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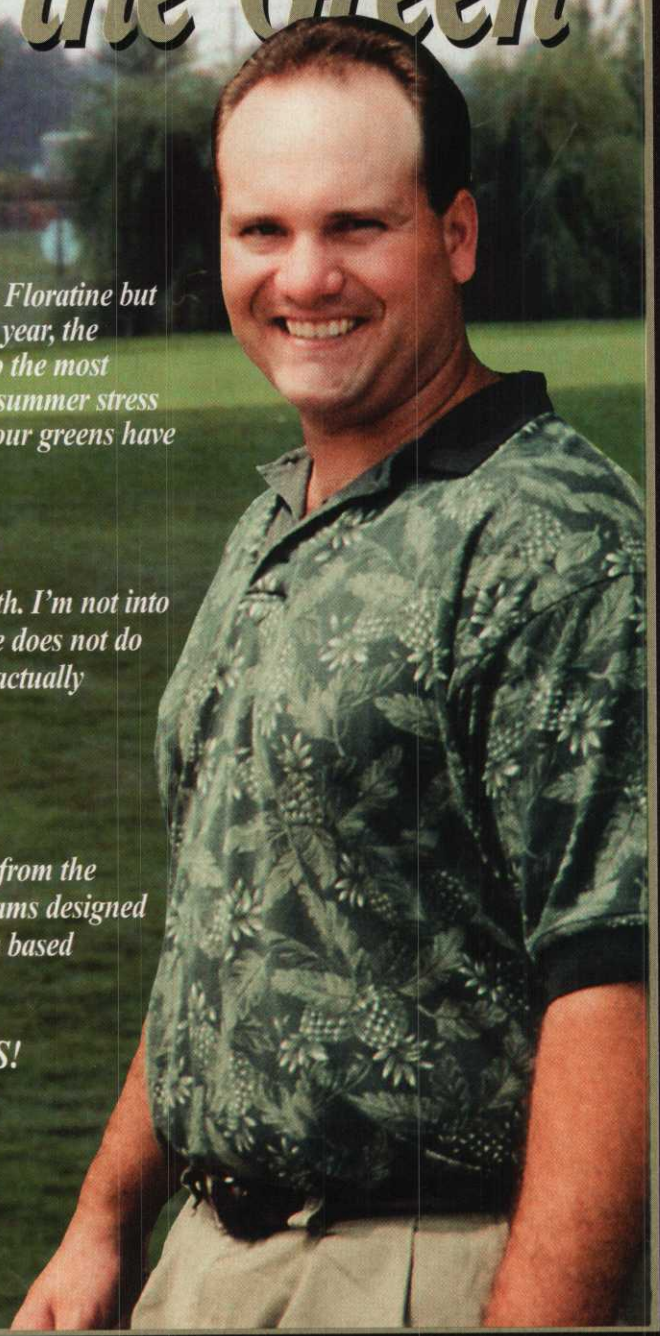
Keepers of the Green



Just Like Floratine? Not Even Close!

I've tried a number of products marketed as "Just like Floratine but cheaper," but was never satisfied with the results. This year, the "Floratine Program" has proven that it can hold up to the most severe conditions. Despite no spring and the toughest summer stress in memory (25 + days over 90° with little or no rain), our greens have never looked better.

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Just Like Floratine?

There are a number of things that separate Floratine from the competitors like knowledgable sales people and programs designed specifically for your turf and soil using scientific facts based on soil and tissue tests.

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CIRCLE NO. 107

Continued from page 10
researchers was Manhattan. "Since then, there has been a Manhattan 2, a Manhattan 3, and they're probably working on a Manhattan 4 as we speak," said Jim Murphy, an extension specialist at Rutgers.

Since the '60s, there's been a boom in ryegrass varieties, and recent breeding programs have developed better turf-type varieties, Murphy adds, noting that early varieties were hindered by poor mowing quality and greater sensitivity to pest problems. "The older varieties are nowhere near the quality we have today," he says.

Bios for dollar

Dollar spot has been around for more than 100 years, but it's been a real pain in the golf course industry's backside in only the past five years, especially on fairways.

Clarke was asked if any biological fungicides could help control dollar spot. "We're always looking for biologicals that give good disease control," he answered.

"The key is – and this is sacrilegious but I'll say it anyway – you need to raise the height of cut slightly."

BRUCE CLARKE, RUTGERS

But Clarke wouldn't say if a biological product would perform as well as a synthetic fungicide. "Our recommendation is: When you find a biological that works, weave it into your program—either in a tankmix combination with reduced rates of synthetic fungicides or alternating with synthetic products," he said.

LARRY AYLWARD

Rutgers/Cook College turf experts say velvet bentgrass has more of a vibrant green color than other bentgrass varieties, among other positive attributes.

Syngenta's tandem

Clarke said colonial bentgrass is more susceptible to brown patch than creeping bentgrass. But he says Rutgers researchers have discovered that tankmixing two fungicides — Syngenta's Heritage and Banner — may extend the interval of an application from 14 days to 21 days. Heritage is a strobilurin, and Banner is a demethylase inhibitor.

Stacy Bonos, an assistant professor, said the school is trying to breed a colonial bentgrass that's more brown-patch resistant.

Unbreakable?

Of all cool-season grasses, tall fescue is the most tolerant of insects. It's not that insects don't feed on tall fescue, but the grass can outgrow the damage before it becomes severe. Tall fescue also has deeper roots to combat hungry grubs. And because of the deeper roots, hungry crows have a difficult time peeling back tall fescue to get to the grubs.

Burn, baby, burn

If you're looking to do away with the weeds — as fast as you can say "dandelion, dandelion, dandelion" —you might want to try a herbicide with carfentrazone, which provides rapid desiccation of broadleaf weeds at low use rates. "It won't give you better weed control, but it will give you more rapid burn of weeds," Hart said.

But Hart warns superintendents to use herbicides with carfentrazone on roughs and collars only. Keep it away from fairways and greens, especially bentgrass. "I'm a little leery of using it on them," he adds.

Out with the old?

It's probably no surprise that the newer bentgrass varieties are more apt to keep *Poa annua* from launching a full-scale invasion. In a recent trial, researchers overseeded several bentgrass varieties with *Poa* to see which bentgrasses could keep the *Poa* in check. The older varieties, which don't have the density of the newer bents, allowed more *Poa* invasion.

Larry Aylward can be reached at 440-891-2770 or laylward@advanstar.com.

