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Never risk saturating main landing areas while attempting to irrigate the bordering areas of play.

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Turf managers walk a fine line between too much and too little watering. Simply using what their eyes tell them when they look at the putting surface is not enough. Some level of discoloration is acceptable, especially when weather patterns are taken into consideration. But superintendents need to poke holes through the surface and take subsurface measurements for moisture content.

Superintendents' first priority should be sufficient irrigation to maintain plant health, which may often mean holding off on using overhead irrigation cycles until absolutely necessary. Replacing irrigation-system watering with hand-held irrigation to specific areas is a good practice, particularly in the spring, Happ says.

Former First Lady Nancy Reagan's advice to those considering using drugs was "Just Say No." Superintendents should offer the same retort to golfers who pressure them to over irrigate to soften the soil to make it more receptive to golf shots.

Also, consider the limitations of the current irrigation system. If it is aged, inadequate or requires upgrades, do not push it beyond its capabilities, experts say. Focus on center lines of play first and make an attempt to maximize playing quality. Never risk saturating the main landing areas while attempting to irrigate the bordering areas of play.

"It all comes down to being too wet," Happ agrees, when discussing the surest recipe for disaster. "Control is the key. With the dynamic weather conditions we face in the Mid-Atlantic region, it is important to monitor weather patterns as much as possible.

"Even if the turf manager has a system that provides the opportunity to irrigate wall-to-wall, it does not mean the system should be used every day," Happ adds. "All too often, there is outside pressure to use a newly installed system when the best strategy is to drag a hose to those isolated areas of concern. We need to continue to educate golfers about when turf needs water. Mid-summer days of high heat and high humidity are not times to be throwing heavy irrigation cycles."

Very occasionally, however, a situation occurs where it is virtually impossible to over water. Superintendents often refer to this a "Black Saturday" or "Black Sunday," according to David Oatis, director of the Green Section's Northeast region.

This unfortunate recipe for disaster usually occurs in July or August in the Northeast, when weak grass roots and a prolonged period of high humidity/high temperature is followed by a sudden drop in humidity. The dry weather kicks off a high demand for moisture with plants losing water through the leaves faster than the impaired roots can absorb it through the ground. Plants begin wilting, often by mid-morning.

"We had one of those days last year on the first Saturday in August," Oatis recalled. "The first week of August was one of the hottest and most humid on record. Then Saturday was low-80s, high skies, real low humidity and good winds. The turf wilted uncontrollably. That is one of those rare days superintendents cannot keep up with wilt using a hose. They need to turn on the sprinkler heads and let them run.

"Usually if you have wilt, you should chase it with a hose and syringe very lightly," Oatis adds. "But that was a day when massive amounts of water were being pulled out of the turf and superintendents could not keep up with the plants' demand for water. Those are the days that kick off disease, and courses lose grass to drought stress and traffic on stressed turf. They do not happen very often, but they are tough, tough days. They always seem to happen on Saturday or Sunday afternoons, when the superintendent might not be on site."

Ultimately, there are no hard-and-fast rules. There are many ways to irrigate a green. "Irrigation philosophies are all over the map," said Chris Hartwiger, senior agronomist with the USGA Green Section's Southeast Region. "There are deep and infrequent guys, and there are daily-replacement guys. I've seen both work well. Ultimately, irrigation is an art." ■

Peter Blais is a freelance writer from Monmouth, Maine.

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Turf M.D.

■ THE DOCTOR IS IN THE HOUSE

"Change is often rejuvenating, invigorating, fun ... and necessary."

— Lynn Povich, *journalist*

Spring is an annual ritual for cool-season turf rejuvenation. Maximum root elongation and production occurs in the early spring with the foliar growth following shortly behind. Middle to late spring should be the time creeping bentgrass and/or *Poa annua* greens are on full "go" reflected in the ubiquitous green color of the season. In the last 15 years "go" has been replaced with a "caution or stop," characteristic of the yellowish-orange symptoms of anthracnose.

Anthracnose, caused by the pathogen *Colletotrichum cereale* (formerly *Colletotrichum graminicola*) was associated with summertime stress on *Poa annua* greens and fairways 30 years ago. Signs of the disease were foliar in nature — primarily the presence of the fungi-fruited structure known as acervuli with setae (spines) in the leaf lesion. Often referred now as the foliar anthracnose, the pathogen primarily attacked *Poa annua* fairways.

