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Increased outings combined with reduced maintenance budgets and less staff make it difficult to maintain recommended, aggressive aeration in the spring and fall. Will courses suffer?

by Rob Thomas

The only thing constant is change. While superintendents continue aerification as a must in maintaining a healthy course, the last five years has seen quite a bit of change.

Agronomists Ty McClellan, manager of the USGA Green Section's Education Program, and Adam Moeller of the USGA's Northeast Region, have both seen growing differences on when courses are being aerated.

TIMING. McClellan has found many golf facilities aerate less frequently in the spring and fall than they have in the past. "Much of this movement to aerate less was in response to a challenging economic climate," he says.

Increasing challenges prevent supers from doing recommended, aggressive aeration.

ALL IMAGES: TY MCCLELLAN

A soil sample reflects sand movement into the soil.

Equipment innovations

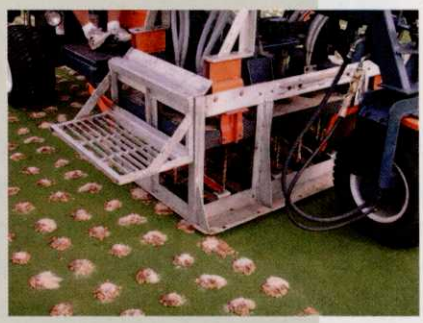
Improvements in walk-behind aeration equipment have provided numerous benefits to the golf industry, says USGA agronomist Adam Moeller. Easy tine type – hollow, solid, large, small – and spacing adjustments, allow for a good pace while creating a clean and deep aeration channel. Likewise, offset tires – so cores are not run over during the process – are some of the improvements in modern walk-behind aeration equipment.

"Better topdressing equipment has also allowed for more accurate and efficient applications of sand to back-fill the aeration channels without applying too much material, which could compromise turf health and delay the process," Moeller says.

Improved core harvesters, sweepers and counter-rotational brushes to incorporate topdressing to fill the aeration channels are other items that have improved the core aeration process.

"New ideas such as using pull-behind and/or back-pack blowers to help fill aeration channels have also become popular among superintendents, improving the core aeration process," Moeller says. "The availability of bagged sand and/or kiln-dried sand has also helped improve the success and speed of backfilling core aeration channels because the dry sand works into the aeration channels and turf canopy much easier than moist sand."

While every situation is different, the USGA's Ty McClellan says if deep soil modification is necessary — usually on soil-based greens that suffer from poor internal drainage — then the Drill-N-Fill option is very effective. This has become increasingly popular and is usually performed on a contract basis and involves a series of drill bits approximately ¾- to 1-inch in diameter on 6-inch spacings. Holes are created to an 8 to 12-inch depth and backfilled with sand.



Better equipment has improved the core aeration process.

"Never before has there been such a selection of sophisticated aerators to choose from that will likely meet the specific needs of each golf course," McClellan says. "Modern aerators are more efficient than older models and create cleaner holes which leads to less golfer disruption and faster turf recovery."

An increase in scheduled outings to make up for lost revenues, declining membership and fewer rounds played all contribute to the economic shortfall. Increased outings combined with reduced maintenance budgets and less staff make it difficult to maintain recommended, aggressive aeration in the spring and fall.

"When aeration is performed it seems the golfing calendar trumps sound agronomic principles, meaning aeration has been pushed earlier into the spring and later in the fall so as to lessen the impact on play," McClellan adds. "Unfortunately, when aeration is not performed at the ideal times of year, i.e. when the turf is most actively growing, recovery of aeration holes is slowed from as little as 7 to 10 days to a month or more."

Aerating too early in the spring or too late in the fall, while trying to maintain pure bentgrass greens, is an open invitation for *Poa annua* encroachment into slow-to-heal aeration holes because it is actively growing, while bentgrass is not.

Moeller has seen the same push of "off-season" aerifying to better accommodate golfers, but understands the dilemma.

"Core aeration when the turf is actively growing and moderate air temperatures occur – late April/early May and late August/early September in the Northeast – is optimal for fast recovery with the least amount of risks," he says. "These have been the traditional timing for the last few decades, but some are changing primarily to reduce disrupting the golf calendar. Clubs weigh the risks of core aeration in sub-optimal times with the potential benefits of non-disrupted golf in April/May and September and make their decision.

"Core aeration in a sub-optimal time is better than no core aeration at all, though," he says.

While spring and fall aeration seem to have decreased, minimally disruptive aeration performed in the summer months is on the rise. This is generally performed using small-diameter tines – also referred to as needle or pencil tines that are approximately ¼-inch in diameter – slicing tines or water injection, Moeller says.