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BECAUSE OF THEM, OUR INDUSTRY IS A BETTER PLACE.

Tom Gosselin

Overbrook GC, Bryn Mawr, Pa.
Public Relations Committee Member, Philadelphia AGCS

When then-President Don Brown and the board of directors decided to fully support and revamp its newsletter, *The Bonnie Greensward*, Gosselin answered the call. A new format, new logo and concentrated efforts to get editorial contributions from colleagues and Penn State professors produced national GCSAA awards for Most Improved and Best in Category 1 (budget less than $10,000) in 2000 and for Best in Category 4 (publication by a professional or executive secretary) in 2001.

"This newsletter is a great way to circulate information about current events, drought emergencies and other information," Gosselin says, while deflecting credit for its success to Brown, Executive Secretary Kristen Liebsch and others. "I think it is almost more important now for the local chapters to be more involved."

"Tom did a great job on the newsletter," said current President Benny Peta of Bedens Brook Club, in Skillman, N.J.

Greg Harkin, CGCS

Willow Creek GC, West Des Moines, Iowa
President, Iowa Turfgrass Institute

When Greg Harkin was presented the Iowa GCSA's 2002 Distinguished Service Award earlier this year, he teased IGCSA President John Ausen that the only reason he got the award was because Ausen's wall is full. "I was quite honored because there are a dozen guys who do more than I do," Harken said. If so, the IGCSA itself may deserve an award for volunteerism.

Not only has Greg worked endless hours for the IGCSA, he has also served on the board of directors of the Iowa Alliance for Environmental Concerns and this year assumed the presidency of the Iowa Turfgrass Institute.

"It helps me to give back to my profession," Harkin said. "But I get more out of it than I ever give. It helps me keep abreast of the current issues. All the superintendents are friends and I can call them at a moment's notice for their insights and help.

"Fortunately, we've always had a good group in Iowa. When the association needs help, people step forward."

DO YOU KNOW A LOCAL HERO IN YOUR CHAPTER?

Send us a note at *pjones@advanstar.com* and we may feature your hero in an upcoming tribute.

Off The Fringe

Business briefs

Golfers spending, NGF says

A new National Golf Foundation (NGF) report signals that the downturn in the economy and the cratering stock market hasn't affected the way golf consumers spend their money.

The study, "The Spending Report: Sizing the Golf Consumer Marketplace," reports that consumer spending totaled more than $23 billion in 2001, up 2.9 percent over the past two years.

Golfers spent $26 billion on travel to play their favorite courses in 2001.

As a result of economic conditions of 2001, the NGF continues to monitor the spending habits of golfers in 2002, and will release a new report examining spending next April.

Lesco selling plants

Lesco plans to sell its Novex plant in Disputanta, Va., and its blending plant in Stockton, Calif. The company said it wants to source Novex from the eventual buyer of the Virginia plant and the blended fertilizer for its West Coast sales facilities from retained Lesco blending facilities or the eventual buyer of the Stockton plant.

"Novex is an excellent product for golf course greens and tees," said Michael P. DiMino, Lesco's president and CEO. "However, the Novex plant capacity is far greater than we need for our customer demand. We are looking for a buyer who can supply Novex to us and then use the remaining capacity in markets that are not competitive with Lesco's U.S. golf and professional lawncare markets."

Lesco announced that sales for the second quarter, excluding some charges,

Briefs continue on page 16

About That Fall Fungicide Application

IF YOU HAVEN'T DONE IT, KEEP IN MIND IT'S ONE OF THE MOST IMPORTANT APPLICATIONS OF THE YEAR

By Ed Vandenberg

Fall fungicide applications are some of the most important applications of the year. They keep turf disease-free throughout the winter when colder weather in some regions makes applying chemicals nearly impossible. With winter weather and cool-season turf disease working together to damage a course, superintendents need to get the most out of their late-season turf management practices.

FCF SCHMIDT

Snow molds are the most widespread diseases to afflict cool-season turf and are major contributors to winter turf injury.

Snow-cover, high moisture and low temperatures will weaken turf, providing ideal conditions for the spread of turf disease. By the time weather improves, damage from disease outbreaks may be widespread.

Gray and pink snow mold are the most widespread of the cool-season diseases and are main contributors to winter turf injury. Heavy snow cover prior to turf hardening-off increases moisture in the soil, providing ideal conditions for snow mold development.

Pink snow mold will appear during cool, wet weather, with temperatures ranging from 30 degrees F to 60 degrees F. Snow cover is not required for its appearance, but it does provide favorable conditions for disease development. Pink snow mold produces small (less than 6 inches across), round spots on the turf. The pink tint that gives the disease its name is most noticeable during the early morning.

Gray snow mold is caused by two species of fungi that thrive when moisture is plentiful (particularly during prolonged periods of snow cover). The disease is particularly common after snowfall on unfrozen ground. Gray snow mold can create significant damage in locations where snow cover has lasted three months or more. Damaged turf will have a grayish-

white appearance with distinctive black sclerotia visible on vegetation after thawing.

Cool-season pythium will affect turf on multiple levels. The turf-quality effects of a pythium outbreak are visible longer than the aesthetic effects. On the surface, cool-season pythium outbreaks appear as small patches of water-soaked slimy grass that shrivel and fade from green to light brown.

Cool-season pythium root rot is difficult to recognize and often mistaken for other diseases. It causes stunted growth and severe rotting of turf roots. Turf exhibits slower, stunted growth and thinning, even after fungicide treatment.

Basal rot and foliar blight anthracnose thrive on weakened turf. Basal rot, the more prolific of the two, first appears in March, but is active through November on *Poa annua* and creeping bentgrass. First signs of infection include irregular patches of orange-to-yellowing turf (also known as "winter anthracnose"). Later, infected plants collapse, looking like bacterial wilt. Because basal rot is difficult to detect in early stages, turf will ultimately die once the disease is visible.

Harsh winter weather will often cause as much turf injury as will disease outbreaks. The overall turf quality decline caused by winter stresses — collectively known as winterkill — can be visible months after the arrival of warmer weather.

There are several cultural practices superintendents can adopt in autumn to prevent winter disease outbreaks. These practices include avoiding heavy nitrogen applications late in the season, mowing fairways late to reduce canopy buildup, improving drainage, increasing aeration and improving sunlight exposure where feasible.

