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Q & A With the Canadian Turfgrass Research Foundation

Turfgrass and environmental research in Canada took a giant leap forward in 1993 when the Canadian Turfgrass Research Foundation (CTRF) restructured to become a partnership between the Royal Canadian Golf Association, Canadian golf superintendents and seven regional turfgrass associations and foundations. In the following six years through 1998, the RCGA contributed $435,000 and the regions and industry donated $210,000. This total of $645,000 has attracted $453,250 in matching government and industry grants.

An independent Research Steering Committee of qualified turfgrass researchers and professionals assess all research proposals and monitor the projects to ensure relevance and scientific integrity. The program has resulted in the funding of 10 research projects at five different Canadian universities and research facilities designed to answer the following questions.

Will winter covers protect Poa annua putting greens?

J. Dionne, and Y. Desjardins, Dept. of Plant Science, Laval University, Quebec (3 yr study completed 1996)

The principal causes of winter damage on putting greens are snow mould fungi, low temperature kill and hydration damage which is the repeated freezing and thawing of plant tissue. Poa annua (annual bluegrass) putting greens are the most susceptible to hydration damage and superintendents have been experimenting with ways to protect their greens with varying results. Laval University's Dr. Yves Desjardins and graduate student Julie Dionne set out to test a variety of cover materials and measure the temperature changes under the different covers.

Test plots were set up in Quebec City where snow accumulation was great and Montreal where snow cover was variable. Eight different cover materials were tested. Some provided insulation while others helped to keep the green dry. Snow proved to be a very good insulator keeping the temperature under the covers fairly stable at just under 0° C, regardless of the cover material used. Straw and mats made of shaved wood provided the most insulation for greens with little snow cover.

Some practical information was revealed by the Laval study. Protection against hydration damage requires keeping the greens dry. This can be achieved with solid plastic covers either alone or over insulating materials. If local snowfall is deep and consistent, insulating material is not necessary. Timing of installation and removal of the covers is crucial. The greens must be exposed to lower temperatures in the fall to properly harden the plants. Also, leaving the covers on too long in the spring will promote disease and premature, weak growth. All covers appear to promote snow mould disease activity requiring all greens to be treated with a preventative fungicide. Finally, covers are not a substitute for correct construction and management of greens. Work is being continued to better understand what is happening under the covers.

At what temperature does winter damage occur in grass plants?

Tompkins, Bubar, Toews and Ross, Prairie Turfgrass Research Centre, Olds College, Alberta (3 yr study completed 1997)

Previous studies by researchers and observations by golf course superintendents indicate that creeping bentgrass has a greater tolerance of cold temperatures than Poa annua (annual bluegrass). Dr. Darryl Tompkins and his team at Olds College set out to determine if there is a physiological difference between the two species that would explain this and if other factors may be involved in a plant's susceptibility to low temperature damage.

Bentgrass and Poa annua plants were exposed to different freezing temperatures in the lab and the field and then regrown. When fewer than 50% of the plants recovered, this temperature was considered the lethal temperature for that plant group. Without any pre-cooling to condition (harden) the plants, little difference was seen between creeping bentgrass and Poa annua. Both species could withstand temperatures of about -5°C before half of the plants would die.

Exposure to a constant temperature of -3°C for an extended period "hardens" the plants enabling them to withstand lower temperatures. This is when differences between bentgrass and Poa annua started to show. The hardened Poa annua plants were able to withstand temperatures to -25°C in the lab and only while the bentgrass could survive in temperatures of -39°C. Field tests showed that both species were not able to attain their maximum cold tolerance due to incomplete hardening and Poa annua will probably only tolerate -15°C on a golf course.

In the spring, plants start to lose their cold hardiness as the temperature rises, making the plants more susceptible to low-temperature damage. Maintaining dormancy as long as possible is preferred while severe low temperatures are still a threat. Snow can protect the plants from rapid, premature dehardening if temperatures fluctuate wildly in the spring, but may be safely removed if temperatures remain above freezing.