"Using these options there is very little, if any, impact on playability of putting surfaces," he says. "The purpose is to safeguard turf health against summer heat stress by increasing oxygen levels in the rootzone, promoting gas exchange and minimizing root dieback."

OBSERVATIONS. There are many theories regarding aeration strategies, McClellan says. And while some work, many do not.

The most successful aeration programs for bentgrass or *Poa annua* greens generally involve a combination of core aeration and deep, solid-tine aeration each spring and fall using tines ½-inch in diameter or larger combined with minimally disruptive aeration techniques (i.e. summer venting) every three weeks or so throughout the growing season, he says. For Bermudagrass greens, the most aggressive aeration practices are performed in the summer during active growth.

"Any aeration program that deviates too much from these standard aeration schedules probably isn't all that successful long-term," McClellan says.

Because solid-tine aeration is a very clean process that does not bring soil to the surface, many facilities have gotten away from using hollow tines, or core aeration, he says.

"In very few instances can a golf facility get away from core aeration for more than a few years, but the need to use hollow

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— Ty McClellan, USGA Green Section's Education Program

tines can be reduced if an excellent sand topdressing program is in place," says McClellan. "With more sand applied more often there is better thatch dilution, less layering in the rootzone and a playing surface that is more traffic-tolerant because sand resists compaction. This means there is less dependency on core aeration, but it does not mean it can be eliminated, just possibly reduced and substituted instead with solid tine aeration more often."

Moeller, too, has seen increased interest with superintendents following a non-disturbance or zero-disturbance philosophy and thatch control only through dilution with regular topdressing. "This theory supports the idea of thatch dilution and solid tine aeration only; never pulling a core through tradition core aeration," he says. "While this may work on a limited basis, the concept is largely unsuccessful in the field and increases the chances of thatch buildup."

In most instances, superintendents adopting the non-disturbance theory benefit from happy golfers when other courses are dealing with core aeration disruption, but at some point they realize thatch is building despite topdressing routinely.

The absence of core aeration concerns Moeller because thatch removal is one of many benefits from core aeration: compaction relief, soil modification, alleviating layering issues and improved rooting are lost or greatly reduced if this process is abandoned.

"Solid-tine aeration in place of core aeration can aid in compaction relief and rooting, but soil modification and addressing any layering issues is very limited unless core aeration is used," he says. "If people are going to follow the non-disturbance theory, it is essential to frequently test the soil's physical properties in the upper profile to ensure thatch, porosity and infiltration are not moving in the wrong direction."

RESULTS. There are few shortcuts when it comes to aeration that won't ultimately result in deteriorating course conditions down the line, McClellan says. "Whereas a number of golf facilities have remained committed to sound agronomic principles throughout difficult economic times, during my travels and onsite visits to golf courses in recent years, it is obvious that turf problems resulting from soil-related problems are on the

rise at a majority of courses visited," he says.

Less aeration and less sand topdressing leads to higher organic matter accumulation in the root zones and increased soil layering problems. In fairways and approaches, soil compaction problems are becoming increasingly apparent if aeration programs are scaled back or eliminated. Increased organic matter levels and more soil compaction leads to increased soil moisture, reduced soil oxygen and stunted root systems.

"Combine this with record-breaking heat each of the last two summers for much of the United States and it is no surprise that golf facilities experiencing devastating turf loss generally were those that were not on excellent aeration and topdressing programs," McClellan says. **GCI**

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SUMMER DUSTINGS

There is a discrepancy in topdressing programs between golf facilities with varying budgets. "Courses with large staffs and modern topdressing equipment can easily administer sufficient quantities of sand each spring and fall in combination with aeration," says Ty McClellan, manager of the USGA Green Section's Education Program. "On the rise at higher-budget golf facilities is the application of light quantities of sand every 7 to 14 days throughout the growing season."

Often referred to as "summer dustings," these small applications are an excellent way to keep pace with ongoing organic matter production, which is needed for new bentgrass and Bermudagrass cultivars that are extremely dense and prolific thatch producers.

"Additionally, these frequent, light topdressing applications throughout the growing season actually lead to consistently faster greenspeeds and results in smoother, truer putting surfaces since minor surface imperfections – such as those caused by ballmarks – are leveled frequently," McClellan says.

Summer dustings of sand have little impact on play and require little to no brushing or dragging to work sand into the turf canopy.

Adam Moeller, agronomist with the USGA's Northeast Region, sees a downside to dustings, which actually stems from improved equipment.

"In past decades, superintendents could not apply topdressing too lightly (because the equipment wasn't that good) where it would have little benefit," he says. "This has changed with improved topdressing equipment and kiln-dried sand. Unfortunately, this means superintendents can be topdressing every week, but if the application rate is too light, the benefits with thatch dilution and smoothness/firmness are not being realized."