On greens, anthracnose did not become a widespread problem until 15 to 20 years ago. A serious problem on *Poa annua*, it also became a disease of creeping bentgrass greens primarily in the mid-Atlantic and southeastern United States. Basal rot anthracnose attacks greens from early spring through the entire growing season. As the name implies, the pathogen attacks the lower sheaths of the turf plant, including the crown. The pathogen produces small black bumps, which are the acervuli. It was thought years ago that basal rot anthracnose did not produce setae, but this is not the case. Setae are often present in the later stages of anthracnose development.

Describing conditions favorable for basal rot development are frustrating. We are often comfortable in describing a disease through specific environmental conditions like ideal temperatures and humidity or leaf wetness. Unfortunately, basal rot anthracnose is not so easy. Given that basal rot anthracnose can occur from March through September (although now it seems to

Basal Anthracnose: Springtime Ritual

BY KARL DANNEBERGER



AGGRESSIVE
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occur year round), an additional component, stress, is needed to produce favorable conditions.

Stress that occurs because of management practices is extremely frustrating to golf course superintendents because it's hard to isolate one or more of the contributing factors. Basically, management practices implemented to increase green speed (frustrating?) enhance the potential for basal rot anthracnose. For example, a low height of cut is often targeted as the major culprit causing anthracnose. Although low mowing heights are a significant factor, anthracnose can occur at varying cutting heights. Factors associated directly with the mowing process — grooved versus solid rollers or the type of mower head (fixed, flex, or floating) — can influence anthracnose severity. Add a few additional factors to increase green speed like lower fertility levels, maintaining a moisture stress condition, untimely topdressing and verticutting practices, and anthracnose becomes a severe and chronic problem. How do you know when your management practices are too extreme? Not an easy question, but simply stated: It's when your fungicide program for managing basal rot anthracnose no longer works.

But basal rot anthracnose has resulted in some positive changes or rejuvenation in putting green management. Given its strong association with plant stress, providing a healthy environment around putting greens is a necessity. For example, some of the earliest aggressive tree-removal programs were instituted around *Poa annua* putting greens that had chronic basal rot anthracnose. These greens are healthier now growing under higher light and air-movement conditions.

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Any Way You

Agronomic objectives should determine aerification technique

Punch It

BY CHARLIE FULTZ
CONTRIBUTING EDITOR

Aerification is probably the most important cultural practice you can do to enhance and improve a turf stand. But with so many different methods and depths, which is the best for your facility? Before you can answer that question, you first must answer these questions:

- What am I trying to achieve with my aerification?
- Am I trying to modify my existing soils?
- Am I trying to control thatch and compaction issues?
- Am I trying to increase drainage and air/nutrient exchange?

After you answer those questions, others arise:

- Do I want to incorporate soil amendments into my aerification holes?
- What amendments do I want to put in if I do? Sand, porous ceramics, sand/peat mix?

Each question has a solution through various aerification practices that can achieve the goals you set.

Let's start with standard core aerification using tines from one-quarter inch up to one-half inch. This manner of aerification can accomplish many of the goals we have set. Cores are pulled and can be removed or ground back into the turf canopy. If removed, then amendments can be added and dragged in. With this practice, you get the following: thatch removal, compaction relief, increased drainage in the upper 3 to 4 inches of the profile, and increased air and nutrient utilization.

There are numerous machines on the market that do an incredible job of core aerification. One of the drawbacks of core aerification, however, is the heal-up time. On golf greens, it is the most disruptive, yet most beneficial, practice one can do. It also causes the most golfer complaints. But a practice that has found approval from golfers and superintendents in recent years is the use of one-quarter-inch tines on a smaller hole spacing. This allows the turf manager to achieve the above results with a shorter heal time and less disruption to the putting surface.

Deep-tine aerification is another kind of beneficial aerification

turf managers use to achieve certain results. Usually tines range from one-half-inch to 1 inch and anywhere from 5 inches to 10 inches in length. Cores can be pulled, or solid tines can be used to open up the profile below the 3 inches to 4 inches that standard core aerification achieves. With deep-tine aerification, you achieve: compaction relief at a deeper level, improved drainage, pulling cores and thatch removal, increased drainage, and increased air and nutrient utilization.

This process has found more favor in recent years on older push-up greens. Course managers can delay the rebuilding of greens by going "deep" to help improve drainage and add soil amendments. One downside to deep-tine core aerification is the size of the core pulled, which will leave a larger mess and subsequent cleanup. Associated with this is a longer heal-up time due to larger holes on a wider hole spacing.

