town also named Marshfield). You can guess which state is second behind us! Anyway, the Francis family has a strong tie to the history of VBG. Their operation started out as a sod farm, growing all types of bentgrasses. Land was slowly turned over to the current golf course layout, featuring all native soil push-up greens that were vegetatively propagated using stolons of 'Vesper' VBG from Vesper Country Club. Manny Sr. was the developer of 'Vesper' from when he worked at Vesper CC. Green Harbor is a low-input operation, using triplexes on the greens, tractor-pulled gang fairway mowers and a low green fertility rate of about 2.0 # N/M/yr. With that said the course was in excellent condition and packed with golfers! Manny III's only wish was that he could verticut and topdress more than three times per year since his only problem is the thatch level on the greens. Chemical inputs are only needed when the *Poa annua* gets hit with a disease. It was a great honor to meet and speak with the family responsible for developing one of the most popular velvet cultivars (it is our cultivar of choice here in WI for research). To interact with that much history is just amazing!

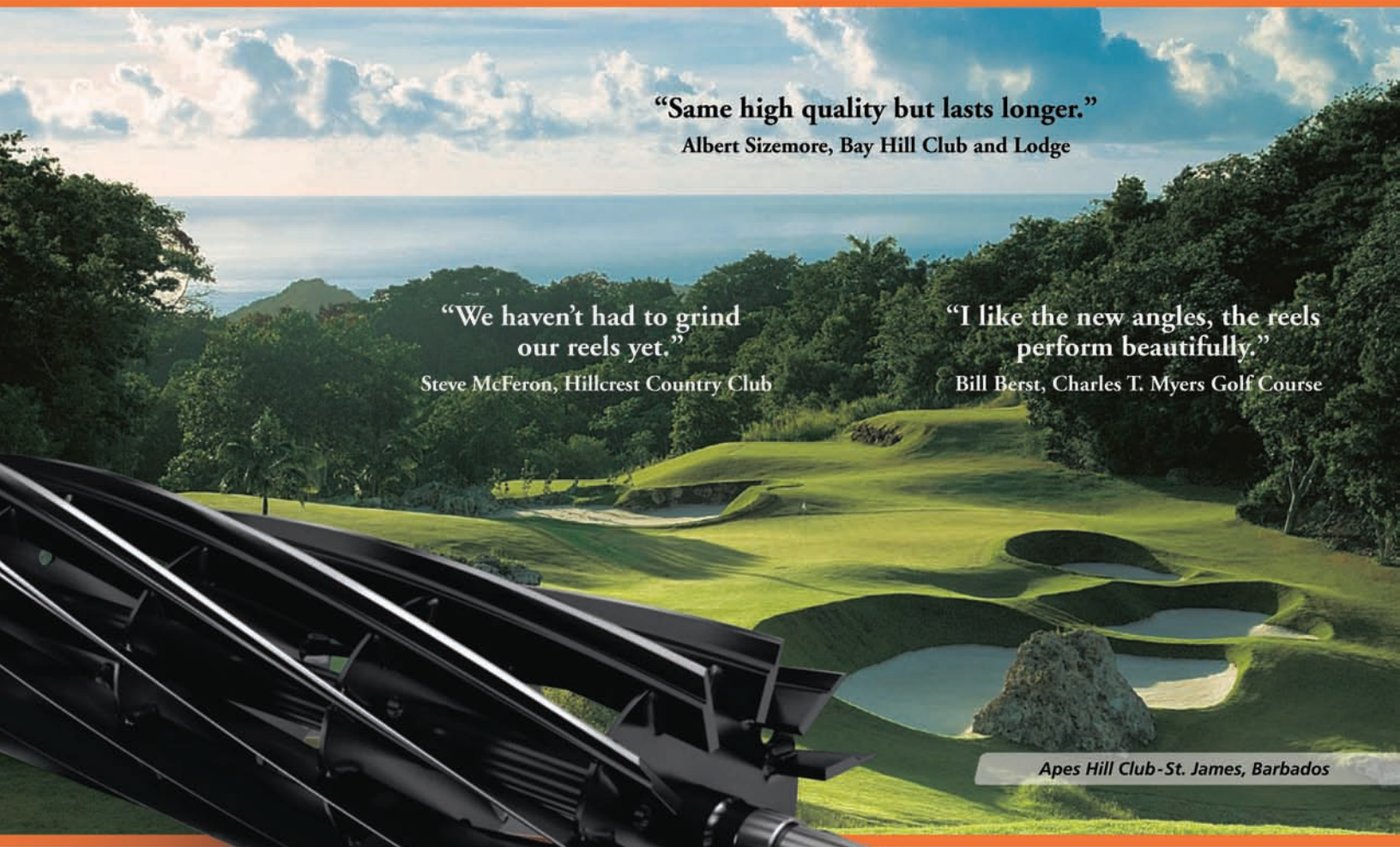
After this quick (or lengthy) overview of east coast velvet use, how does this translate to the Midwest? Let's make a simple comparison of climates. The primary cities of the Midwest are Chicago, Madison and Minneapolis/St. Paul. These cities are at latitudes 41.8, 43.1 and 45.0, respectively. The sites I visited on the east coast (Newark, NJ, Rhode Island and the Boston area) are at latitudes 40.7, 41.5 and 42.4, respectively. As you can see, the latitudes do not differ by more than a few degrees. A bigger and more important difference could be in the USDA Hardiness Zones. The Hardiness Zones are separated by annual average minimum temperatures. The Midwest is comprised of zones 3b to 5a (-30/35 to -15/20 degrees F) while the east coast area mentioned before is of zones 4b to 6b (-20/25 to 0/-5 degrees F). So while the Midwest does have lower temperatures than the East coast during the winter, we are well-versed on how to deal with the accompanying diseases/conditions. Our VBG at the OJ Noer has always come out of the winter as the "shining star".