What type and levels of gases accumulate under green covers in the winter?

Dionne, Desjardins, Castonguay, Rochette, Nadeau, and Huff Dept. of Plant Science, Laval University; Agriculture Canada; and Agronomy Dept. Pennsylvania State University (2nd yr of 3 year study)

This is a continuation of the winter green cover study completed in 1996. In addition to temperature, oxygen and carbon dioxide measurements were taken under the different winter covers. Carbon dioxide levels increased as the oxygen was consumed, but not in equal amounts. Dr. Yves Desjardins believes some of the carbon dioxide may be trapped in soil water, possible allowing the Poa annua greens to survive longer in an oxygen depleted environment.

The Olds College study looked at temperature as the primary factor involved in the "hardening" or cold acclimation of turf grass plants for winter survival. This study indicates that low oxygen situations may also affect cold hardiness. The collaboration with Agriculture Canada allows the Laval researchers to analyze biochemical changes associated with cold-tolerance to further understand what makes a plant better adapted to survive low temperatures.

This cold acclimation work is being used to screen Poa annua strains for

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cold tolerance. Collaborative work with Penn State University may one day result in commercially available, turf-type Poa annua seed for use in Canada. Poa annua is such a prolific and successful weed species that could make a good putting surface if we could improve its winter hardiness.

Will prolonged ice or snow cover damage Poa annua or creeping bentgrass?

Tompkins, Ross, and Moroz Prairie Turfgrass Research Center, Olds College, Alberta (2nd yr of 3 year study)

Turf managers have always been concerned when greens become covered in ice. The question arises as to whether the ice should be removed. Research from the 1960s recommended removal of ice covers before 50 days. This study was designed to define specific ice cover tolerance, using laboratory and field data. Dr. Darryl Tompkins and his team discovered quite a difference between Poa annua and creeping bentgrass. Poa annua plants were dead after only 60 days covered in ice. In contrast, creeping bentgrass plants showed cold hardiness to -26 °C after 90 days of ice cover before 50% of the plant population died. After 120 days of ice cover, this cold tolerance was further diminished with 50% of the population dying at -16 °C.

A related field study compared the effects of snow cover, snow removed in February, ice cover and ice removed in February for the two grass species. Ice covered Poa annua plants were dead by late February after a period of less than 40 days. Creeping bentgrass plants in all treatments could tolerate temperatures below -20 °C into April. However, plants from plots where the snow and ice were removed had reduced levels of cold hardiness. Therefore, to be safe, ice should be removed from Poa annua within 30 days of cover, but bentgrass should survive 90 days of ice cover.

Is there a Biological control of grey snow mould?

Hsiang and Liu (5th yr of 7yr study) Dept. of Environmental Biology, University of Guelph, Ontario

Grey snow mould is a common disease of turfgrasses in areas where there are over 90 days of continuous snow cover during the winter. The disease is caused primarily by two fungi in the Typhula genus and is commonly controlled by synthetic fungicides on many golf courses in Canada. Although excellent control of this disease can be achieved with fungicides, societal concerns of the environmental effects of synthetic pesticides compel us to investigate alternative management approaches.

Dr. Tom Hsiang has been working with a fungus that has shown to have antagonistic abilities against the fungi causing the grey snow mould disease. Dr. Hsiang has been able to isolate a few very effective strains of this fungus that can suppress grey snow mold as well as a fungicide. Tests to ensure that this biological control for grey snow mould is not toxic to plants, animals and humans are currently being conducted and possible application techniques are being examined.

Can the microbes in your soil predict the health of your greens?

