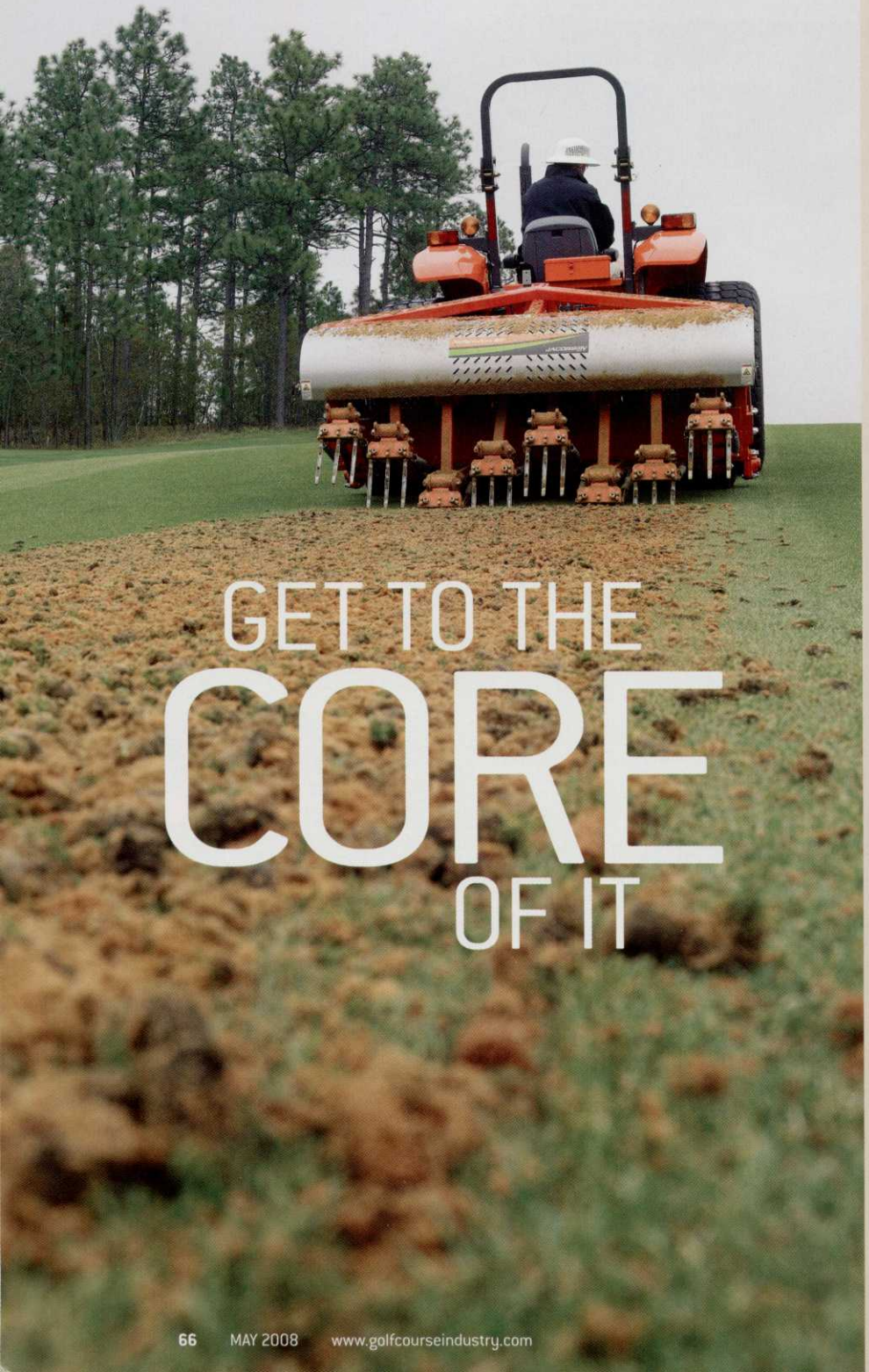
Aerification improves root zones, stress tolerance and firms greens BY DAVID WOLFF



GET TO THE CORE OF IT

No one has to convince golf course superintendent Mark Burchfield about the effectiveness of an aggressive aerification program. When he arrived at The Victoria Club in Riverside, Calif., five years ago, his first task was to revive the *Poa annua* greens, which were built in 1903.

