

while elevating the front of the putting surface to provide additional cup placements. Finally, they recreated the buried elephant.

"We were off by no more than an inch in some areas, which we were able to duplicate by simply bringing in a little more sand," Nagle says. "We created a green that yielded more cupping space yet kept an internal feature exactly the same. The members were happy. Frontier can take a lot of the credit for that."

SOD OFF

While Frontier was busy shaping, earthmoving and rebuilding two putting surfaces, Grimac's staff concerned itself with regrassing the remaining 16 greens, fairways and most of the tees.

The greens had shrunk throughout the years, but the Tavistock crew recaptured the original green shapes and sizes, adding another 35 percent of putting surface in the process. That required using methyl bromide on the old turf before replanting with two varieties of bentgrass, A-1 and Tyee, a relatively new offering from Seed Research of Oregon.

Grimac's crew used Basimid (a granular fumigant) and recontoured the fairways to recreate the original flow. He replanted 007 (another Seed Research variety of creeping bentgrass) along with a chewing fescue nurse grass.

All the tee surfaces were sodded with 007.

"We wanted to have a thatch layer on the tees," Grimac says. "Because the tee work was done later in the fall, we needed to sod them. We also sodded all the green surrounds with bluegrass. Being in the transition zone, we have to have a lot of grass varieties. There's no one perfect grass. We also sodded the intermediate rough with a low-mow bluegrass to provide a contrast between the bentgrass fairways and intermediate rough."

Luckily, the weather during most of the construction season was dry, and while the extreme heat was demanding occasionally on the various crews, the season was ideal for construction work.

"We had a couple major thunderstorms after they planted the greens that washed a lot of the seed out, but they were repaired rapidly," Brennan says.

RESTORATION HAS ITS PRICE

While returning Tavistock to its Findlayesque roots required little in the way of additional

construction costs, it necessitated a significant increase of the ongoing personnel budget, Grimac says.

Maintaining and hand-mowing the severe ground features around the greens, coupled with the decision to start hand-raking bunkers, has meant additional labor hours. The recapturing of additional putting surface area, much of it running to the crest of the surrounding banks, has meant more time spent grooming the greens, plus the need to walk mow rather than machine groom those areas.

"We've added another five people on the maintenance staff and raised our labor budget by \$120,000, about a 20-percent increase," Grimac says. "Our overall maintenance labor budget is \$706,000 with a total maintenance budget of \$1.36 million."

The transition-zone climate and the low-lying, poor-draining nature of the property leave Tavistock susceptible to many turf diseases. Grimac's preventive fungicide program had been fairly expensive, but that all changed after the renovation.

"Now that we're mostly bentgrass with no *Poa annua*, we've decreased our fungicide budget," Grimac says. "But we're using more plant growth regulators to fight the reintroduction of *Poa*. So, what we're saving on fungicides, we've made up for with PGRs."

THE GREEN ROAD AHEAD

In his 29 years at Tavistock, Grimac has tried to be a good steward of the environment. The club recently earned the first stage of certification with Audubon International's Cooperative Sanctuary Program.

Grimac is proud of the fact that all of the club's irrigation water comes from an on-site lake fed by natural drainage.

"Every drop of water that falls on the course for several miles around drains into our lake," he says. "We waste no water. Almost everything we irrigate goes back to that pond."

Plus, Grimac's irrigating less now than he used to.

"The bentgrass is easier to maintain than the old *Poa annua*," he says. "We inject wetting agents into the water to maximize the effectiveness of the water we use. The new irrigation system is much more site-specific. We went from having about 600 heads before to about 1,900 now. Each head is individually controlled, so we can deliver water only where it needs to be."

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COURSE CONSTRUCTION

POSITIVE REINFORCEMENT

Grimac has always been a big believer in communication with members. For instance, before initiating the tree-management program several years ago, he held frequent meetings with members to explain what he hoped to accomplish, then kept them informed via e-mail, newsletters and bulletin-board postings as the project progressed.

"We started slowly until we gained the members' confidence," he says. "We've received virtually no complaints. We've carefully evaluated the trees through committees and with input from the USGA Green Section's agronomist Dave Oatis. We concentrated largely on the agronomic benefits first. The members have embraced the project and enjoy the expanded views, cleaner look and healthier turf."