Because there is not much velvet in use on actual golf courses in the Midwest, one of the main reasons for my travels was to see how velvet stands up to daily play. Questions I received at this summer's Field Day regarding velvet were mostly along the lines of aerification and ball-mark recovery. VBG, while denser, is not as aggressive as CBG so Midwest Superintendents have been skeptical on how quickly greens can recover from stress events. Three of the four courses I visited had aerified their greens only two weeks before my arrival and before I was told the timeframe, I assumed it was four or five weeks prior! At two weeks post-aerification the greens were smooth and recovering well, very much like a creeping green would be. At each course I specifically asked to see a couple par-3 greens, as they are the usual suspects for the most ball-mark damage. Velvet recovers the same (or quicker) than CBG. Absolutely none of the greens looked like the mine-field this cautious Midwest turfie envisioned! My theory is the slow growth of velvet is off-set by its higher plant density. When individual plants are damaged by ball-marks or traffic there are simply more surrounding plants available to move in.

So is velvet applicable to the Midwest and does it have any advantages over traditional creepers? Yes and yes! As seen in the case studies above, management practices are comparable to our current methods. We already spray/verticut/topdress on 10-14 day intervals for "high-input" CBG greens. We also hand water hot spots, roll when necessary and manage the *Poa annua* population. Velvet fertility needs are similar, if not lower. So what's the advantage? What's becoming more and more regulated each year? Water usage and chemical product availability. Velvet uses less water than creeping. At the OJ Noer, for years we have been irrigating velvet on sand at 75% ET replacement and on soil at 60% ET replacement, each only three to four days per week. This is prolonged, sustainable deficit irrigation that does not result in a decrease in quality; a huge plus. Did the above courses have complicated chemical programs? Not at all; if any products were applied it was on an as-needed basis for the *Poa annua* (and since velvet is so dense, it keeps *Poa* populations much lower). Imagine if you did not have to spray for dollar spot. What might that save you in product and labor costs? Again, at the OJ Noer, our sand and soil velvet greens had one outbreak of dollar spot in the last few years. Aside from snow mold prevention, they have been nearly chemical-need-free.

These observations have greatly calmed my cautious fears of adopting velvet bentgrass for use as a Midwest turf. I hope they have given you something to think about during the upcoming off-season. While velvet bentgrass is not the end-all for green turfgrasses, it definitely has many positive attributes that should place it as a top contender for future use in the Midwest. Thank you for reading and thanks again to Dr. Jim Murphy of Rutgers and all the Superintendents for their generous hospitality.

If You Are Looking at a Fairway Mower… Start from the Ground Up.



The Jacobsen® Difference.

For almost 90 years, Jacobsen has manufactured the most advanced, precision-engineered reels in the world. Reels that hold their adjustment and provide a superior quality of cut day in and day out.

Now the legendary Jacobsen Classic XP™ Reels feature **Advanced Relief Technology™ (ART)**. ART provides increased **durability**, **reduced wear** and **extended life**. Users get up to three times more spin grinds with this aggressive new reel design. They feature the ultimate standard in precision with tighter tolerances, making them the next evolution in performance. Experience the Jacobsen difference today.

EST. 1946 HORST DISTRIBUTING, INC.