"The greens didn't drain very well and the subsurface was old, so we couldn't be aggressive with our cultural practices," Burchfield says.

The superintendent had to combat an arid climate and lack of rainfall, which inhibit downward water movement and allow sodium to migrate back up to the root system and crown of the plant.

"Leaching the greens has been key to our survival," Burchfield says. "*Poa annua* is very susceptible to salt. When mowing at one-eighth inch or lower, the root system is shallow, and the plant is sensitive to any outside influence, which throws it into stress and makes it prone to rapid blight. The sodium-based disease comes in over a short period of time. It can hit in late evening, and within 12 to 16 hours, the greens can be almost engulfed and losing turf."

Once that situation was diagnosed and controlled, the maintenance staff pursued an aggressive aerification program. Greens are deep-tined twice a year, simultaneously core aerified to 3 inches with half-inch tines. The staff also verticuts and hydrojects throughout the year.

"We're trying to keep the greens open," Burchfield says. "With our older greens and subsurface, aerification is the most important thing we do."

The Victoria Club members support the aerification program, largely because of a disastrous episode in 2003.

"Instead of pulling cores, we just sliced, so we didn't disrupt a special event," Burchfield says. "The result was a catastrophic loss of turf that hurt us. Aerification is no longer a four-letter word at this club, and the results speak for themselves. Our greens are the best they've ever been."

MORE OXYGEN, LESS HEAT

Good agronomic practices necessitate aerification of the soil profile to maintain a high level of macropores in the root zone. A well-aerated soil is cooler during summer because air is a better insulator from heat than water. In contrast, water is an excellent conductor of heat where root zones with excessive water hold more heat and less oxygen.

The aerification process:

1. Extracts excessive accumulation of organic matter.
2. Reduces compaction.
3. Improves soil/gas exchange.
4. Stimulates new root development.

Aerification doesn't have to include extracting cores. It also can be accomplished by using solid tines to create vertical shafts in the root-zone profile. Photo: David Wolff

5. Stimulates microbial activity.

6. Improves the plant's ability to withstand biotic and abiotic stresses.

But for all its benefits, aerification is one of the most despised cultural practices for golfers because it disrupts the playing surface. Aerification usually is done during the prime playing seasons, and according to most golfers, has no redeeming features other than to decrease green performance and raise one's golf score, says M.C. Engelke, Ph.D., professor and faculty fellow at the Texas AgriLife Research Center in Dallas, which is an agency of Texas A&M University.

"On the other hand, aerification is likely the most important cultural practice a golf course superintendent can perform," Engelke says. "Why? Simply put: It maintains a root system under the target plant. The plant's response is to maintain density, enabling it to tolerate traffic and resist ball marking; maintain a deep, effective root system to withstand limitations on water quantity and quality; and maintain healthy plant growth to tolerate biotic and abiotic stresses."

REMOVE ORGANIC MATTER

As plants grow, roots, stolons and rhizomes will develop, increasing the level of organic material in the upper soil profile. The more plant growth, the healthier the plant is, resulting in a superior playing surface.

The down side of plant growth is organic accumulation. Left unchecked, the level of organic matter can create a high organic layer, which, by itself, can change the dynamics of the root zone. Periodic monitoring of the root zone is proactive when maintaining a uniform balance in the amount of organic matter, sand, silt and clay throughout the soil profile.

"If an organic layer accumulates near the surface, it can restrict water and air flow into the root zone," Engelke says. "During periods of high abiotic stress, the plant demands much more plant-available moisture and soil oxygen. Restrict either, and the root also will be restricted."