It was only natural for Grimac to continue with the communication effort, keeping members involved and abreast of what was happening throughout the preconstruction, construction and postconstruction processes. He also expanded his communication efforts to draw in outside contractors such as Forse Design and Frontier.

"I feel great about how the project turned

out," Nagle says. "The feedback from the club has been tremendous. I attribute much of that to Tom's upfront communication."

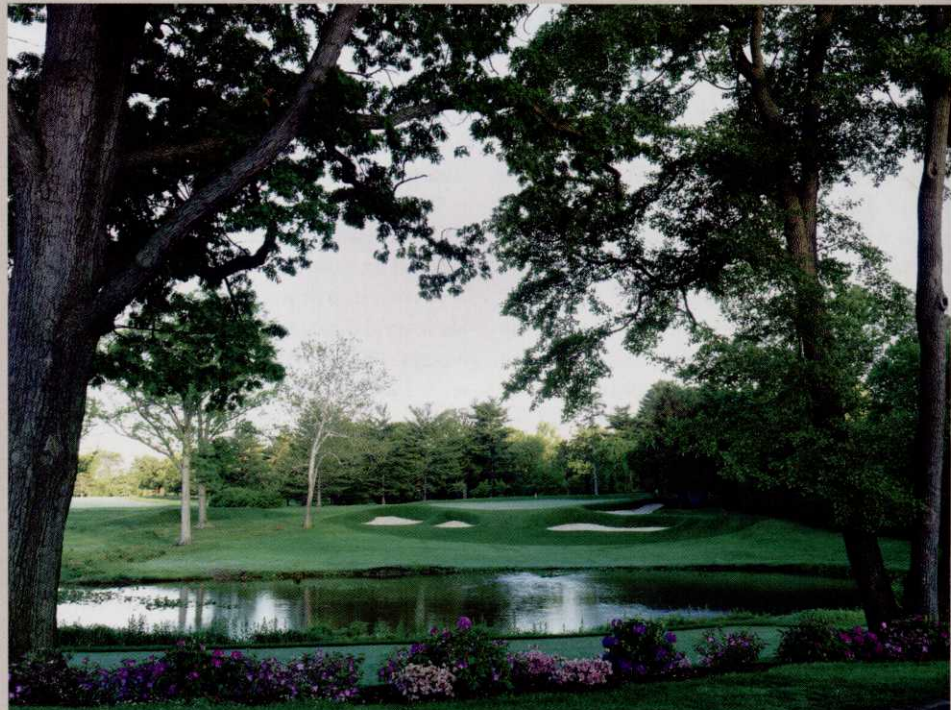
Grimac posted photos on the club's Web site and took members on tours of the construction at crucial phases, giving them the opportunity to share their input.

"Tavistock has a lot of excellent amateur golfers who compete in local, state and national competitions," Nagle says. "They are strong golfers with strong ideas about course design. They offered a lot of ideas and depended on us to tell them whether the ideas would work or not. Even if we didn't use their suggestions, they were happy we'd listened to them."

Brennan was impressed equally with Grimac's communication skill and the effect it had on the final product.

"Not only were club officials well-informed, they informed other members about what was occurring through mailers, the Web site and walk-throughs," he says. "That was huge. But the best indication of how everything worked out was hearing from members that the outcome exceeded their expectations. We can't ask for more than that." GCI

Architect Jim Nagle believes the major challenge he and Frontier Golf faced was rebuilding the 16th green, pictured below. Photo: Jerry Sheets



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BY TODD BURKDOLL

Looking for clarity

Researchers make headway detecting and treating new turf diseases

The presence of several new turfgrass diseases has increased on golf courses in the United States recently. Three new diseases in particular – Pythium root dysfunction, brown ring patch and rapid blight – are challenging for golf course superintendents. Fortunately, researchers have made headway detecting and treating these destructive diseases.

TACKLING NEW DISEASES

New turfgrass diseases can evolve for a number of reasons, and several factors contribute to the prevalence of disease such as geography, moisture and temperature.



