE GRASS ROOTS

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2001-2002 WGCSA OFFICERS AND DIRECTORS

SPRINGTIME THOUGHTS

By David Brandenburg, *Golf Course Superintendent, Rolling Meadows Golf Course*

As spring approaches, I hope this message finds us enjoying warming temperatures and looking forward to a great start to the 2003 golf season.

Congratulations to Monroe Miller, editor of your Grass Roots, as the publication has won best content for a chapter publication with an unpaid editor from GCSAA. The recognition once is enough but Monroe has led our newsletter to this award for the 19th year in a row. Great job Monroe, and eternal thanks to you and Cheryl for your donation of time and talent to the WGCSA.

The WGCSA Board of Directors was reminded by Randy Witt a few meetings ago that for some of our members, the Grass Roots is their only source of association information. I will be honest that I had not thought of that detail and it made me appreciate the Grass Roots even more. Because of the geographic size of Wisconsin and the various budgets our members deal with, some of our colleagues rarely attend a meeting. For them the Grass Roots is their eyes and ears when it comes to association news and views. It is also the best record of chapter history we have.

Having shown you how important and valuable the Grass Roots is, I have a favor to ask you. As you read through this issue of the Grass Roots be sure to look at the ads. Read the columns, yes, but remember without the ads the columns would not exist. I need you as members to do two things. Thank the advertisers who you do business with and let them know how much their support means to our chapter and our members.

At the same time, think about the companies you deal with that are not in the Grass Roots. The next time you see that company's representative twist their arm a bit. Let them know how important the Grass Roots is to our members. Our ads are very economical compared to other advertising venues. For the entire year (all six issues) an eighth page ad is $600 and a full-page ad is $1,500. Let me know whom to contact, and I can send advertiser information and past issues for your vendor to see.

Most importantly though, "Thank You" to the current advertisers. Your continuing support makes the Grass Roots and the WGCSA what is today.

By now, our meeting agenda is out for the year. We have great sites again offered by gracious hosts. I have been attending the meetings regularly for 14 years and I take something new home from every meeting that I can use at my course.

If you have never or rarely been to a golf / education meeting I invite you attend more this year. You do not need a foursome; we will pair you up so you meet some new people. You do not need a good golf game; we have all skill levels participating. You do not need to golf. We do have members who only come for lunch or dinner to network and enjoy the education.

The meetings are a great opportunity to learn from another's golf course, while supporting the host member and club. Networking with your fellow members is an educational and relaxing way to spend a summer day. I hope to see you there!

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Winterkill

By Dr. John Stier, *Department of Horticulture, University of Wisconsin-Madison*

Winter is always a tough time for golf course turfs because some turf loss is almost inevitable. Turf dies during the winter due to one or more factors termed collectively as "winterkill". In no particular order, the six mechanisms of winterkill are 1) frost heaving, 2) low temperature fungi, 3) anoxia or toxic gas accumulation, 4) desiccation, 5) indirect low temperature injury, and 6) direct low temperature injury.

Frost heaving is mostly a problem on immature turf swards established too late in the growing season. Often the soil is fairly porous (i.e., low bulk density) due to tilling prior to seeding and lack of compacting forces (i.e., traffic). Winter rains fill up the air pores in the soil. As the soil temperatures decline below 32°F the water freezes and expands as ice, which pushes outwards on the soil. Since the path of least resistance is towards the surface, the majority of expansion occurs upwards essentially causing eruptions at the soil surface because the limited root system does not effectively bind plants to one another. The small root systems of the young turf are exposed to air which causes desiccation (drying) of the plants. While soil ice can still cause an upheaval in mature turf, the roots bind the plants to one another and the turf is easily pushed back into the soil by traffic. Smoothing out the minor hills caused by frost heaving is one of the reasons a lightweight rolling in the spring has long been a tradition in turf management.

Most years in Wisconsin various snow mold fungi can cause severe injury to turf stands. In many cases entire stands of turf can be lost unless a protective fungicide is applied in the autumn. In 1997 Dr. Millet, formerly of the UW-Madison Plant Pathology Department, surveyed several golf courses in Wisconsin for the prevalence of snow mold fungi. Dr. Jung followed up on the initial survey work and collected snow mold samples from 100 golf courses in 2001. Using molecular markers, Dr. Jung has verified the presence of at least four fungal species that can cause snow mold in Wisconsin: *Microdochium nivale, Typhula incarnata, T. ishikariensis,* and *T. phacorhiza* (Scheef and Jung, 2002; Rangel and Jung, 2002). *Microdochium* patch, sometimes known as pink snow mold or *Fusarium* patch, infects turf at higher temperatures than the *Typhula* species, occasionally as high as 70° F. The *Typhula* species can be considered colder-weather pathogens and, unlike *Microdochium*, seem to require a snow or leaf cover for infection. Dr. Jung's work to identify the species and biotypes of the snow mold pathogens will help superintendents to develop site-specific fungicide treatments to manage the snow mold pathogens on individual golf courses.