Phone: 800-279-2341 • Fax: 920-849-9576
Email: gmortimer@horstdistributing.com
Website: horstdistributing.com

Horst Distributing, Inc.
PO Box 110, Chilton, WI 53014-0110

JACOBSEN® A Textron Company

When Performance Matters.™

Preventative Control of Fairy Ring

By Dr. Jim Kerns, *Department of Pathology, University of Wisconsin - Madison*

The first disease described on cultivated turf was fairy ring. W. Faulke wrote an essay in 1563 entitled, "A goodly Gallerye with a most pleasant Prospect, into the garden of naturall contemplation, to behold the naturall causes of all kynde of Meteors, that first described fairy rings as "those round circles that ignorant people affirm to be the rings of the Fairies dances". Today we know that fairy ring is caused by many different species of basidiomycete fungi, but imagine how much simpler life would be if a fairy did cause fairy ring. Oh how nice it would be to say "I don't believe in fairies!!" and have our fairy ring problem disappear instantaneously. I know it sounds cruel to end poor Tinkerbell's life, but lets face it fairy rings have become a major issue for golf course superintendents.

The first question that always pops into my mind is, Why? Why has fairy ring become an emerging problem for golf course superintendents? I think the main reason is we have switched from very non-specific fungicides to more specific fungicides. I suspect the fungal populations of turf systems treated with lead-, mercury- and cadmium-based fungicides were not too happy. Another reason may be the dominance of sand-based root zones for putting greens. We do not know a whole lot about the biology of fairy ring fungi, but we do know that they are primary colonizers of substrates. Therefore in a relatively inert rootzone such as sand, these fungi likely move in first.

We also know that fairy ring fungi are ubiquitous soilborne organisms that are everywhere. They are waiting for the opportunity to thrive on an organic matter source. Spores of fairy ring fungi are airborne as well, so they can travel great distances on air currents. Therefore sterilization of soil may effectively limit fairy ring development initially; yet overtime the fungi will establish themselves in the ecosystem. Fungi that cause fairy ring have been around for a long time and have caused disease on turf swards for many years. Like many of our diseases in turf, we know very little about the biology, epidemiology and management of fairy ring. However, some nice work on the biology and preventative control of fairy ring has emerged from North Carolina. Plus we conducted a small preventative fairy ring trial that showed promising results.

Biology

Fairy ring can be incited by 60 different species of basidiomycete fungi. However, the crew at NC State has collected over 200 isolates of fairy ring from all over the country and has narrowed the species list down to four or five. That's not to say that others cannot cause fairy ring, but from putting greens there seems to be four or five prominent species. They have identified the isolates based on morphological characteristics (Figures 1 and 2) and molecular characteristics. Eighty-eight percent of the isolates they have collected (which includes isolates we sent them from Wisconsin) were identified as *Vasecellum curtisii* or *Bovista dermoxantha*. Both of these species are puffball fungi and these seem to be the predominate species inhabiting putting greens.

A question that arose at the International Turfgrass Conference was, "Is fairy ring a disease?" A disease is defined as an abnormality in structure or function of a plant caused by the constant irritation of a microbial agent that results in the production of symptoms. I would say that fairy ring meets that definition to the letter! Then the question remains, "are fairy ring fungi pathogens?" Yes they are because pathogens are microorganisms that cause disease and we have already established that fairy ring is a disease.

Figure 1. Hyphae of a fairy ring fungus. The small bump on the centermost hypha is a clamp connection, a key diagnostic feature of fairy ring fungi.

Figure 2. Close-up of a puffball collected by Lee Miller at North Carolina State University.

Figure 3. Type I fairy ring symptoms. Note the necrotic rings surrounded by dark green tissue.

When it comes to terminology I am a hard-liner. Plant diseases cannot be caused by abiotic factors, in other words I subscribe to the philosophy that there is no such thing as an abiotic disease. Yet there are a few cases when a pathogen causes a disease without actually infecting the plant. Of course fairy ring is one of those diseases. Another classic example is sooty mold. This particular fungus lives on aphid excrement, but can cause damage to plants by profusely colonizing the leaves that severely limits photosynthesis. Essentially my point is fairy ring is a disease, eventhough the causal agents may not infect the plant.

So what causes the symptoms we see? First there are three types of fairy ring symptoms- Type I, Type II and Type III. Type I are when the rings become necrotic, type II symptoms are the luxuriant green growth of the outer ring and type III is just a ring of mushrooms or puffballs (Figures 3, 4). Fairy ring fungi are happy inhabitants of soil organic matter, so type II symptoms are likely the result of luxuriant growth of the turf due to the liberation of nitrogen from the organic matter. As the fungal body expands, the old tissue dies coating the soil particles with a hydrophobic substance. The necrotic rings develop once the environment becomes dry enough to kill the turfgrass plant. This is a diagnostic feature of fairy ring, as the thatch layer or upper 1 inch of soil is orange (Figure 5). We rarely see mushrooms or puffballs on putting greens because they are mowed daily. The mower is a deadly enemy of mushrooms and puffballs, which is the likely reason we have been in the dark about fairy ring populations for so long. The biology of fairy ring fungi is important to keep in mind when thinking about fairy ring management.

Management:

Fairy ring management can be accomplished preventatively or curatively. However, usually the best medicine for any plant disease is preventative treatments.