These ultra-light applications may have some minor benefit in surface conditions, but if the application is so light that it is undetectable, it is too light to be really helping improve turf conditions, Moeller adds.

This means an application rate of 0.75-1 cubic feet per 1,000 square feet every 7 to 14 days. Those topdressing at <0.5 cubic feet per 1,000 square feet fall in the ultra-light category where the benefits are not likely to be very noticeable.

Similar to aeration, topdressing requires resources and time and it, too, has been scaled back in many instances as golf facilities try to navigate through a difficult economic climate, McClellan says.

"Sand topdressing is preventative against excessive organic matter accumulation because it dilutes it each time sand is applied," he says. "When topdressing programs do not keep pace with turfgrass growth, organic matter content increases in the rootzone and more aeration and topdressing will then be required in the future to correct the problem. This is the position in which many golf facilities now find themselves."

Timing, temperature are the keys to winning this wa of attrition against *Poa*.

The inva

By David McPherson

Think of *Poa annua* as that annoying uncle who comes to visit unexpectedly once per year: you know he's coming. You can prepare for his arrival with distractions to hopefully minimize his stay. He's familiar, yet he's still hard to figure out.

Fighting *Poa annua* (commonly referred to as annual bluegrass) on putting greens – where it's perennially an unwanted guest – is a battle many superintendents face each spring. *Poa* adapts faster in cool-season climates. Once this turf variety invades a club's greens, it is difficult to get rid of. For the best success, superintendents can attack this unwanted intruder in the early spring before it germinates by spraying its seedheads with Plant Growth Regulators (PGRs). This inhibits, and limits, *Poa's* production before it reaches the surface and spreads.

Sean McCue can relate to this perennial pest. The superintendent at the Country Club at Castle Pines in Colorado for the past 16 years says trying to prevent *Poa annua* from further encroaching into his putting surfaces is one of his biggest maintenance challenges. Castle Pines' greens are made up of a 25-year-old Penncross bentgrass variety, which at 70 percent, is the dominate strain of turf; *Poa* makes up the remaining 30 percent.

Castle Pines' members, who are privileged to play this Jack Nicklaus design near Denver, are very active. According to McCue, they play, on average, 26,000 rounds in an eight-month season. And, like all private golf club members, they expect the highest level of conditioning.

Over the years, superintendents have used different formulations of Embark (now known as Embark Turf and Ornamental) to inhibit *Poa* seedhead production. More recently, many superintendents have used the combination of Primo MAXX and Proxy with good results. For McCue, a combination of PGRs is the best way to keep *Poa* at bay and to improve the overall playability of greens. Throughout his career, the superintendent has relied on a variety of products.

"These products have ranged from pre- and post-emergent herbicides and an extensive use of PGRs such as TGR, Primo, Embark, Cutless and Proxy, all with varying degrees of success," McCue says.

Regardless of the product he uses, McCue says proper timing of the applications is the key to successful *Poa* suppression. While many superintendents rely on, and have achieved great results by using growing degree days (see "Growing Degree Days (GDD) for *Poa annua* suppression") to time their applications, McCue subscribes to a different maintenance model; this illustrates that, yet again, there is no single scientific

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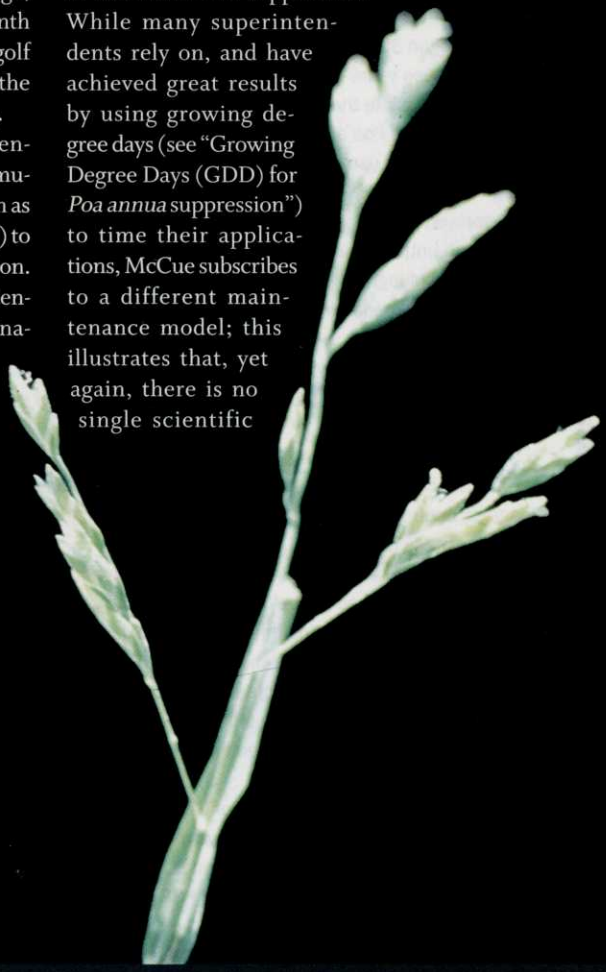