Ice often causes concern for superintendents. Ice can result in turf death by any of three means: 1) anoxia (lack of oxygen), 2) accumulation of toxic gas, or 3) crown hydration. (Crown hydration is explained later in the article as it occurs after ice melts and is a form of direct low temperature kill.) Recent research at Laval University and the University of Guelph has shown that toxic gases such as carbon dioxide from root or microbial respiration in soil can accumulate under ice sheets (Dionne et al., 2002). Oxygen levels decline during respiration under ice, potentially causing turf root death since roots and crowns need oxygen for respiration. Even if sufficient oxygen exists near the surface to keep the crown alive, a loss of oxygen deeper in the soil causes anaerobic conditions and a shift in the microbial population. Fermenting microorganisms increase in number and produce methane which can be toxic to turf plants when it accumulates under ice. Grasses vary in their capacity to survive under ice with creeping

bentgrass able to withstand up to 150 days under ice cover while *P. annua* may die between 45 to 60 days (Beard, 1964).

Desiccation injury is a common form of winterkill. Desiccation occurs when transpiration and/or evaporation rates withdraw too much moisture from the turf. Usually exposed turf leaves die from the combination of cold temperatures which prevent chlorophyll production and sunlight which degrades chlorophyll. Leaf death virtually eliminates transpiration and provides a natural blanket to reduce evaporative losses from the soil. In some cases, however, wind moving across a green turf in a frozen soil removes moisture from the plant which cannot be replaced and the plants die from desiccation injury. Desiccation can still occur when the leaves are dead as the crowns remain alive and may transpire at a low rate, especially when the temperature exceeds 32° F, throughout the winter.

The other two forms of winterkill, indirect and direct low temperature kill, are less obvious than frost heaving or snow mold diseases. Indirect low temperature kill is basically a form of desiccation (drying) injury. Indirect low temperature kill occurs when ice forms between cells, causing a lower water potential than that inside the cells. Moisture from inside plant cells moves towards the ice between the cells. If enough moisture moves out of the cell, cell turgor is lost and the cell membrane essentially collapses (plasmolysis). When plasmolysis occurs in enough cells in the crown the plant dies because the crown is responsible for both new leaf (upper crown) and root (lower crown) formation.

Direct low temperature kill occurs when temperatures decline below some threshold value which kills the plant. Direct low temperature kill is less common than indirect low temperature kill but can result in large areas of turf death rather rapidly. Water in the plant freezes, forming ice, which destroys cell membranes when freezing occurs rapidly or at excessively low temperatures. The low temperature threshold varies by species and sometimes by cultivar. The low temperature threshold is usually defined as the Lethal Temperature to kill 50 percent of the population (LT_{50}). Determination of the LT_{50} values uses laboratory methods to test freezing tolerance. Freezing tolerance values derived in the laboratory tend to overestimate the likelihood for death at any specific temperature, but provide useful comparisons between species and cultivars for breeding or establishment purposes. The most common method for determining LT_{50} values is to remove the crowns from turf plants and subject them to a range of sub-freezing temperatures in a methanol or glycol (antifreeze) bath (Gusta et al., 1980). Afterwards the crowns are potted in soil and checked for regrowth in greenhouse conditions. Numerous studies have shown that freezing tolerance increases during the fall, peaks around December-January, then declines by spring. In other words, turfgrasses have the best freezing tolerance in early to mid-winter; by late winter (March) freezing tolerance is little better than in summer.

Sometimes turf comes out of the winter looking green only to die a few weeks later. *Poa annua* is especially susceptible to this phenomenon.

We recently published evidence to explain why turfgrass leaves may appear green in the spring following snow melt only to die several weeks later. The answer is that the turfgrasses can freeze from the bottom up. We used an infrared video camera to detect temperature changes in turfgrass plants. Both cold-acclimated and non-acclimated plants were placed in a cold room and subjected to a decreasing temperature from 32° F to -18° F. The camera detected heat which indicated where ice was forming and how it was moving through the plant (heat is emitted as water freezes). The freezing events were recorded on videotape (examples of color images can be found at http://crop.scijournals.org/, then selecting the January/February

	Temperature at which tissue froze (F)	
Tissue type	**Perennial ryegrass**	**Supina bluegrass**
Roots	26.1	28.0
Crowns	23.9	23.5
Leaves	21.6	22.1
LSD (0.05)	0.7*	

*LSD value is for comparing temperatures between species or between tissue types within a species.