Left: Formerly known as waitea patch, brown ring patch can be a problem on creeping bentgrass greens. Photo: Lane Tredway



Above: Fungicide efficacy on *Poa annua*. Photo: PACE Turf



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Stress caused by heat, drought and excess moisture can weaken turf, making it more prone to disease. Simply put, healthy turf is less susceptible to disease. The challenge with golf courses, particularly on greens, is that turfgrass is kept short by plant growth regulators and/or frequent mowing, which causes stress.

Players expect superintendents to provide the best of both worlds – short grass and healthy turf. It's a difficult balance, especially when new diseases emerge and superintendents don't know how to treat them.

University and industry researchers are addressing these three emerging problem diseases. To avoid being caught off-guard, superintendents should learn more about these diseases. Doing so will help identify and treat the diseases, and in some cases, avoid them altogether.

PYTHIUM ROOT DYSFUNCTION

Discovered in North Carolina in 1994, Pythium root dysfunction attacks putting greens and is

limited to newly constructed greens younger than eight years old. It's most commonly found in the Southeast but also occurs in Midwestern areas with harsh summers. Bentgrass is most susceptible to the disease, which occurs on turf stressed from one or more of the following factors:

- High heat.
- Repeated close mowing.
- Low fertility schedules.
- Drought.

Pythium root dysfunction causes the roots and crown of turfgrass to turn brown or black. The symptoms are most visible during the summer, but the disease spreads during spring and fall, when it's cool and wet.

Because symptoms are less prevalent on plants with strong root systems, there are several cultural practices superintendents can undertake to minimize damage caused by Pythium root dysfunction. Root enhancement techniques – specifically aerification, nutrition supplements,

verticutting and reduced irrigation – are helpful to counteract symptoms of the disease.

Irrigation management also is extremely important. Clay and compacted soils are more likely to harbor Pythium root dysfunction because of reduced drainage.

It's less difficult and less expensive to prevent Pythium root dysfunction than it is to try to cure it. Fungicides such as pyraclostrobin and triticonazole are two of the most effective at preventing the disease.

Lane Tredway, Ph.D., turfgrass pathologist at North Carolina State University, is one of the foremost experts on Pythium root dysfunction. To learn more about his research and information on N.C. State's Center for Turfgrass Environmental Research & Education, visit www.turffiles.ncsu.edu.

BROWN RING PATCH

Formerly known as waitea patch, brown ring patch has been reported sporadically through-

IMPACT ON THE BUSINESS

Getting to the root of the Southeast's Pythium disease

The good news for Charles Sheffield, superintendent at Croasdaile Country Club in Durham, N.C., is that only one disease significantly disturbs his turf. The bad news is that it's Pythium root dysfunction, caused by *Pythium volutum*. Golf course superintendents and plant pathologists living in the Southeast are learning that Pythium root dysfunction on creeping bentgrass greens is a plague.

Since 2002, Pythium root dysfunction caused by *Pythium volutum* has been observed attacking greens at 40 to 50 golf courses in the Southeastern U.S. and is limited to newly constructed greens younger than eight years old. Bentgrass is most susceptible to infection, and in a matter of weeks, if left untreated, the pathogen can cause serious decline, with the ability to wipe out entire greens.

Unlike the more common warm-season Pythium root rot, in which infection is visible quickly, this unknown disease doesn't display symptoms. When the weather becomes warmer and the turf becomes stressed from high heat, continued close mowings, low fertility schedules and drought-causing weather patterns, the disease manifests itself with brown blotch-like or blighted irregular patches of turfgrass.

Attempts to treat the disease through cultural controls such as syringing greens to keep them moist, raising mower blade heights and increasing fertility have aided turfgrass recovery but haven't hindered the pathogen's damage. And fungicides that effectively treat Pythium blight on bentgrass haven't stopped the turfgrass decline.

"This disease is different than anything else we've seen here," Sheffield says.

Sheffield first noticed patches of discoloration, ranging from the size of a golf ball to a steering wheel, in early March 2002 when the course reopened after construction. The spring heat brought out the discolored patches on the nubs, slopes and greens of the course – high traffic areas where the turf was more susceptible to stress and drying out.

Sheffield used pyraclostrobin, at 0.9 ounces per 1,000 square feet, in his rotation and was able to get four weeks of control. He continues to apply the active ingredient preventively and plans to make an application in the cooler fall season, when the disease is likely to infect the turf.