F.B. Holl, Dept. of Plant Science,

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University of British Columbia
(3 yr study completed in 1996)

Microbes found in soil can be both beneficial and harmful to plants. Plant disease work has taught us that problems in the rootzone can start well before we see any damage above the ground. Dr. Holl's research was designed to see if the microbial populations react to conditions that cause damage to turfgrass. The bacterial populations of two greens were evaluated at three golf courses in the Vancouver area. The superintendents were asked to select one good and one bad green based on their performance throughout a normal season. The greens were similar in construction, location and maintenance, but reacted differently to environmental stress.

The bacteria were identified in each green, grouped by their food sources and population shifts were noted. The bacterial populations changed when a green was under stress, but it is premature to determine whether this could be used to predict turfgrass damage. Ideally, if turfgrass damage could be correlated to an extremely high or extremely low presence of certain bacteria, those organisms could be used as early warning signs and management practices could be adjusted to avoid problems. Turfgrass-bacteria relationships are still being investigated.

Will the right variety or mowing height of creeping bentgrass stop Poa annua (annual bluegrass) from invading?

Smith, Avicilla and Cattani, Dept. of Plant Science, University of Manitoba
(4 yr study completed 1997)

Dr. Ray Smith and his team in Winnipeg wondered why some varieties of creeping bentgrass seem to be able to prevent annual bluegrass becoming established in a green and if mowing height had anything to do with this ability. They found varieties of bentgrass producing a lot of side shoots called tillers competed more effectively with annual bluegrass. Therefore, high tiller density would be a good bentgrass characteristic for combatting annual bluegrass invasion. Interestingly, they did not find mowing height to be much of a factor in the level of annual bluegrass invasion.

To compare the different bentgrass varieties and mowing heights, researchers need to be able to measure the percentage of each grass type in the research plots. Traditionally, this has involved counting the individual bentgrass and annual bluegrass plants, a very tedious and time-consuming task. The second part of this study was to test the use of computers to measure the percentage of each grass type based on colour difference. This method of estimating the bentgrass and annual bluegrass populations was compared to the standard method of counting individual plants. Unfortunately, the computer did not prove to be very accurate, but may have value in comparing healthy and diseased plants. So, the good news is that this computer technology may have benefits for turfgrass managers and scientists in the future for disease detection. The bad news is that graduate students will still be using tweezers to determine grass population statistics.

Will a mixture of bentgrass cultivars compete better with Poa annua than a single cultivar?

Eggens, Hsiang, Hall and Carey Guelph Turfgrass Institute, University of Guelph, Ontario (4 yr study completed 1997)

Golf greens have often been criticized for being monocultures, since a diversity of plants should be better able to withstand disease and weed pressures. The low mowing height of putting greens has limited Canadian golf courses to colonial and creeping bentgrass. However, many different varieties or "cultivars" of bentgrass are now available. This study was designed to see if mixing different types of bentgrass improved a green's competitiveness.

Poa annua (annual bluegrass) is a low-growing weed species that often invades greens. Unfortunately, Poa annua is not very stress tolerant and large patches can die out in mid-summer and during winter. For this reason, most clubs will try to eliminate it. Researchers at the Guelph Turfgrass Institute introduced Poa annua into single cultivar and multiple cultivar plantings of bentgrass to see if mixtures had an effect on annual bluegrass invasion.

The suspicion that diversity promotes vigour proved correct in this study. The multiple cultivar plantings did show increased dollar spot resistance and were able to withstand annual bluegrass invasion better than the single cultivar plantings. Although this may seem to clearly advocate mixing and matching bentgrass cultivars, it may not be that simple since colour and texture of the different cultivars must be compatible. Also, we do not know how long this effect will last. Any population study requires many years of observation to determine if effects are long-term or temporary.

Can native perennial grasses be used for turfgrass plantings?

S.R. Smith Dept. Of Plant Science, University of Manitoba
(3rd yr of 3 year study)

Many grass species seen growing in the Canadian prairies have survived very severe climate and soil conditions for generations. In an effort to reduce management requirements for turfgrass, Dr. Ray Smith and his graduate student Anthony Mintenko have been testing a number of native prairie grass species under different mowing regimes to determine if any have potential for golf course or landscape use. The two main characteristics that are being sought are drought and salt-tolerance. If any of the selections show promise, they may be used in future breeding programs to produce tougher grasses that will have good playing characteristics.