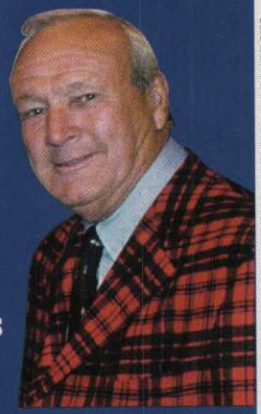
Once winter has arrived, superintendents can continue to maintain their course to prevent the appearance of disease. Large drifts of snow can be avoided using snow fences and landscape plantings, and restricting walking and common snow sports on important turf areas can reduce compaction.

While these practices will reduce the chance of winter disease from appearing, the best measure a superintendent can take is to develop a preventative fungicide program on important turf areas, especially those that are susceptible to snow mold every year.

The window of opportunity to apply fungicides late in the season can be short, depending on the timing and severity of cooler weather. Therefore, fungicide applications need to perform multiple functions, providing control of winter disease while leaving turf better prepared for the winter weather as well as early spring play. This spectrum of control can be achieved by making applications of a combination of fungicide chemistries. Incorporating different chemistries into regular fungicide applications is necessary to reduce the risk of resistance.

Ed Vandenberg is a field development representative for Bayer Environmental Science-North America and works throughout the Midwest.

"Quotable



AMERICAN SOCIETY OF GOLF COURSE ARCHITECTS

"I was born on a golf course, but the only opportunity I had to use that golf course was to ride a steel-wheel tractor while cutting the fairways when I was 6 years old. The tractor I drove had to be cranked [to be started]. I remember my father saying to me, 'Stay away from that crank, boy.' I said, 'Pap, let me crank that tractor.' And he said, 'You'll get knocked on your (@#$).' "

— Arnold Palmer, reminiscing about working with his father, who was superintendent of Latrobe (Pa.) CC

"I can't believe we're still fighting this stuff — racism, gender equality or whatever. But that's life, I guess. It's not going to change overnight, but hopefully, in the coming years, it will change."

— Juli Inkster, LPGA golfer and U.S. Open Champion (Associated Press)

"It is really going to be beautiful. This is Elvis' dream ranch."

— Pro golfer and Presley fan John Daly on his plans to build a King-themed resort with two golf courses in Memphis (Reuters)

Business briefs

Briefs continued from page 14

increased 1.4 percent to $166.5 million from $164.1 million in 2001. Golf sales declined 4.3 percent.

"Second-quarter golf sales were disappointing, and there are no excuses," DiMino said. "We are changing the structure of the golf sales team, and we expect better results in the coming periods."

Lesco announced its third-quarter results in late October.

Billy Casper to manage Forest Preserve

The Forest Preserve District of Cook County, Ill., owner of 10 golf courses and two driving ranges in the Chicago metropolitan area, has entered into a multiyear agreement with Billy Casper Golf of Vienna, Va., to manage its golf facilities.

BCG will provide turnkey-management services to the Forest Preserve District, including agronomy, beginning after the 2002 golf season.

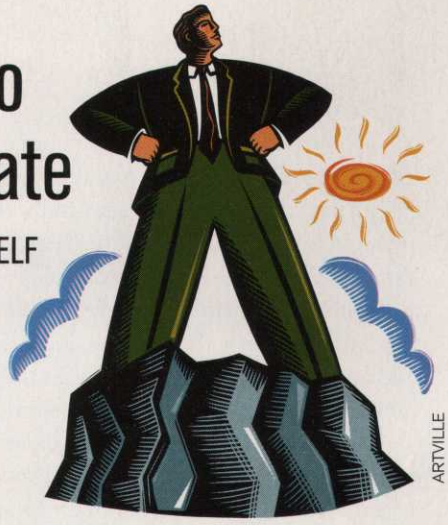
Bush Hog, Great Bend expand

Bush Hog and Great Bend recently opened a 400,000-square-foot plant expansion at Jonesborough, Tenn., to meet demand for their equipment. The facilities are designed to meet Bush Hog's and Great Bend's manufacturing needs for the next 10 years. Additional land has been set aside for future expansion.

Leave Your Ego at the Front Gate

BY DOING SO, YOU'LL RID YOURSELF OF A LOT OF STRESS

By Jim Black



ARTVILLE

I have some humble advice about this line of work that I would like to share, especially to assistants going after your first superintendent positions and students ready to take on the real work of a golf course. That advice is this:

Leave your ego at the front gate.

In my observation as a grunt, an assistant and a superintendent, I've noticed an amazing amount of golfers who assume they know my job better than I do. I didn't think about this angle going in and thought I could just grow the grass, mow the grass and everyone would be happy. Well, I can assure you that you won't be able to please everyone — no matter what you do. This is where the trouble starts.

Unfortunately, it's human nature to focus on the negative and overlook the positive. For example, you can have a day of 250 golfers traipsing around, stomping on, driving over and chunking out your turf. I'll take an unscientific guess that 90 percent of those golfers will have no contact with you; 5.4 percent will say the course looks great; you will smile and wave to 4 percent; and then the dreaded .6 percent (one or maybe two people) will have some sort of complaint, criticism or judgement about your hard work.

Now, I don't mean to be preaching to the choir, but bear with me a minute. Who do you listen to? I would venture a guess that while the 5.4 percent complimentary people are nice to listen to, the .6 percent will grate on your nerves. You may even lose sleep over whatever the complaint was.

You will wonder why this "thing" went wrong and who's to blame. If the

A Friend of the Earth Offers Educational Tips

You might think someone like Brent Blackwelder, president of Friends of the Earth, a national environmental organization dedicated to preserving the health and diversity of the planet for future generations, would be down on golf. But Blackwelder enjoys the game and can drive and putt with the best of them. "I've spent my whole life playing golf," he says.

Blackwelder also loves the earth, and believes golf and the environment can co-exist. At the fourth National Golf & Environment Summit held in Nebraska City, Neb., earlier this year, he offered these ideas for golf courses to educate players on the importance of the environment.

- Use yardage books to convey an environmental message.
- Use signs to educate. "Sometimes signs say to keep out of an area because it's environmental," Blackwelder says. "But the sign doesn't tell why to keep out. That message can be illuminating."
- Explain the health and harm a course can do to water and wildlife in a golfer's guide.
- Use the media for coverage on what your course is doing to preserve the environment.
- Stage a golf-and-environment tournament to raise money for environmental improvements.