Table 1. Differences in freezing temperatures among leaves, crowns, and roots of two cool-season turfgrasses (adapted from Stier et al., 2003).

issue, then selecting Notes). Freezing events were conducted several times then the videotapes reviewed to analyze the temperatures at which freezing occurred. The results for supina bluegrass (*Poa supina*, a close cousin of *P. annua*) and perennial ryegrass (*Lolium perenne*) are shown in table 1.

The results showed that roots always froze at higher temperatures than either crowns or leaves. The camera showed that ice formed first in small roots then moved quickly throughout the root system, eventually reaching the lower crown. The crown tissue appeared to inhibit ice formation. As the temperature continued to decrease, ice slowly worked its way to the upper crown where new leaves form, then into the shoots and eventually the leaves. We never saw leaves or crowns freeze independently of roots. Ice-nucleating bacteria were placed on plant leaves, crowns, and roots: while the water droplets containing the bacteria froze, the bacteria did not cause ice formation in the plants as has been reported for some plants (Lindow et al., 1982).

What are the implications of our study? Although roots are protected from air temperatures by the soil, surface soil will be significantly colder during the winter than soil at a two or four inch depth. Our study showed that small roots close to the surface could freeze, allowing ice to propagate (move) into the lower crown where roots are formed. When the lower crown is frozen and the cells responsible for root formation die, new roots cannot be formed. Thus, it is possible for new leaves to be produced early in the spring as long as there is sufficient moisture in the soil surface for direct absorption by the crown. Without new root formation, though, the plants eventually die because they can't absorb enough moisture and nutrients to keep the plant growing. Beard and Olien (1963) proposed that lower crown death was responsible for winterkill in *P. annua* but only recently was the technology developed to test their hypothesis and explain how lower crown tissue could be killed while upper crown tissue was left intact.

Freezing injury to the lower crown through roots near the surface may be an important factor in what is often referred to as "crown hydration" [injury]. Direct low temperature kill occurs most often during late winter or early spring freeze-thaw events. During cold acclimation in the fall turf plants reduce the amount of free water in their tissues by slowing water absorption rates and by reducing [free] water potential by accumulating salts and/or sugars or by binding water with special proteins. These molecules are degraded during the winter and cold acclimation decreases with the approach of spring. In "crown hydration", water is absorbed by the plant during snow or ice melt and the amount of free water in the plant is greatly increased. When exposed to freezing conditions, the free water in the plant freezes, resulting in direct low temperature kill.

Understanding the phenomenon of winterkill allows supertintendents to develop strategies for dealing with winter injury. New turf should be established early enough before winter to allow a sufficient root system to develop and reduce the potential for frost heaving injury. Fungicides are used to prevent snow mold diseases. Ice can be physically broken up or melted using dark-colored substances such as Milorganite™ to absorb solar heat and melt ice (salt is not useful as too much can kill the turf). Desiccation can be prevented by a heavy topdressing during late autumn or by using an insulating blanket such as an Evergreen™ cover which allows only limited air exchange. Indirect and direct low temperature kill can be minimized by ensuring adequate surface drainage as internal drainage is prohibited when soil is frozen but snow or ice are melting on the surface. Maintaining a healthy turf going into winter is important for avoiding all types of winterkill, and this of course requires a growing season-long effort.

References

Beard, J.B. 1964. Effects of ice, snow, and water covers on Kentucky bluegrass, annual bluegrass, and creeping bentgrass. Crop Sci. 4:638-640.

Beard, J.B., and C.R. Olien. 1963. Low temperature injury in the lower portion of *Poa annua* L. crowns. Crop Sci. 3:362-363.

Dionne, J., Y. Castonguay, P. Rochette, and P. Nadeau. 2002. Annual bluegrass and creeping bentgrass responses to contrasting O2 and CO2 levels at two near-freezing temperatures. *In* Agronomy abstracts. American Society of Agronomy, Madison, WI. [CD].

Gusta, L.V., J.D. Butler, C. Rajashekar, and M.J. Burke. 1982. Freezing resistance of perennial turfgrasses. HortScience 15(4):494-496.

Lindow, S.E., D.C. Arny, and C.D. Upper. 1982. Bacterial ice nucleation: A factor in frost injury to plants. Plant Physiol. 70:1084-1089.

Rangel, Y., and G. Jung. 2002. Pink snow mold research in Wisconsin! The Grass Roots XXXI(4):15, 17, 19.