Can we genetically alter turfgrass to make it more stress tolerant?

S.R. Bowley, B.D. McKersie, K.J. Kasha Crop Science Dept., University of Guelph, Ontario
(3rd yr of 3 year study)

Plants, like people, produce something called free oxygen radicals when under stress. These oxygen radicals are believed to cause major disruptions at the cellular level. Molecular biologists have discovered a gene called Mn-superoxide dismutase (Mn-SOD) that produces enzymes that are scavengers of oxygen radicals and thus act to detoxify the free oxygen radicals. This is the same idea behind many antioxidant products such as certain vitamins that have been in the news recently.

Dr. Bowley and his team have successfully inserted this gene into alfalfa and the resulting plants have shown superior environmental stress tolerance. The stresses range from freezing and ice encasement to flooding and drought. The same techniques have been used to insert the gene into creeping bentgrass and perennial ryegrass. The goal is to create grasses that can withstand greater environmental stress. The team has successfully inserted the gene and is working to determine if the desired characteristics will be expressed in the adult plants.

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Ice Injury

By DR. KARL DANNEBERGER
The Ohio State University

Intermittent ice formation on golf greens and fairways is a common event in the northern United States. However, over the last few years ice formation has increasingly been singled out as the cause or strongly associated with winter injury. Ice injury can occur either directly from continuous cover or as part of freeze injury (low temperature kill).

Continuous Ice Cover Injury

The first type of ice injury is the direct result of a continuous ice cover. In the early to mid-1980s Jim Beard conducted controlled laboratory study where he looked at the survival rate of three cool season turfgrasses under a continuous ice cover and two turfgrasses under field conditions. He found that creeping bentgrass could survive 120 days of continuous ice cover; however, annual bluegrass *(Poa annua)* loss occurred after 60 days with substantial loss around 75 days. In a Canadian field study annual bluegrass and creeping bentgrass turf was subjected to 45 days of continuous ice cover and then the ice as removed. Seventy-five days after initiating the study and 30 days after removing the ice cover creeping bentgrass still maintained its cold hardiness, while annual bluegrass was dead. It would appear from this study that annual bluegrass under a continuous ice cover will survive for about 45 days.

The reasons commonly proposed for ice injury are the build-up of toxic gases and/or the development of anoxic conditions, and the loss of cold hardiness. It appears that carbon dioxide accumulation under ice cover is a major contributor to the death of herbaceous plants. Intermittent thawing helped eliminate the carbon dioxide buildup and injury to the plants in this study did not occur.

The loss of cold hardiness under ice cover occurs and varies among turfgrass species. Under continuous ice cover annual bluegrass loses its cold hardiness, while creeping bentgrass is not affected. The loss of cold hardiness in annual bluegrass is likely due to the anoxic (lack of oxygen) conditions that develop under an ice cover.

Ice in Association with Freeze Injury

In most of the Midwest and Northeast, a continuous ice cover exceeding 45 days is unlikely. The winter weather pattern is generally broken with intermittent periods of thawing and melts the ice. Where "ICe injury" plays a more likely role is a component of freeze injury. In this role the freezing of water that would occur with a rapid drop of temperature in or around the growing point during or after dehardening of annual bluegrass.

The critical precursor to freeze injury is the loss of cold hardiness through dehardening and subsequent rehydration of the annual bluegrass crown region. Continuous ice covers as previously mentioned contribute to the decline in cold hardiness. However, the most important factor regulating dehardening is temperature. In annual bluegrass the dehardening process can occur quickly when soil temperatures exceed 46°F for 48 hours.