— Larry Aylward, Editor

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TURFGRASS TRENDS

Section II • Volume 11, Issue 11 • **November 2002**

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THATCH CONTROL

Researchers Seek Nonmechanical Thatch Control Plan

By Matt F. Gregg and Bert McCarty

Today's post Penncross-era bentgrasses on golf course greens show exceptional disease tolerance, superior visual qualities and superior putting characteristics.

Creeping bentgrass is the most widely used cool-season turfgrass on greens (Huang et al., 1998). Deemed as "ultra-dwarf" varieties, researchers classify these newer bentgrasses as providing uniform upright turf, narrower shoot widths and increased root biomass.

Unfortunately, due to more intensive lateral growth, most of these newer bentgrasses become thatch/mat prone compared to Penncross. Superintendents discovered that to maximize the qualities of these newer bentgrasses, a more demanding maintenance program must be incorporated into their daily cultural practices.

Defining thatch

Thatch is a tightly intermingled layer of living and dead stems, leaves and roots of grass that develops between the shoots and soil surface (Beard, 1973). Thatch is formed primarily from periodically sloughed roots, horizontal stems (stolons and rhizomes), stubble, and mature leaf sheaths and blades (Engel, 1954; Roberts and Bredakis, 1960).

Understanding that thatch is only one constituent of the organic-matter layer below the turf canopy, scientists have added another organic layer to this definition. This second layer, called mat, consists of highly decomposed organic matter intermixed with mineral soil from the profile or from topdressing. Both thatch and mat contribute to golf greens' accumulation of organic matter.

Thatch is a tightly intermingled layer of living and dead stems, leaves and roots that develops between the shoots and soil surface.

The accumulation of semi and partially decayed organic matter is known to contribute to scalping, disease and insect infestations, localized dry spots and fairy-ring occurrence.

Thatch/mat occurrence is often a result from the imbalance between accumulation and decomposition of surface organic debris (Beard, 1973). Accumulation of thatch/mat is associated when the turfgrass production rate of viable foliage exceeds its decomposition rate. When environmental and agronomic parameters favor excessive accumulation of thatch/mat, undesirable characteristics such as reductions in water infiltration, low water retention, reduced tolerance to cold temperatures and pesticide effectiveness can occur from this excessive organic layer.

A limited layer of thatch is typically desirable. A limited mat (≤ .5 inches) is desired for proper ball bounce, limiting soil temperature extremes and contributing to the durability of the golf green against foot traffic (Beard, 1973). Maintain-

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IN THIS ISSUE

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TABLE 1

Core cultivation equipment describing penetration depth and surface disruption

Aerifier Type	Penetration Depth (cm)	Tine/Blade Spacing (cm)	Surface Disruption
Hollow Tine	5.08-30.48	2.54-20.32	Moderate-Heavy
Slicing	5.08-20.32	10.16-30.48	None
Spiking	0.635-5.08	2.54-5.08	None
Solid Tine	5.08-40.64	2.54-20.32	Slight
Water Injection	10.16-50.18	7.62-15.24	None

SOURCE: MCCARTY & MILLER, 2002

ing this level of thatch and mat has shown a proper balance of durability and longevity to the turf surface.

Due to excessive thatch/mat accumulation associated with most newer varieties of bentgrass, superintendents are now seeking new management strategies to control this.

Understandably, superintendents have shelved many traditional cultural practices while experimenting and incorporating newer thatch/mat prevention and control techniques.

Ounce of prevention

Due to this aggressive thatch/mat layering, superintendents are looking for preventative means to maintain bentgrass greens.

For example, frequent grooming and vertical mowing are being incorporated throughout the growing season. Core aerification is still required on a routine basis and can not be eliminated or skipped. Light topdressing is typically applied on weekly or bi-weekly basis. Success is being achieved with frequent light topdressings using bagged, dry material applied through a rotary spreader. Just a few years ago, the normal practice was to use heavy, infrequent topdressing applications applied with larger machines.

Overall, a preventative thatch/mat approach will lessen a green's downtime when compared to a curative approach, which is often more destructive.

Minimal destruction

The turfgrass industry is currently exploring new biological and mechanical approaches for nondestructive thatch/mat control. Alternatives in decreasing thatch/mat production and its removal are of interest. Superintendents would like to find a remedy that would allow minimal surface disruption, but still be an effective and efficient tool in preventing accumulation.

Due to excessive thatch/mat accumulation on most newer bentgrasses, superintendents need new management strategies for control.

As mentioned, topdressing is the practice of applying a thin layer of sand to the turf surface. The newly applied sand is then incorporated into the dense turf canopy by a light brushing or irrigation. Recognized as the most effective practice in controlling thatch, topdressing works by improving the microenvironment for microbial thatch decomposition (Ledeborer and Skogley, 1967).

Light, frequent grooming is also a recent advancement in vertical mowing (McCarty, 2001). A grooming unit is commonly attached to the front of a walk mower or riding triplex unit, and the blades mimic shallow vertical mowing. The overall objective is to insert the miniature blades into the turf canopy to slightly raise the leaf blade, where it can be removed by mowing. This innovative approach allows periodic thinning of the

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TABLE 2

Aerification tine size diameter and hole spacing effects on the turf surface area displacement

Tine Diameter (in.)	Tine Hole Spacing (in.)	No. of Holes per sq. ft.	Surface Area Impacted per Tine (sq. in.)	Surface Area Displacement (%)	No. of Aerifications Needed to Impact 20% of Surface Area
1/4(.025)	1 x 1	144	0.049	4.9	4
	1.25 x 1. 25	92		3.1	6.5
	1 x 2	72		2.5	8
	2 x 2	36		1.2	16.7
	2.5 x 2.5	23		0.8	25
3/8 (0.375)	1 x 1	144	0.110	11	1.8
	1.25 x 1.25	92		7.1	2.8
	1 x 2	72		5.5	3.6
	2 x 2	36		2.76	7
1/2(0.50)	1 x 1	144	0.196	19.6	1
	1.25 x 1.25	72		9.8	2
	1 x 2	36		4.9	4
	2 x 2	23		3.1	6.5
5/8 (0.625)	1 x 1	144	0.307	30.7	0.7
	1.25 x 1.25	72		15.3	1.3
	1 x 2	36		7.7	2.6
	1 x 2	23		4.9	4
	5 x 5	5.8		1.2	0.8
3/4(0.75)	2.5 x 2.5	23	0.44	7.1	2.8
	5 x 5	5.8		1.8	11
1 (1)	5 x 5	5.8	0.79	3.16	6.5

SOURCE: MCCARTY & MILLER, 2002

Grooming is neither as radical nor aggressive as vertical mowing and thus may be incorporated on a more frequent basis.

dense turf canopy and assists with topdressing, as well as water and nutrient penetration into the soil below.