Scheef, E., and G. Jung. 2002. Have less snow mold this year? We're trying to find out why. The Grass Roots XXXI(3):53-55.

Stier, J.C., D.L. Filiault, and J.P. Palta. 2003. Visualization of freezing progression in turfgrasses using infrared video thermography. Crop Sci. 43:415-420.

He's Been Down Many Roads in His Life and Career

By Lori Ward Bocher

Interviewing Bob Emmerich about his life is like maneuvering through a maze - the maze of a fascinating mind and interesting career. We take a few steps forward, then backtrack and head in a different direction. Just when I think we've covered one section of the maze, he adds a few more paths to explore. Indeed, Bob has been down many roads in his life and career.

Currently Bob is a partner with his brother, Tom, in T.J. Emmerich Associates, Inc., located in Hartland. They are independent irrigation consultants for golf courses, commercial facilities, and residential properties. Tom started the business in 1992, and Bob joined him in 1996.

Bob has worked in the irrigation business from the ground up - literally and figuratively: He started by digging ditches shortly after graduating from high school; and he got into the business as it was just emerging in the Midwest. At many points in his career his technical knowledge and experience in the business proved to be very useful.

But wait. Let's back up and start at the beginning. Born in Milwaukee, Bob graduated from Messmer High School in 1965. High school was an unusually influential time in Bob's life. It was there that he met his bride-to-be, Kathy, who has been a part of his journey ever since. Extra-curricular activities led him to college and a scholarship. And a job in the high school cafeteria led him into the irrigation business.

"As a freshman I knew I wouldn't be a basketball player," says Bob. "So I became manager of the freshman team. My sophomore year I became manager and trainer of the

varsity team." Already Bob was showing his ability to master a job and move on to the next level.

The Messmer basketball coach was a graduate of St. Norbert College in DePere, and Bob's older brother was a student there and also a sports equipment manager. This helped open the door for Bob to get a partial scholarship as the athletic trainer for all sports at St. Norbert - hence, his choice of college.

Rubs elbows with Green Bay Packers...

Bob worked as the trainer for all four years in college. He has fond memories of sharing the campus with the Green Bay Packers who still have a summer training camp at St. Norbert. This was from 1965 to 1969, during the Glory Years of Vince Lombardi and Bart Starr. Bob met several of the great players. "Bart Starr was a real nice guy," Bob recalls. "He spoke at our athletic banquet the year I was a senior. I ran into him 10 years later at an airport and he still remembered me."

Bob's college major was sociology. "I was going to save the world," he says. "But, ultimately, I realized I couldn't make enough money in it." So we backtrack a few years to find out how Bob started in the irrigation business when he was just a senior in high school.

Bob worked in the cafeteria to help pay for tuition at his Catholic high school.

While washing dishes one day, he was approached by the man who operated the boiler for the school pool. This man, John Lynch, also owned Acme Lawn Sprinkler Company. "He asked me if I wanted to work for him for $5.50 an hour," Bob remembers. This was pretty good money back in 1965, so Bob accepted. He worked for Acme the summer before he started college and for four summers after that. Acme installed automated irrigation systems in upscale subdivisions and at commercial properties.

Each summer, Bob earned more responsibility. His first year he dug ditches. "And I realized there's a right way to do that," he adds. Soon he learned how to install plumbing and valves. "The first time I installed valves they were all backwards," he admits. "I had to dig it all up and do it over. I never made that mistake again." Eventually, Bob knew irrigation well enough that he worked the service truck.

He helps write the test...

But let's back up again. During his years at Acme, the State of Wisconsin started a licensing program for irrigation installers. Bob became an apprenticed learner, and then a journeyman. Since this was a new license, tests needed to be developed. Bob helped write the tests that he ultimately would take to get his restricted master plumbing license, a license he still keeps current. While in college, Bob was already showing his ability to get to the core of an issue

Walk mowing greens at Chenequaa CC for Jim Shaw.

and to communicate what needed to be done.