What cultural practices can be instituted to minimize ice injury and/or freeze injury? A thorough discussion is found in the 2004 November /December issue of the USGA Green Section *Record* in an article entitled "Winter Damage" by Keith Happ, which is worth reading. A management program for reducing ice or freeze injury should center on:

1) Produce a health plant going into the winter. A weak annual bluegrass plant with low carbohydrate storage is not going to tolerate ice cover or be resistant to freeze injury as a healthy plant. Shaded areas are more prone to freeze injury than sunny areas, probably due to the carbohydrate status of annual bluegrass.

2) Eliminate poorly drained areas. Annual bluegrass growing in areas where water accumulates is at high risk to rapid freezing during freeze-thaw cycles.

In conclusion, winter injury is normally a combination of several factors, one of which is ice cover. A continuous ice cover alone in the Midwest is not a likely event. However, freeze/thaw cycles in late winter can create a situation where excessive water in and around annual bluegrass crowns can create freeze injury from the ice formed from the freezing of water.

Only the Nose Knows

By KATE GURNETT
Albany Times Union

ALBANY, N.Y. – Three winter wishes: Clear nostrils. Easy breathing. No medicine. For many, relief lies in the neti pot, the Aladdin's lamp of cold prevention. Fill it with salt water and pour it into the nostrils to flush the sinuses. Yes, in the nose. And through. Think grade school cafeteria. Like a good, milk-spewing joke. Leave decorum at the door. "It's an odd type of thing, but it's easy to do," said Kathleen Eberlein, who pours salt water through her nose to combat chronic sinus problems. With as many as 40 million Americans fighting sinusitus and tiring of antibiotics, antihistamines and decongestants, she sees water irrigation as a natural alternative. She is not alone. The Los Angeles Lakers, triathletes and holistic health gurus such as Dr. Andrew Weil recommend a host of techniques from neti pots to $90 electronic nasal systems to ease symptoms from congestion and post-nasal drip to allergies. A recent University of Wisconsin study found the neti pot provided a simple drug-free treatment for sinus infections. Patients reported fewer headaches, fewer side effects and decreased use of antibiotics. Nasal cleansing, known as neti, has been used by practitioners of yoga and ayurveda in India for hundreds of years. First-time users may find the water doesn't drain (adjust your head tilt) or the water stings (add baking soda to the salt water). Blame it on the weather--or on increased knowledge of the pots--but this year, neti pot use is on the rise. "I must have sold 100 and need to order more," said Patricia Kuehfus, the owner of Pathways Body, Mind, Spirit Shop in suburban Colonie. She also sells Sinucleanse, a natural saline solution, to accompany the pots. "If you're starting to get a cold, it stops it. If you have a cold, it helps healing," she said. Flushing removes excess pollens and pollution and soothes dry nasal linings.

Nasal Rinsing May Cut Colds

Nasal irrigation treatment was ``effective'' in reducing overall incidence of colds among practitioners, according to Dr. Richard Ravizza of Pennsylvania State University in University Park, Pennsylvania. Dr. Ravizza presented the findings recently at the 50th Scientific Assembly of the American Academy of Family Physicians, held in San Francisco.

Ravizza told conference attendees that nasal irrigation has been a part of yoga health-oriented ``cleaning rituals'' for centuries. In their study, Dr Ravizza and Penn State colleague Dr. John Fornadley divided 294 college students into one of three subgroups. One subgroup performed daily nasal irrigation, one took a daily placebo pill and the third group was left untreated. All participants were asked to keep a ``cold symptoms diary.''

The authors found that students who used the daily saline rinse experienced a significant reduction in the number of colds contracted compared with non-users. On average, those engaging in nasal irrigation had fewer colds over the study period, the authors say, compared with the placebo or untreated groups.

Dr. Ravizza said that no one is quite sure how nasal irrigation might work to protect the nose against viral infection. ``At a physical level, just cleaning it out, irrigating it, is probably helpful,'' he said. ``At a molecular level, at a cellular level, I have no idea.''