Grooming is neither as radical nor aggressive as vertical mowing and thus may be incorporated on a more frequent basis. From the player's standpoint, grooming does not affect the trueness of ball roll as severely as vertical mowing.

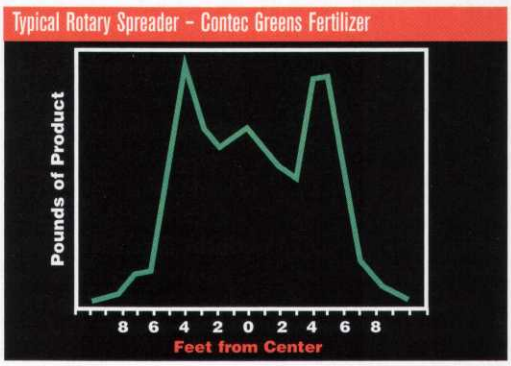
A modified approach to grooming is the advent of brushing. Using a putting-green brush weekly or several times weekly is known to reduce grain from steady lateral growth. Power rotary brushing units (or more commonly fixed, straight stiff brushes) are placed in front of the mower blade. Brushing raises the leaf tissue. which is removed by mowing.

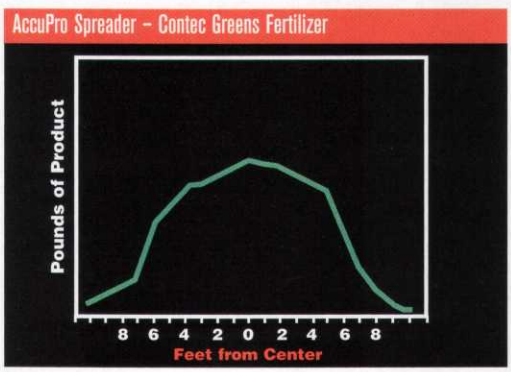
Common mechanical practices for removing thatch/mat include core cultivation or aerification, vertical mowing or ver-

Spreading the Word

Streaks, skips, speckling and time-consuming reapplications are often the result of fertilizer formulations with poor uniformity, widely varying bulk densities and poor flowability. Sometimes, however, the fertilizer itself is not the culprit. The fertilizer spreader and the applicator are variables that are sometimes overlooked when troubleshooting an application that has gone awry.

Today's low-cut greens, tees, and fairways are frequently maintained at reduced fertility levels and are less forgiving when an inappropriate rate of fertilizer is applied. Under these circumstances, the role of the applicator and the fertilizer spreader become all the more crucial. Fertilizer spreader walking-speed demos conducted by The Andersons at field days this spring indicated that as many as half of the applicators walked at least .5 mph faster than the three miles per hour required by the label. Application errors of this type result in insufficient product applied. This can result in particle speckling, skewing and poor turf response.





The graphs above illustrate the difference in the spread pattern of a rotary spreader without a pattern regulator with the spread pattern of the AccuPro 2000 with a helical cone adjustment. The smoothly feathered edges of the AccuPro spread pattern helps to minimize streaking.

The Andersons rotary spreaders (AccuPro 2000 and SR 2000) can't compensate for improper walking speed. But its patented, adjustable helical cone does compensate for a range of particle densities and weights, by placing larger granule products closer to the center of the impeller, and smaller lighter granule products closer to the edge. This insures a more uniform distribution of nutrients across the spreader pattern. Pneumatic tires, stainless-steel bearings, grease fittings in major wear areas, heavy-duty gears and welded frames are additional features designed to insure years of easy operation and reliable service.

Proper calibration is essential to achieve consistently accurate applications. Verifying calibration is simple when a calibration "key" is used and the steps outlined in The Andersons Rotary Spreaders poster are followed. Contact your Andersons distributor to obtain a calibration "key" and Rotary Spreaders poster. The Andersons Rotary Spreader poster provides graphically illustrated, easy-to-understand descriptions of how to set the spreader, calibration, maintenance and the importance of correct walking speed. A fertilizer "collection box" can also be used to help insure the most accurate calibration.

For maximum accuracy, The Andersons offers the SS-2 Drop Spreader equipped with a stainless-steel hopper, pneumatic tires and precision calibration. It is ideal for applying soil amendments, seeding greens and tees and applying Andersons FFII 14-3-3 for snow-mold protection this fall.

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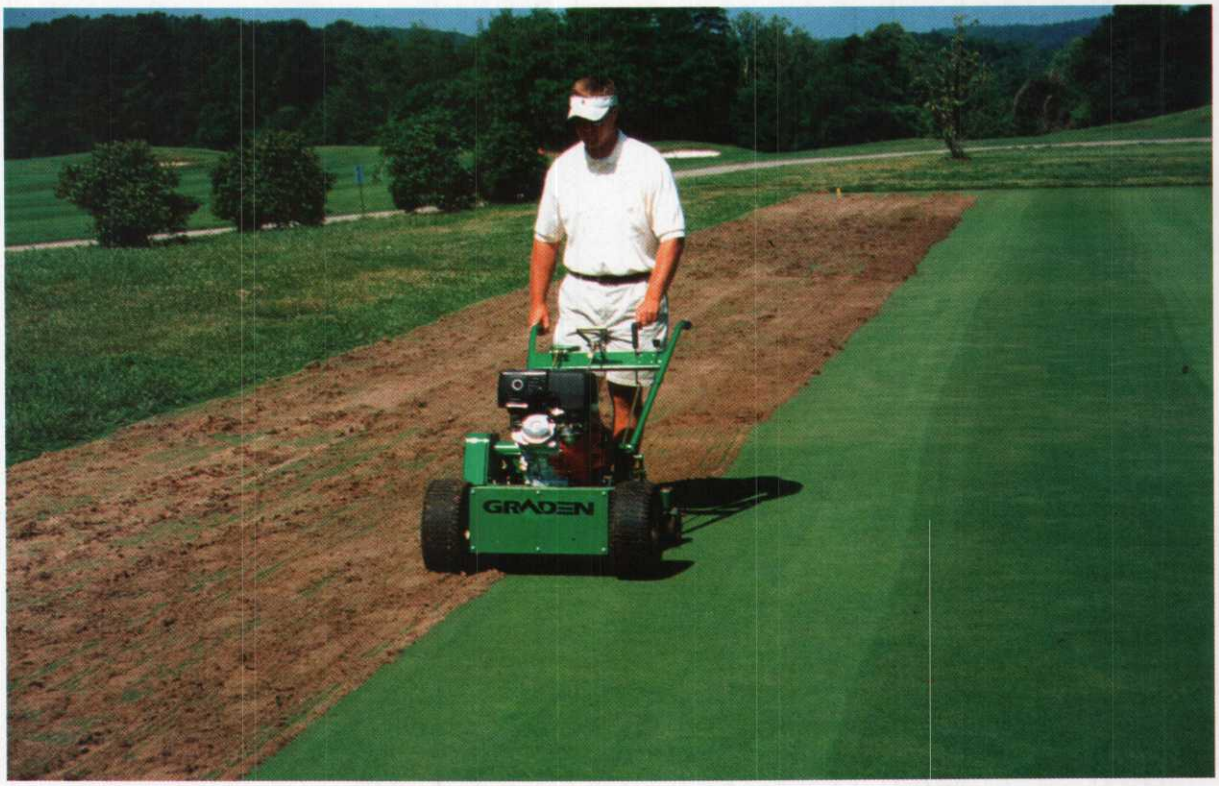