In a 2004 study, Lane Tredway, Ph.D., turfgrass pathologist at North Carolina State University, found pyraclostrobin provided preventative and curative control of this formerly unknown disease on bentgrass. Plots treated with pyraclostrobin exhibited significantly lower disease severity than the untreated control in the curative control study. In the preventive control study, pyraclostrobin plots were almost free of disease symptoms 43 days after the last application was made. Tredway noted in his study that preventive applications might be more effective in the fall and early spring, which is when this disease appears to be most active.

Sheffield will continue to unravel the mystery of this emerging turf disease along with the rest of the superintendents in his area, while monitoring the research being conducted at N.C. State. **GCI**

out the Midwest and is a mounting problem in Southern California. Occurring primarily on greens with high annual bluegrass (*Poa annua*) populations, the disease is prevalent in warm and moist conditions.

Initial symptoms of brown ring patch are thin, yellow, concentric rings several inches in diameter that turn brown under hot or wet conditions. Once established, brown ring patch can quickly damage turfgrass. Temperature plays a significant role in whether or not brown ring patch occurs. The disease doesn't spread in hot or cold conditions, but rather during times of mild temperature (middle 60s to low 80s F).

Cultural control options of aerification and higher mowing heights are sometimes used to combat brown ring patch. Alternating among several fungicides – pyraclostrobin, propiconazole and triticonazole – has been an effective treatment.

Frank Wong, Ph.D., assistant plant pathologist



Rapid blight occurs during the fall and winter, affecting ryegrass, annual bluegrass and *Poa trivialis*, shown here. Photo: PACE Turf



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Research

at the University of California-Riverside, is considered one of the top brown ring patch researchers. For more information, visit UC Riverside's department of plant pathology and microbiology at www.plantpathology.ucr.edu.

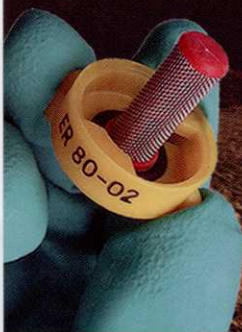
RAPID BLIGHT

Rapid blight occurs in the fall and winter, affecting several annual winter grasses used to overseed Bermudagrass. Affected species include ryegrass, annual bluegrass and *Poa trivialis*. It's primarily seen in the Southwest, including Nevada, Arizona and Southern California, as well as on coastal areas in the Southeast and Northeast. Perennial grasses aren't affected by rapid blight.

Rapid blight occurs in the fall and winter, affecting several annual winter grasses used to overseed Bermudagrass. Photo: PACE Turf



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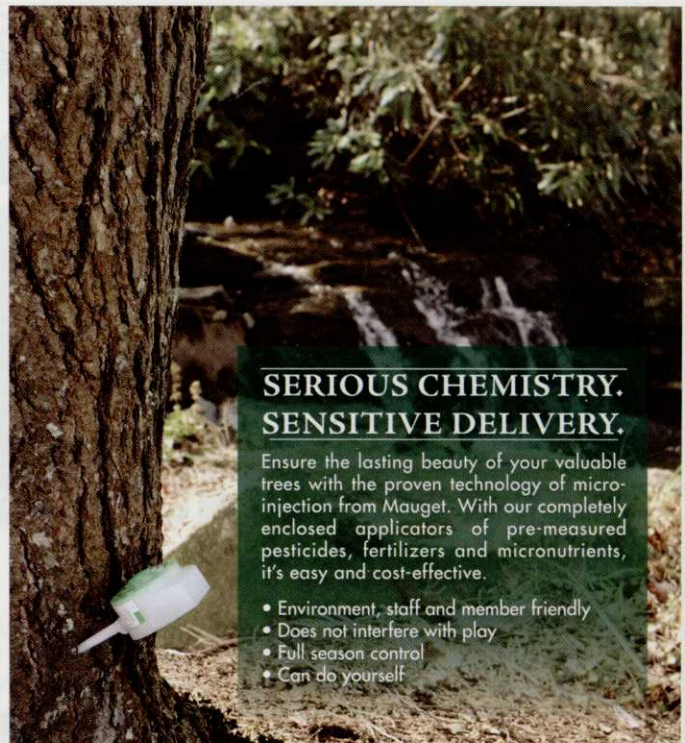
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The disease is associated with a marine organism and cases of rapid blight rise significantly in areas where superintendents use reclaimed water or water with high salinity for irrigation. The disease can occur on any area that has been overseeded but is usually treated only on putting greens.