Research at NC State, The Chicago District Golf Association, Penn State and most recently UW-Madison have demonstrated that preventative applications of fungicides targeting fairy ring should be applied when soil temperatures are between 55 and 65oF. The fungicides that have proven effective are: triticonazole, metconazole, triadimefon, pyraclostrobin, azoxystrobin and fluoxastrobin (Figure 6). The current recommendations are to make the first application when soil temperature reach 55o-F and follow that application up 28 days later with another application. Each application should be irrigated with 1/8 to 1/4 inch of water. Preventative applications **should not** be tank-mixed with wetting agents!

The beauty of this program is, most of these chemicals are known to be effective against take-all patch. The timing of applicationsfor take-all patch is similar too. Under severe fairy ring outbreaks preventative control may only be achieved with more applications. For example, most preventative fairy ring programs start and end in the spring, but for severe cases applications in the spring and fall may be necessary. Along with preventative fungicide applications, an aggressive topdressing and aerification program should be followed. We know that fairy ring fungi thrive in organic matter or thatch therefore it is imperative that we limit thatch production. It is also recommended that wetting agents be periodically applied during the summer months.

For curative applications, flutolanil (ProStar®) is really the only fungicide that is recommended. During application the chemical should be mixed with a wetting agent. Efficacy may also improve if applied after spiking the putting surface. Fighting fairy ring curatively is a constant battle because of the shear amount of the fungus in the soil. Typically the residual activity of flutolanil against fairy ring is 14 to 21 days, so applications will need to continue on a regular interval during optimal conditions. Yet the problem with the aforementioned statement is, we do not know what the optimal conditions for fairy ring development are!

As far as cultural control is concerned, type II symptoms can be masked with nitrogen or iron applications. Aerification and spiking disrupts the fungal body, which can slow the development of the disease. Minor infestations may be kept at bay with cultural practices, but without chemical intervention the problem could become more severe. Basically, these cultural practices should be coupled with a strong preventative control program to achieve season-long fairy ring control.

Figure 4. Type II fairy ring symptom, a ring of luxuriant green growth.

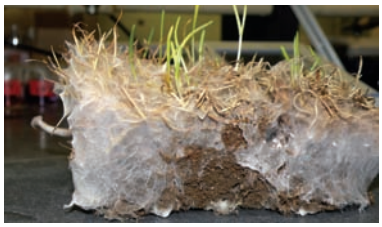


Figure 5. Mycelia mat of fairy ring fungi after incubation. Notice the orange color of the thatch layer and the plants where the fungus is. Anyone see the little mushroom popping out of the side of the sample?

Figure 6. Plot from our preventative fairy ring trial in 2009. This particular plot was treated with Disarm G (fluoxastrobin). Applications were made when soil temperatures approached 55°F and were repeated approximately one month later. Note the dark green area at the top of the picture in the adjoining plots. This indicates that fluoxastrobin may be effective against fairy ring, but we need more data to confirm this.

When it comes to fairway aeration projects, productivity is the key. That's why Toro offers new aeration solutions to get the job done fast. The ProCore 864 features a 64" coring width that can aerate up to 1.5 acres per hour. The ProCore 1298 aerates up to 2.3 acres per hour with a 98" coring width and dual coring heads that articulate to follow undulations in the ground. The revolutionary ProCore Processor sweeps, processes and disperses aeration cores in one pass directly behind the ProCore aerator. Call Reinders today to see how these aeration innovations will help keep your course in championship condition.

GAME CHANGING SIMPLIFIED AERATION

ProCore 864

ProCore 1298

ProCore Processor

Reinders

Solutions & Supplies for the Green Industry

MILWAUKEE, WI (262) 786-3301 13400 Watertown Plank Road, (800) 785-3301, Elm Grove
WAUKESHA, WI (262) 524-0200 2343 Pewaukee Road (Hwy. J)
KENOSHA, WI (262) 857-3306 20830A 75th Street (Hwy. 50), Bristol
MADISON, WI (608) 244-0200 4217 Nakoosa Trail
APPLETON, WI (920) 788-0200 900 Randolph Drive, Little Chute
STEVENS POINT, WI (715) 342-3600 3510 Post Road (Hwy. 54 & 51), Plover
CHICAGO, IL (888) 838-5778 3816 Carnation Street, Franklin Park
VERNON HILLS, IL (847) 573-0300 1000 S. Butterfield Road #1007
ROCKFORD, IL (815) 961-0200 2241 N. Central Avenue
MINNEAPOLIS, MN (763) 503-0200 6801 Shingle Creek Pkwy., Brooklyn Center

Reinders is the Proud Supplier of Turf Equipment to the Milwaukee Brewers

Brewers

www.reinders.com

TORO®

Count on it.