Soil cultivation is currently the best way to remove thatch.

ticutting. Although effective, these practices are more disruptive to the playing surface.

Soil cultivation, aerification or coring is the removal of small cores or plugs of soil with grass from the turf surface, leaving a hole in the sod (McCarty, 2001). Coring or aerification equipment can be divided into the following categories: core cultivation, aerification, solid or hollow tine cultivation, water injection and deep-surface cultivation (Table 1).

Soil cultivation by core cultivation has many beneficial effects on turf. Effects may lead to thatch/mat control, less surface compaction, improved uniformity for water infiltration and increased surface aeration and rooting (Carrow et al., 1987; Dunn et al., 1995; Ledeborer and Skogley, 1967; Shildrick, 1985; White and Dickens, 1984).

Situations of improved biological conditions are also promoted through core aerification, where core cultivation provides available oxygen for soil organisms. Those organisms, in turn, help break down thatch naturally (McCarty, 2001).

Aerification assists in soil replacement when combined with topdressing, thus providing healthy soil micro-organism activity below the turf surface.

The dark thatch layer inhibits water flow.

The primary objective of core cultivation is to relieve soil compaction, improve atmospheric release of toxic gases, improve surface drainage and mechanically remove the accumulation of organic matter within the top inches of golf green (Table 2).

An existing mechanical practice that has taken a new twist is vertical mowing or verticutting. Aside from the removal of unwanted thatch/mat, this mechanical method stimulates new tissue growth because it severs rhizomes and stolons.

Manufacturers have developed such "surgical-grade" vertical mowers because the

TABLE 3

Turf surface impact by vertical mowing blade widths

Vertical Mower Blade Width (in.)	Spacing (in.)	Surface Area Impacted (%)	No. of Vertical Mowings Needed to Impact 25% of Surface Area
5/64-inch	0.5	15.6	1.6
	1	7.8	3.2
9/64-inch	0.5	28	0.9
	1	14.1	1.8

SOURCE: MCCARTY & MILLER, 2002

Mechanical practices equate to downtime.

slices/grooves produced are clean and precise and can vary in depth and width (Table 3).

Solution for the future

Superintendents would like to adopt non-destructive practices where playability and putting-speed uniformity would not decrease. Such practices may include 'light' topdressing, grooming and brushing. The outcome of these agronomic practices would increase the growing environment and enhance playability for these newer varieties of bentgrass.

When research eventually reports positive results for biological thatch/mat control products, manufacturers may serve an important role in this industry with the development of such an effective product. A positive outcome of such a product would allow playability not to be affected and serve as a key asset in controlling the persistent thatch/mat problem. However, current research provides no such alternative.

Overall, superintendents must continue to practice the traditional destructive agronomic practices to deliver the consistency and quality demanded by today's newer bentgrass cultivars.

Gregg is a graduate assistant and Bert McCarty is a professor of turfgrass at Clemson University, Clemson, S.C.

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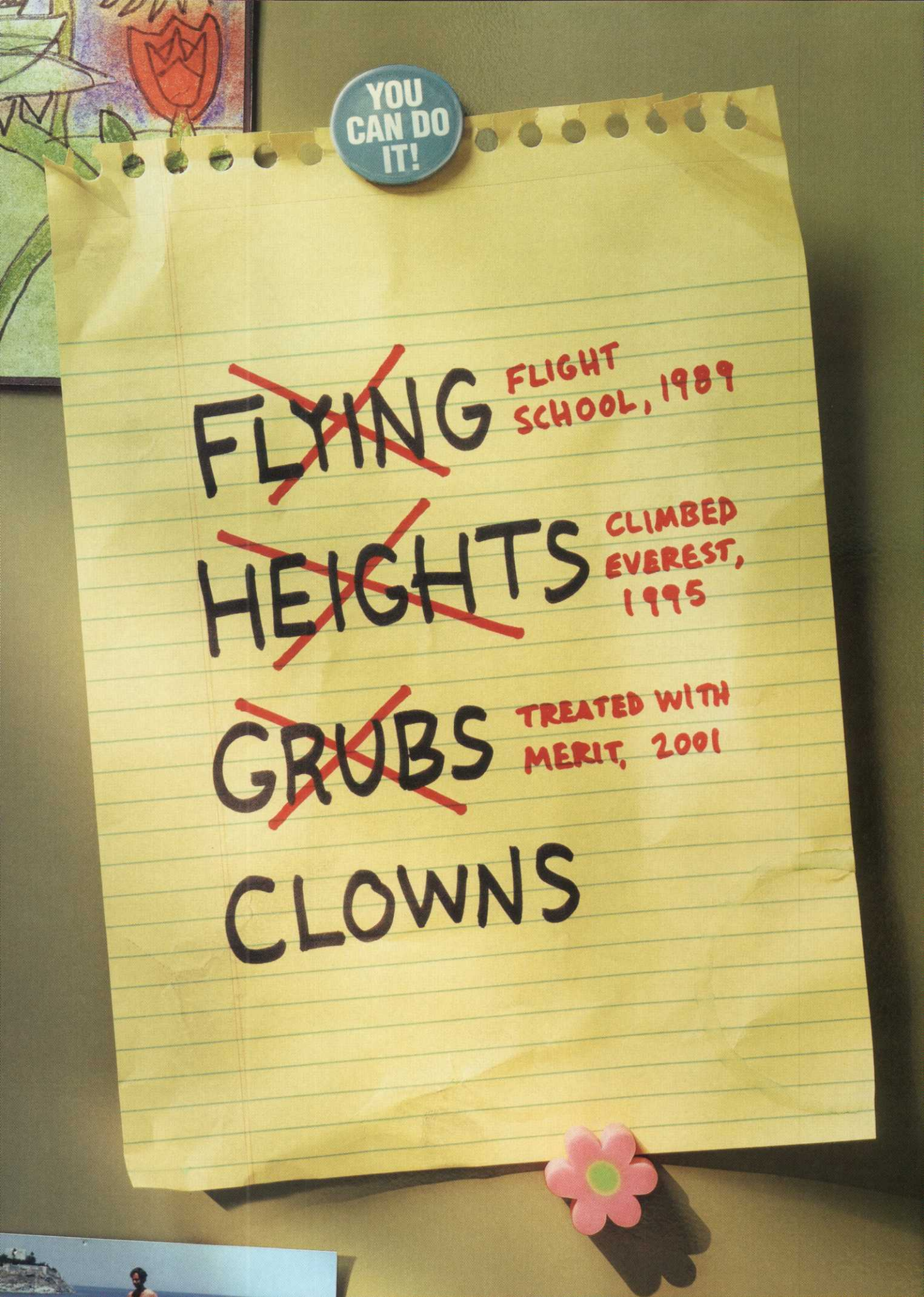
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CIRCLE NO. 117