One practice finding favor the last few years is deep tining around Thanksgiving and allowing the greens to stay open during the winter. The philosophy behind this is to allow the natural freeze-and-thaw process, combined with the freezing and thawing of snow and/or water, to help alleviate winter compaction and improve drainage and airflow through the winter.

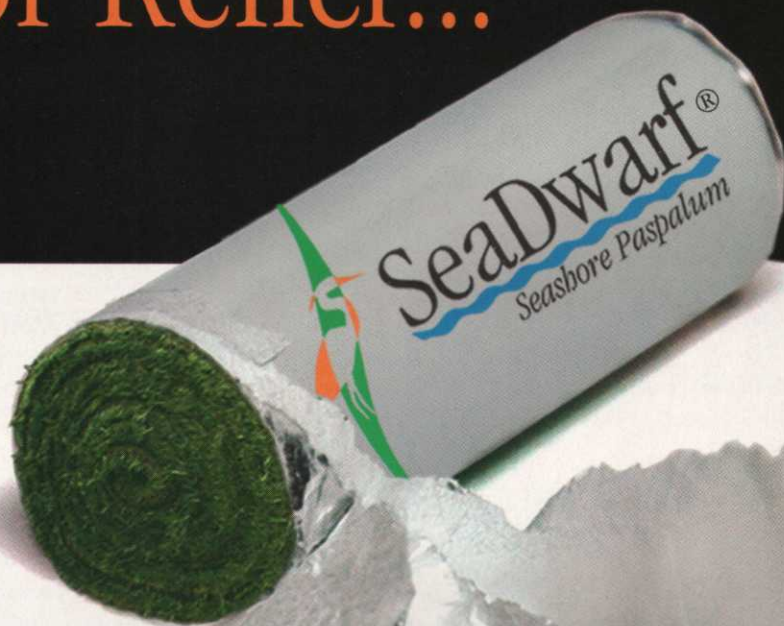
Another type of aerification that has gained favor the past five to 10 years is the use of subsurface injection aerification, which injects amendments, water and/or air into the root zone. The machines use air and/or water pressure to create a hole, which, depending on the machine, simply leaves the hole open or can inject materials into the profile.

One of the biggest pluses for subsurface injection aerification is that the playing surfaces are almost undisturbed after the machine finishes. Most golfers can't detect that the putting surface has been aerified. But this type of aerification certainly doesn't alleviate thatch problems.

A final aerification method that has also begun to gain popularity, especially during the summer, is the use of slicer, bullet or spiker tines. These tines are extremely effective at opening up a portion of the turf's canopy and thatch to allow air movement into the upper 1 inch to 3 inches of the soil profile. ■

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■ MOSS CONTROL

Managing Moss

A new herbicide proves efficient in ridding greens of those problem clumps. But superintendents must also adhere to important cultural practices for moss control

BY LARRY AYLWARD

The golf course greens at Highlands Country Club are a haven for moss. The Donald Ross design is located in the mountains of western North Carolina, an area that receives about 85 inches of rain annually. Golfers love the temperate climate. But so does moss — a small, soft, nonvascular plant that grows in clumps on putting greens and causes superintendents pounding headaches.

“Moss is always a battle in this climate,” says Brian Stiehler, who’s in his fourth year as superintendent at Highlands.

Until recently, Stiehler had to improvise to control the moss on the course’s greens. He threw everything at moss but the kitchen sink, including a product he uses to wash dishes in the kitchen sink. Stiehler mixed a strange brew of Ultra Dawn dishwashing

soap, Listerine mouthwash and a wetting agent to control moss.

“It was bizarre,” he says of the unconventional concoction. “We used a whole arsenal of stuff.”

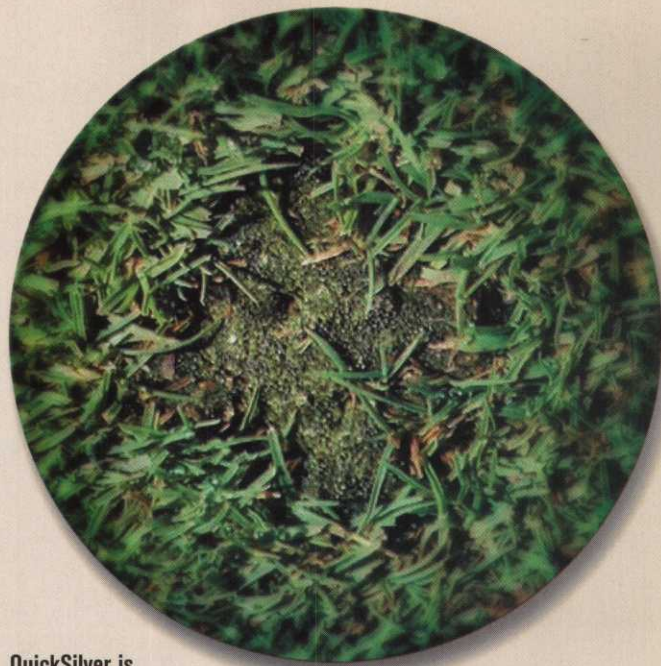
That stuff worked — to a degree. But Stiehler couldn’t achieve the moss control his course’s greens required.