Organic matter will seal the soil surface from water and air infiltration and accumulate salts from evapotranspiration, suffocating the root zone.

"Ever wonder why roots are shorter in the heat of summer?" Engelke asks. "In short, they suffocate. The organic material restricts the availability of soil oxygen, which, under high soil and air temperatures, is quickly depleted because of a rapid level of root respiration. A simple solution to this problem is to recognize aerification isn't an annual event. It's an event that should occur frequently and with a purpose."

AERIFY DURING HIGH GROWTH

Root growth and maintenance require a lot of soil oxygen. One of the best ways to deliver this is to aerify, especially during periods of high growth. Aerification for the purpose of organic

STAY TUNED FOR 31 YEARS OF GOOD LIVING

Bob DeMarco

POWELTON CLUB
NEWBURGH, NEW YORK

Having tutored under the "Bill Smart" school of turfgrass culture makes me think of one of Bills's favorite lines in the summertime "Should have been a mason, bricks don't wilt". That's why the spray rig never leaves the shop without Surf-Side 37. I've used Surf-Side with just about every chemical on the market. NEVER HAVE I BURNED WITH IT!

YEARLY PROGRAM My first application is late March / early April. Last application is around Thanksgiving (I go skiing after that!). Greens and Tees 4oz. / M Surf-Side on a regular basis that being every 2 to 4 weeks.

HYDROPHOBIC SOILS Any area of the Golf Course not up to par gets a DRENCH of 5gals. Surf-Side in 160 gals. water put out with a hand gun watered-in. This brings the areas under control.

LOCALIZED DRY SPOTS I've put up to 12-oz Surf-Side 37 in 2-gals. water and poured it on the LDS. It's best to first core the area with a soil probe. Follow with lots of water, and VOILA!!! No more problem. It's a "no brainer" for Superintendents fighting LDS.

DISEASE PROGRAM This is a good time to cut labor costs and maintain your Surf-Side 37 Soil Water Management Program. We average 5 to 7 fairway sprays a year and put 2-gals Surf-Side in the 160 gal. sprayer. On green and tees we average 8 to 10 sprays a year and put 1-gal. Surf-Side 37 in the 100 gal. sprayer.

Montco Products Box 404 Ambler, PA 19002 Phone: 215-836-4992 Fax: 215-836-2418

www.golfcourseindustry.com/readerservice - #48

Go with the Pros
PROFESSIONAL WETTING AGENT APPLICATOR GUNS

LiquidPro™

Patented Precision™ nozzles assure uniform coverage of wetting agent.

PelletPro™

Powerful yet gentle spray at up to 48 GPM applies liquid or pellet surfactants uniformly... and fast! LiquidPro™ can treat **1000 sq. ft. in less than a minute!**

2 Products in 1! Each gun disassembles easily to create a high end hose nozzle.

Underhill
866-863-3744 • www.underhill.us

www.golfcourseindustry.com/readerservice - #49

The Victoria Club's 100-year-old *Poa annua* greens were revived with an aggressive aerification program. Photo: David Wolff

material extraction should be done during the period of time the plant is most active, Engelke says. This ensures the physical hole created by removing organic material will heal rapidly.

"The USGA suggested 20 percent of the upper root-zone cavity should be extracted annually," he says. "If we take this as a given, machines on the market equipped with a modified quad tine holder and half-inch tines on 1-inch centers will remove 11 to 12 percent in a single pass, thus requiring only two aerifications per year."

A single aerification during the most active growth period of the year will help extract organic material. Timing is species dependent. Bermudagrass, zoysiagrass and paspalums have their most active period during summer, whereas bentgrasses and even *Poa annua* are most active in early spring or late fall.