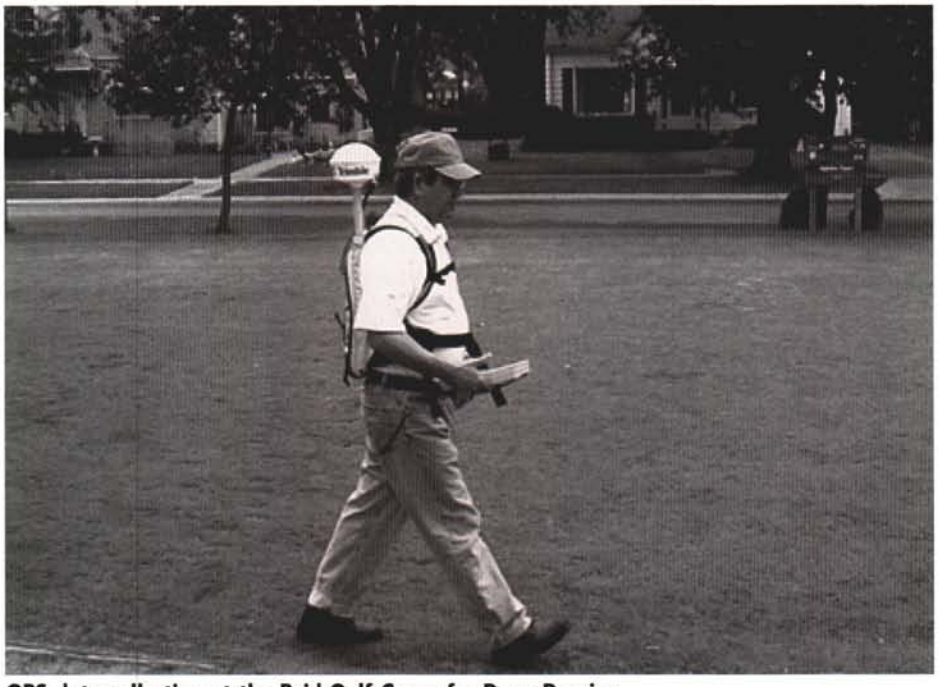
Bob graduated from St. Norbert with a degree in sociology in 1969. For the next one and a half years he served on active duty in the Signal Corps of the Wisconsin Army National Guard. At this time, communication technology was rapidly improving and Bob had a natural ability to learn that new technology. He worked his way up to Captain in the Signal Corps. He left active duty in 1970, married Kathy in October of 1970, and served weekend duty in the Guard for eight more years. With his sociology background, Bob feels that the most important lesson he learned from military service was: "Whatever you accomplish, you have to accomplish it through other people." This insight would serve him well in the years to come.

Also in 1970, Bob took a job in the irrigation department at R & S Parts, Inc., in Milwaukee - a Toro distributor - and eventually became the Assistant Manager. "The irrigation industry was growing rapidly, and R & S needed to be better organized in the way it did business," Bob recalls. "I organized their inventory, formalized a business structure, and started sessions to help contractors place orders more effectively. Coming out of the military, this was all very basic to me."

In 1974, Bob took a job with a pool company for a short time. Then he was snapped up by Toro. "At the time, unbeknownst to me, Toro had a policy of not hiring people away from their distributors," Bob explains. "So after I left R & S Parts, Toro offered me a job as a Technical Sales Rep." Later, Bob was offered a 14-state District Sales Manager position with Toro. In addition to his full-time job, Bob was also attending regular Guard training one weekend a month and a special Guard class a second weekend each month. Consequently, he was off only two weekends a month.

Paralysis throws up a road block...

But let's back up again. There was something else happening in his life at this time. In 1973, shortly



GPS data collection at the Reid Golf Couse for Doug Devries.

before their first daughter, Lisa, was born, Kathy became paralyzed on the right side. Because she was pregnant, the doctors weren't able to take X-rays. So they waited. After giving birth, Kathy became paralyzed on the left side, too.

Three days later, they found the culprit; a tumor on Kathy's spine. Fortunately, it was benign. Unfortunately, it had already caused irreparable damage. Kathy was in the hospital for several months and received outpatient physical therapy for one and a half years. At one point, scar tissue from the first surgery was causing the paralysis to return, so she underwent surgery again. Eventually Kathy regained many abilities, including the ability to walk. But there are lingering effects, such as weakness in her left side.

During Kathy's recovery, Bob was working full time and doing Guard duty two weekends a month. For a time he had to come home every three hours to help Kathy. When their second daughter, Christine, was born in 1977, life was busier than ever. Bob decided to resign from the Guard so that he'd have more time to be with his family.

From 1974 to 1978, while Bob was a District Sales Manager for Toro, he once again showed his ability to analyze problems and initiate positive changes. He developed training sessions to help irrigation contractors become better at their jobs. He worked with the corporate office to initiate sales forecasting. In 1978 he was promoted to Regional Sales Manager, thus supervising the work of five district managers east of the Mississippi River. In this position, he figured out it would be more advantageous to forecast sales by units, not dollars. He and a plant manager came up with 22 units that should be tracked to predict future sales.

In 1982, Bob was named National Director of Sales for the irrigation division of Toro. His eastern region was already accustomed to unit forecasting, but the western sales region was not. One of his first jobs was to get the western region on board. "It's sometimes difficult to convince