Other superintendents have used Ultra Dawn alone or in combination with other products such as hydrogen peroxide to control moss. Still others, including Stiehler, have tried baking soda.

“The problem is that baking soda yellows the grass tremendously, and the grass takes awhile to recover,” Stiehler says.

While superintendents have gained some success with these unconventional items, none are registered with the Environmental Protection Agency for moss control (although that hasn’t stopped superintendents from using them). But a new product has surfaced that’s registered by the EPA for moss control. Philadelphia-based FMC Corp. introduced QuickSilver, a herbicide that’s making a name for itself in moss control.

During a question-and-answer session at the Ohio Turfgrass Conference & Show with several superintendents, United States Golf Association (USGA) Green



QuickSilver is gentle on most bentgrass varieties, according to FMC Corp., manufacturer of the product.

Section agronomists Bob Brame and Keith Happ touted QuickSilver when moss control was discussed.

QuickSilver, a carfentrazone-ethyl, works by effectively inhibiting a key enzyme in moss chlorophyll production, according to FMC. Fred Yelverton, Ph.D., a turf professor at North Carolina State University, said several years of research reveals that QuickSilver “appears to be the most consistent for controlling silvery thread moss over a broad range of environmental conditions.”

Moss is a year-round threat at Highlands Country Club, but it usually occurs in the summer. “We see it most on undulating greens,” Stiehler says.

When Stiehler began using QuickSilver last year, he was able to place the Ultra Dawn dishwashing soap back in the kitchen cupboard. He uses QuickSilver about once a

month to keep moss in check. He usually tank mixes it with other chemicals. “I don’t have a problem with moss now,” Stiehler says.

Like many superintendents, Stiehler is skeptical of spraying any new herbicide on his course’s greens. Nothing against QuickSilver or any new herbicide, Stiehler says, that’s just the way most superintendents think when it comes to their golf courses’ greens. The greens are the bread and butter of their operations, so they must be cautious.

Stiehler tested QuickSilver on moss growing on the club’s croquet course, which he calls his experimental green. After a few tests, he was satisfied that the product was safe for his course’s bentgrass greens. “I have a good comfort level with QuickSilver now,” he says.

Stiehler says he supplements spraying with aggres-

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Real-Life Solutions

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sive aeration and verticutting programs in areas where the worst moss occurs.

Cultural practices are vital to stop moss from reoccurring, says Brame, director of the USGA Green Section's North-Central region. Even if moss is eradicated, it can return like other turf

diseases, especially if wet conditions that foster the disease are prevalent.

The three most-important cultural practices to keep moss in check are fertilization, cutting heights and water management.

Fertilization has to be adjusted in many cases to prevent moss, Brame says. The specific amount of minor nutrients



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in addition to nitrogen, phosphorus and potassium, is essential to control it.

"A deficiency in a minor nutrient could create a weakening and open the door for moss," Brame says. "So fertilization in terms of the 'total package' has to be considered."

Proper cutting height, which directly affects turf density, is also important. Greens mowed too close can cause turf thinning, and moss can take over the thin areas if the weather conditions are right.

Brame says proper management of water content in the upper soil profile is essential. Too much moisture held by organic matter and finer articles in the soil can spur moss development. Core aeration in the spring and fall, deep tining in the summer and a first-rate topdressing program will prevent moisture and hinder moss development.

But some moss is bound to break through, Brame says. That's why there's QuickSilver.

Stiehler is thankful he now has a reliable product in his toolbox for moss control.

"It's nice to know there's something out there," he says. "There was nothing for the longest time. I don't know what superintendents did 10 years ago if they had bad [moss] problems. I think that's when everybody got into making their own concoctions. But I don't think any of those have been that effective." ■

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