Of course, forcing water up one's nose is not for everyone. But Dr. Ravizza noted that, after an initial week-long adjustment period, ``50% of the subjects who formed the nasal irrigation group characterized (the procedure) as pleasant. Many said it was soothing, others said it was comforting.'' Of the remainder, 21% said they had ``neutral'' feelings regarding the procedure.

Dr Ravizza said that most people who perform nasal irrigation require proper training. ``The key thing is to have good instruction,'' he said. He suggested that those interested in trying

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Its All About Me–

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out the technique contact a local yoga center.

Nasal Irrigation for the Alleviation of Sinonasal Symptoms

American Academy of Otolaryngology Head and Neck Surgery
22nd Sep 2000

A recent study demonstrates that patients with chronic sinusitis may benefit from use of nasal irrigation using a saline solution. Nasal irrigation is inexpensive and yet easy to use; however, few studies exist which examine the efficacy of the procedure.

The authors of the study, "Nasal Irrigation for the Alleviation of Sinonasal Symptoms," are Diane G. Heatley MD, Glen E. Leverson PhD, Kari E. McConnell RN, and Tony L. Kille, all from the University of Wisconsin School of Medicine, Madison, Wis. Their findings were presented September 25, 2000, at the American Academy of Otolaryngology--Head and Neck Surgery Foundation Annual Meeting/Oto Expo, held September 24-27, 2000, at the Washington, D.C. Convention Center.

Methodology

One hundred and fifty subjects were recruited from the Madison area via newspaper advertisements. The inclusion requirements were that patients had to be older than 18 years and at least two symptoms of chronic sinusitis (nasal congestion, anterior rhinorrhea, post-nasal drainage, headache, facial pain, halitosis, cough). Participants were excluded from the study if they had, within a six-month period, undergone sinonasal surgery or used nasal irrigation had profuse nosebleeding more than once a month, or were latex allergic.

Those eventually enrolled in the study were not under medical care for their symptoms, and although most had tried conventional therapy in the past, many no longer used these medications. No medications were prescribed to the study participants, and they were instructed to use, during the study period, any medications that they would normally use for their sinonasal symptoms.

Participants were randomly assigned to one of three treatment groups: (1) nasal irrigation with bulb syringe, (2) nasal irrigation with a nasal irrigation pot and (3) reflexology massage (irrigation control). Prior to the study, each participant underwent anterior rhinoscopy to characterize their internal anatomy, character of secretions, and to rule out a nasal mass.

Groups one and two performed daily hypertonic saline irrigation for two weeks with one method (bulb syringe or nasal irrigation pot) and then switched to the other method for the following two weeks. Irrigation devices were collected and cultured after two weeks of use. Group three (the control) performed reflexology massage daily for two weeks. Data was collected prospectively including pre-treatment Medical Outcomes Study Short Form, pre and post-treatment Rhinosinusitis Outcomes Measure, daily medication use, subjective treatment efficacy and preference of irrigation method.

Results

Completing the study were 127 subjects (49 males and 78 females), ages 19 to 86 (mean of 49 years). The three groups were similar regarding gender, smoking habit, allergic rhinitis, previous sinonasal surgery and pre-treatment Rhinosinusitis Outcomes Measure profiles. Improvement was not influenced by the presence of allergic rhinitis, previous nasal surgery and age.

Overall, 36 percent of subjects reported decreased use of sinus medication (decongestants, antihistamines, pain relievers, and nasal sprays) during the study with no measurable difference between the three groups.

There was equal preference for the bulb syringe (46 percent) and nasal irrigation pot (43 percent). The bulb syringe was found more effective by 36 percent of subjects, nasal irrigation pot by 45 percent.

Smokers were less likely to show improvement. Men (84 percent) expressed improvement in their condition compared to 68 percent of women.