"Periodic monitoring of the organic layer will help determine how frequently core aerification is required," Engelke says. "Maintaining an organic material layer of three-eighths inch to one-half inch is acceptable and will provide good plant response. Depth greater than one-half inch could cause problems during the heat of the summer."

VENTING

Aerification doesn't always have to include extracting cores. It also can be accomplished by using solid tines to create vertical shafts or air space deep into the root zone profile. These vertical shafts are vents. The term "venting" is used instead of aerification frequently.

"These vent shafts are macropores, the site of gas exchange, excessive moisture evaporation, and points of moisture and soil gas infiltration,"

www.golfcourseindustry.com/readerservice - #50

Engelke says. "Using solid tines throughout the growing period creates new macropores, which are essential to supply adequate soil gases to developing roots and microorganisms."

This cultural practice goes hand-in-hand with aerification, but it's not a substitute for core aerification. Venting greens through the summer months generates and maintains active macropores. Because the macropores of aging greens tend to close quickly, it's equally important venting is done frequently.

Along with providing excellent moisture and gas exchange, the improvement in soil gas exchange also supports and stimulates microbial activity, enhancing the rate of organic material decomposition.

"Combined with light, frequent topdressing, core removal and supportive microbial activity, the root zone will be supportive of a deeper, more effective root and healthier turfgrass plant," Engelke says.

FIRM UP THE GREENS

Golf course superintendent Ron Pusateri had an experience similar to that of Burchfield. When he arrived at St. Clair Country Club in Upper St. Clair, Pa., three years ago, turf conditions needed considerable improvement. The 40-year-old, push-up *Poa annua* greens have native soil and no internal drainage.

There were other considerations, too. St. Clair is a private club with a large membership whose handicap ratings represent a wide range of golfing abilities. Pusateri's greatest challenge was to find a happy medium for course conditions and playability.

"The club wants championship conditions, but, during my first year, I learned taking that approach didn't please everyone," Pusateri says. "If there was too much roll in the fairways, the course played too short for some golfers. And the greens might have been too slick for a membership that averages a 20 handicap."

Pusateri's first task was to firm up the greens with an aggressive topdressing program. Heading into his first winter, he covered greens with sand. By the time the staff was ready to aerify in the spring, the sand was almost gone. The staff aerified with three-eighths-inch tines on a 1.5-inch-by-1.5-inch spacing. Later a DryJect process punched sand directly into the surface in two directions on a 3-inch-by-3-inch spacing. A drill-and-fill process was executed twice in the fall using three-fourths-inch drill bits at a 12-inch depth.

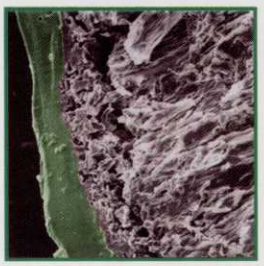
The staff applied two heavy topdressings in the winter. The following spring the staff completed a deep-tine aerification and performed another DryJect process, as well as core aerification.

"We've amended the soil profile on the greens with sand to firm them up," Pusateri says. "The membership is pleased with what we've done." **GCI**

POLYON®

100% Predictability

- Consistent, gradual release of nutrients
- Predictable, long lasting feeding with no lock-off
- Temperature-controlled, with no surge growth
- Environmentally friendly
- Greener, healthier turfgrass from one application



Chemically bonded coating for durability

Please contact your Harrell's Representative for more information

720 Kraft Road | Lakeland, FL 33815

800.282.8007 | www.harrells.com

Harrell's

Professional Fertilizer Solutions

www.golfcourseindustry.com/readerservice - #52

CoolPro™

TURF CANOPY COOLING NOZZLE

Designed for the single purpose of cooling the turf canopy without over watering (which risks damage to the roots). And the 25 foot pattern gets the job done quickly.

Patented Precision™ nozzle fogs to deliver a 25 ft. pattern with only 4-6 GPM.

Underhill

866-863-3744 • www.underhill.us

www.golfcourseindustry.com/readerservice - #51