STEVE DEWEY, UTAH STATE UNIVERSITY, BUGWOOD.ORG

Growing Degree Days (GDD) for *Poa annua* suppression

Aaron Hathaway worked as an assistant with Ron Calhoun at Michigan State University for more than a dozen years. For four of those years (2003-2006), Hathaway was involved in a project to calculate the best temperatures to apply particular PGRs to suppress *Poa annua* on putting greens. Calhoun came up with the idea to use GDD for seedhead suppression PGR timing.

"I sprayed Embark and Primo/Proxy twice per week from early March until the major seedhead flush was finished in June on an annual bluegrass fairway," Hathaway explains. "We then fit the best GDD model to each of the best timings for each of the four years. This way, a best timing for seedhead suppression and fastest injury recovery was not based on a calendar date, but was based on the weather in any given area during any given year."

Today, while Hathaway no longer works directly with Calhoun, he continues to do extensive research on annual bluegrass control in creeping bentgrass fairways and greens with PGRs at Michigan State University.

"We know PGRs such as Primo/Proxy, Trimmit, and Cutless are metabolized by the turf plants more quickly when temperatures increase during the summer," he comments. "Therefore, we recommend increasing rates or lowering rates as temperatures increase or decrease, respectively. We would like to be able to track GDDs in relationship with our PGR applications, whether they are used for green speed regulation or *Poa* suppression.

"We could then use the science of GDDs to improve the efficacy of our PGR treatments and save money by regulating the rates at which we apply them," he adds. "This becomes especially necessary as we recommend PGR programs throughout the growing season in which we are applying PGRs every 14 days. Already, many superintendents are applying Primo/Proxy on a very regular basis."

solution in the battle against unwanted turf species.

"Phenological indicators work best for me," McCue explains. "Our weather patterns in Colorado in the spring are unpredictable and unstable with huge temperature swings from day to day. That's why I find growing degree days extremely inaccurate. If I were to follow this philosophy, I would miss my application window by a month or more. For me, the key is Forsythia bloom. I have found the timing of this has always been right on the money for our applications."

A little further east, Eddie Roach, superintendent at the Jimmie Austin University of Oklahoma Golf Club, finds GDD a useful tool. At this semi-private course, he uses GDD to determine when to apply PGRs to suppress *Poa's* seedhead development on his Penncross greens. In the past, while he's used Primo, his preferred inputs are Trimmit and Legacy.

"The PGR program we use is pretty good," he says. "*Poa* still pops up, but we also control it well by using general maintenance practices such as aggressive verticutting and top dressing, and core aeration to promote a good growing environment for the bentgrass."

Embark Turf and Ornamental is one of the most common PGRs to combat *Poa annua* on putting greens. Gary Custis, certified professional agronomist and manager of field research and technical services at PBI Gordon, explains that the product prevents the seedhead from forming – stopping it right in the crown area of the plant. Like all PGRs, getting the timing right is critical. Most superintendents will do two applications, depending on the seed head development. "Once you miss it, you've missed it," he says.

No matter what PGR combination you use, or when you spray them, when it comes to battling *Poa* on greens, superintendents must prepare for a never-ending fight. Even the academics admit that what makes keeping *Poa* at bay so challenging is its aggressiveness. And, once it presents itself, it is much harder to get rid of.

"It's one that, in all likelihood, will not be won," says McCue. "You will need to do all that you can from an economical and physical standpoint to keep the *Poa* under control. This can be accomplished by sound agronomic practices that do not favor tipping the scale in the direction of the *Poa*. These include proper fertility, irrigation practices, timing of aerification, mowing heights and the use of PGRs and herbicides as an overall management strategy.

"The superintendent's best friend against *Poa annua* invasion is to follow the Turf 101 principle of MTDT – Maintain Thick Dense Turf. This gives you the best chance of winning the war," he says. **GCI**

David McPherson is a Toronto-based freelance writer and frequent GCI contributor.

Web resources

For more information on Michigan State University's research, see gddtracker.net.

http://turf.unl.edu/ResearchReports/GreensPoacontrolInov2011.pdf

The USGA is partially funding a three-year research study at the University of Nebraska that is currently being done cooperatively with Purdue University and Michigan State University; the study is trying to find new and effective ways to control annual bluegrass on putting greens. This is a three-year study that will concludes after the spring observation in 2013.