Conclusions

The study demonstrated that daily nasal irrigation with hypertonic saline offers patients an inexpensive treatment protocol that improves chronic sinusitis symptoms. During the study, a number of patients decreased or eliminated medication.The choice of preferred irrigation protocol was likely linked to the randomization among patient subjects. It is unclear whether the improvement found in patients in the reflexology massage group reflects a therapeutic, placebo or combination of effects. All the findings highlight the complex interactions of managing chronic sinusitis symptoms.

* * * *

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INSIGHT:

One Assistant Superintendent's Perspective

By Chris Tritabaugh
Town & Country Club, St. Paul

Background

I am the Assistant Superintendent at Town & Country Club. It is a 6,300-yard course located on approximately 100 acres near the Mississippi River in St. Paul. T&CC was the first golf course built in Minnesota.

This will be my 12th year in the business. I started on the grounds crew at Albany Golf Club when I was 16 years old. At that time it was a promotion from my current job as clubhouse gopher. Little did I know it was to become a passion and a career. I spent five seasons working at Albany Golf Club during high school and college. While enrolled in the turfgrass program at the University of Minnesota, I decided I needed to find a job at a higher profile course. I got an opportunity at Town & Country and spent two years there as an intern. After graduation, I moved on to St. Cloud Country Club where I spent one season as Assistant Superintendent. After that I came back to Town & Country, where I am beginning my fourth season as Assistant Superintendent.

Why and/or how did you enter the turf management industry?

While I was working at Albany I always found myself wanting to know more about the industry. I read magazines, asked questions and did whatever I could to learn more about turfgrass. I loved my job and figured if I could work on golf courses for the rest of my life I would be very happy.

Who was your professional mentor and why?

I have had the chance to work at some great courses with some great guys. Tom Kasner and Mickey Saatzer at Albany, Dan Hanson and equipment technician Greg Glader at St. Cloud Country Club, Bill Larson and equipment technician Mike Romundstad at Town & Country. Each of these gentlemen has taught me things I use every day. I consider all of them to be mentors and friends.

What has been the highest point in your career?

Having the chance to interview for and then get my first assistant job at St. Cloud Country Club before I had finished my last semester of school was the highest point of my career. There have been many other moments but to this point that has been my highest point.

What has been your lowest point?

It is difficult to pick a low point. There have been some very difficult days but the next day always comes with a fresh start and a chance to reach a higher point.

Are your greatest challenges political, agronomic or managerial?

My greatest challenge is feeling I am prepared to be a superintendent but not being able to completely control how or when that is going to happen. There are many people in the same situation as me who will be looking to move on to superintendent positions and finding out how you can set yourself apart from those people is very challenging.

What is the most difficult disease to manage on your course and how do you?

Like most people in this part of the state, our biggest problem right now isn't disease but how to keep our greens alive over the winter. If I come up with a way to do it I will let you know.

Is it hard to find good help in your area of the state?

We have never had trouble finding help at T&C. We always have a good mix of college and high school students, retired guys and Hispanics. This year we will have three U of M turf students on the crew.

Where will our industry be in 10 years?

My guess is there will continue to be innovations in fertilizers, chemicals and equipment but on a whole the industry will probably not be much different then it is now.

Where would you like to be in 10 years?

In ten years I hope to have a family and be a successful superintendent at a course that makes my family and myself happy.

What is your perspective of our state association and what would you change?

When I was at the U, the support for our turf program was starting to improve but since I've been out of school that support has skyrocketed. It has been great to see such support and the benefits that support brings to the turfgrass industry in our state are outstanding. As an Assistant Superintendent I have been pleased to see more space in *Hole Notes* devoted to this position. If I had to change something, I would continue trying to make assistants a more integral part of our association.

Name your foursome, who would you play with and why.

My foursome would include my dad, my brother and Tiger Woods. My dad and my brother are two of my best friends and who would not want to play a round of golf with the best player in the world?