Sulfur May Not Reduce pH on Some Greens

By Jack Fry, Steve Keeley and Joon Lee

Some golf course putting greens in the United States are constructed using calcareous sands, which by definition are inherently high in calcitic limestone.

Many of these sands arose from coral or are composed of quartz sand in which seashell fragments have been mixed (Carrow et al., 2001). It is not unusual for the pH to be greater than 8 in these growing media.

Sulfur is an essential plant nutrient, with tissue levels of approximately .2 percent thought to be reflective of adequate sulfur nutrition (Goss, 1974). However, superintendents are more likely to apply sulfur in an attempt to reduce soil pH.

We applied 40 pounds sulfur per 1,000 square feet over two years and observed no significant decrease in pH.

As sulfur is oxidized, hydrogen ions are released that can acidify the soil (Carrow et al., 2001). This pH reduction then makes other nutrients, such as iron, more available. On calcareous sands, reducing pH can be an arduous, if not impossible, task because the high lime content acts to buffer any pH effect that sulfur may have (Christians, 1998).

Standard recommendations for reducing sandy soil pH from 8 to 6.5 suggest that up to 25 pounds of sulfur may be required per 1,000 square feet, depending upon calcitic limestone content (Carrow et al., 2001).

To avoid injury on established creeping bentgrass putting greens, however, some experts recommend that no more than 2.5 pounds per 1,000 square feet of elemental sulfur be applied (Turgeon, 1999). Following these guidelines, 10 years would pass before the required amount of sulfur could be applied.

Theoretically, it's possible that a slight change in pH near the soil surface could help to make some micronutrients more available. However, no research has specifically investigated soil and plant responses to sulfur application on a calcareous-sand putting green.

We wanted to evaluate the influence of sulfur rate and timing on soil pH and creeping bentgrass injury, and the potential for using ammonium sulfate as a nitrogen source to reduce pH.

Our approach

This two-year study was initiated in September 1998 on a sand-based golf green at the Rocky Ford Turfgrass Research Center at Manhattan, Kan.

Established Penncross creeping bentgrass was growing on a root-zone mix comprised of 84 percent sand, 14 percent silt and 2 percent clay. Soil pH was 7.7, and the calcitic limestone content was approximately 1.5 percent. Irrigation water was delivered from a well, and had a pH of 7.1. Turf was mowed six days weekly at 5/32 inch with a riding triplex mower and was irrigated on rain-free days to provide about .2 inches of water.

Elemental sulfur from a 90-percent source was applied at 2.5, 5, 10 or 20 pounds per 1,000 square feet once annually (October), split equally into two (April and October) or five (April, May, September, October and November) applications through the year.

An ammonium sulfate treatment was also included and was applied in April, May, September and October at 1 pound per 1,000 square feet; and in June and July at .5 pound per 1,000 square feet.

A control plot was also included that received methylene urea at the same rates as described for ammonium sulfate. All plots except ammonium sulfate-treated

TABLE 1

Creeping bentgrass injury in 1999 and 2000 as affected by sulphur applied at 20 lbs./1,000 ft²/yr split into 1, 2, or 5 applications.

Applications per year**	INJURY* 1999 July 15	2000 May 10	2000 June 7	2000 July 5
1	4.3c***	7.0 b	5.0 b	5.0 c
2	7.7 b	9.0 a	8.3 a	7.3 a
3	8.7 ab	9.0 a	9.0 a	9.0 a

*Bentgrass injury was rated visually on a 0 to 9 scale where 9 = no injury and 0 = dead turf.

**The total annual sulphur level was applied once (September), split equally in two (April, October) or five (April, May, September, October and November) applications.

***Means followed by the same letter in a column are not significantly different (P<0.05).

turf also received the same application of methylene urea.

Data were collected to evaluate soil pH and creeping bentgrass injury. Three or four 1-inch diameter by 2.75 inch-deep cores per plot were sampled in July 1999 and July 2000 to determine sulfur application effects on soil pH.

In 2000, additional sampling-depth intervals were included to evaluate potential vertical differences in pH within the profile. Sampling depths were 0 to .5 inch, .5 to 1.6 inches and 1.6 to 2.75 inches.

Samples from each treatment were submitted to the Kansas State University soil-testing laboratory for analysis. Bentgrass injury was rated monthly from May through July each year using a 0 to 9 scale, where 9 = no signs of sulfur burn; and 0 = dead turf.

Sulfur effects on pH

Neither sulfur level nor application timing had any effect on reducing soil pH in 1999. Separating the soil profile vertically to determine pH in 2000 again revealed no effect of sulfur on reducing pH regardless of rate, timing or soil depth.

Furthermore, ammonium sulfate was no more effective in reducing soil pH than sulfur. Mean soil pH values in both years ranged from 7.8 to 8.1.