Mary Olsen, Ph.D., plant pathology specialist for the University of Arizona-Tucson, has confirmed rapid blight is caused by an obscure microorganism that, before its discovery in turf, was known to infect marine plants such as seagrass, diatoms and algae. The University of Arizona's division of plant pathology and microbiology is available at <http://ag.arizona.edu/PLP>.

Rapid blight shows itself as water-soaked, slightly sunken and darker-looking turf. It turns yellow and dies in patches.

The primary cultural control option is to use better quality irrigation water, avoiding reclaimed water, if possible. Pyraclostrobin provides the most effective preventative control; mancozeb is a less effective alternative.

PREVENTION AND EDUCATION

To avoid being caught off-guard by new diseases, it's important to stay educated, be consistent with preventative tactics and devote time to detection efforts.

Part of being proactive is keeping up with

the latest research and information about turfgrass disease. Superintendents who collect and absorb background information are better prepared when they encounter a problem.

They know what they're dealing with and who can help them.

Some superintendents are quick to write off an undiagnosed problem as untreatable by a particular fungicide they've already applied, and they simply re-treat with a different product. Instead, they should take a turf sample and send it in to a diagnostics lab.

Fungicide manufacturer representatives, university extension personnel and other golf course superintendents also are good sources of information. It's wise for superintendents to seek the help of others if they encounter an abnormality they don't recognize.

It's common sense, but it's important for superintendents to walk their courses daily, keeping an eye out for abnormalities. New diseases such as Pythium root dysfunction, brown ring patch and rapid blight can cause problems quickly if undetected. **GCI**

Todd Burkdoll is a market development specialist for BASF Turf and Ornamentals.



Wong

Pythium root dysfunction causes the roots and crown of turfgrass to turn brown or black. Photo: Lane Tredway



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SPRAYERS

BY MARGARET HEPP

A numbers game

Director of golf course maintenance keeps two different courses in line in Virginia

At Wintergreen Resort, Fred Biggers oversees two golf courses 13 miles apart – a total of 45 holes maintained by 37 peak-season staff. Factor in two completely different climatic zones and a separate routine at each course, and Biggers is nothing short of a mathematician.

Wintergreen is a membership-owned, four-season resort in the Blue Ridge Mountains of Virginia that features golf year-round on two courses. Devil's Knob, the highest course in Va. (a 3,850-foot elevation), is an 18-hole

course on the mountain for which it's named. Stony Creek is a 27-hole course in the valley below. In addition to golf, Wintergreen features ski slopes, a tennis facility, a spa and several thousand condos at the top of the mountain, but Biggers has little time for leisure with his busy schedule.

The vast differences in climate between Devil's Knob and Stony Creek – the former is open April through November and rarely gets warmer than 80 degrees, while the latter is a product of its native surroundings – keeps

Biggers on his toes when it comes to maintaining turf. Routine maintenance can be quite a production, but Biggers knew what he was getting into when he arrived at the resort nine years ago.

"I took over for a pretty sharp, certified superintendent," he says. "So I had a pretty good idea going in. I knew Devil's Knob is more like a northern course – a lot of *Poa annua*, a lot of bentgrass. The climate in the valley is similar to Richmond, Va."

Biggers has a golf course superintendent and assistants at both courses, and works closely with his mechanical staff – two separate crews.

As part of Wintergreen's equipment fleet, the resort owns a small fleet of sprayers:

- A Toro 150-gallon greens sprayer at each golf course.
- A Toro 1150, purchased in 1999, used at Devil's Knob.
- A Toro 1250, purchased in 2005, used at Stony Creek for spraying greens and tees.
- A Toro 5500 300-gallon sprayer for spraying fairways.
- An Airtec tractor sprayer, which cost less than \$20,000 when it was purchased six or seven years ago.



Fred Biggers mainly uses a tractor sprayer to apply fungicides on green surrounds and fairways. Photo: Airtec