Isolated sampling in 2000 of plots treated with sulfur at 20 pounds per 1,000 square feet per year showed localized are where the pH was approximately 4.5. These plots had previously exhibited symptoms of injury

Sulfur has been shown to effectively reduce soil pH on noncalcareous soils (Bell et al., 2001). In that study, the pH of sand under creeping bentgrass was reduced from 7.1 to 6.5 when sulfur was applied at 1.5 pounds per 1,000 square feet monthly between July and November.

The authors observed no effect of sulfur on turf quality.

Theoretical calculations suggest that neutralizing the surface 3 inches of sand containing 1 percent calcitic limestone would require that sulfur be applied at approximately 74 pounds per 1,000 square feet (Carrow et al., 2001).

Using these figures, nearly four years would be required to neutralize pH if sulfur were applied at 20 pounds per 1,000 square feet per year. Indeed, we applied 40 pounds of sulfur per 1,000 square feet over two years and observed no significant decrease in pH.

Furthermore, the risk of bentgrass injury is too great when this level of sulfur is applied over such a short period of time.

Superintendents may apply sulfur when soil pH exceeds 7.5 simply because they are frequently reminded that the optimum pH for turf performance is between 6 and 7. This may be, in part, because they are concerned

that a hidden micronutrient deficiency may occur when soil pH is relatively high.

In fact, visible iron deficiencies, exhibited as leaf chlorosis, are common when soil pH approaches 8 (Christians, 1998), but were not observed in our test. Attempts to reduce the pH of calcareous sand under a bentgrass with sulfur or ammonium sulfate, under conditions similar to those evaluated in this test, would be a waste of time and money.

Superintendents should be aware of the calcite content of their root-zone sand before attempting to alter its pH with sulfur or ammonium sulfate.

Alternatively, a better approach would be to use fertilizer applications to address potential nutrient deficiencies.

Creeping bentgrass injury

Only sulfur applied at 20 pounds per 1,000 square feet per year caused bentgrass injury, and phytotoxicity was greater when this rate was delivered in one application instead of two or five (Table 1). During 1999, treatment differences were not observed until July 5, which was 10 months after the initial application.

The oxidation of sulfur, and subsequent release of hydrogen, are dependent upon the bacterium *Thiobacillus* (Carrow et al., 2001). As such, the rate of this reaction increases with temperature. Because complete reaction of elemental sulfur can take months, superintendents often misdiagnose sulfur injury as some other problem. In fact, initial symptoms of sulfur injury resemble dollar spot and then become progressively worse.

We were surprised by the lack of bentgrass injury observed across sulfur levels from 2.5 to 10 pounds per 1,000 square feet per year.

We have received reports of bentgrass injury from superintendents following single application levels as low as 2 pounds per 1,000 square feet. Injury may be less likely on a calcareous sand that buffers the acidifying effects of sulfur.

Furthermore, application overlaps and miscalculations are more likely on the golf course than on research plots. Other factors employed under actual golf green conditions may also increase the likelihood of sulfur injury, including ultralow mowing heights and greater soil compaction and turf wear resulting from foot traffic.

Conclusions

Superintendents should be aware of the calcite content of their root zone sand before attempting to alter pH with sulfur or ammonium sulfate. Calcitic lime content can be easily determined by any soil-testing laboratory.

When a calcareous sand is present, attempts to adjust pH with sulfur should be avoided. Potential nutrient deficiencies that appear on sand-based calcareous greens should be addressed with fertilizer applications.

Fry is a professor, Keeley is an assistant professor, and Lee is a former graduate student in the Department of Horticulture, Forestry, and Recreation Resources at Kansas State University in Manhattan, Kan.

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CIRCLE NO. 118

Thresholds Pinpoint Insecticide Timing

By Pat Vittum

There are two important factors in determining how to control grubs on your turf. The first is accurately identifying which grubs are attacking. The second component of a good grub-control program is to figure out how many grubs are actually present in your turf.

Grubs can be identified to species by inspecting the shape of the anal slit and the pattern of hairs on its posterior. With new environmental restrictions appearing each day, superintendents no longer have the freedom to treat grubs with impunity. Therefore, superintendents should figure out what the threshold is that grubs must cross before they cause serious damage to the turf.

Action thresholds are a way of quantifying how many grubs your turf can tolerate. In general, turf that is already under some agronomic stress will be less able to tolerate grub activity. Stress factors include mowing height, fertility, soil pH and condition, fertility, moisture and temperature. In this article, we will discuss different white grub species and action thresholds for each. The action thresholds mentioned here are intended as guidelines only and can serve as a way of comparing damage potential between species. A higher threshold indicates that each individual grub causes less damage than a species with a lower threshold.

Japanese beetles

Japanese beetles have a transverse anal slit (it follows the contour of the grub), and a v-shaped row of spines just in front of the slit, pointing toward the head.

These beetles can be found virtually anywhere east of the Mississippi River and north of central Georgia. They also are beginning to show up in parts of Minnesota and some of the central Plains (including Kansas). They have even shown up in California a couple times, but authorities acted quickly and eradicated the outbreaks.

They are the most widely distributed (and the most commonly encountered) grub species in North American turfgrasses. Fortunately, they are more susceptible to chemical control than most of the other species. Action thresholds typically range from six to 15 grubs per square foot in moderately maintained turfgrass.

European chafers

European chafers have a branched anal slit and two almost parallel rows of spines that look like an opening zipper. These chafers are active in the eastern third of Massachusetts (within 30 miles of Boston), Rhode Island and along the Erie Canal in New York, as well as southern New Hampshire and southern Maine.

There are several other areas of infestation along the shores of the Great Lakes, including east of Cleveland and parts of southern Michigan. Action thresholds usually are slightly lower than those for Japanese beetles, at five to 10 grubs per square foot.

Overall, white grubs are more widespread and impact a wider range of turf settings than any other insect, particularly in cool-season turf.

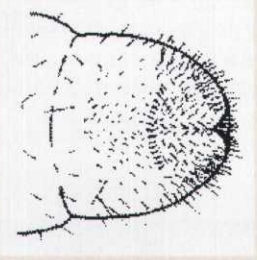
Oriental beetles

Oriental beetles have a transverse anal slit (like the Japanese beetle) and two almost parallel rows of spines. They are found in coastal New England (including most of Rhode Island and Connecticut), Long Island, N.Y., eastern New Jersey and parts of Pennsylvania.

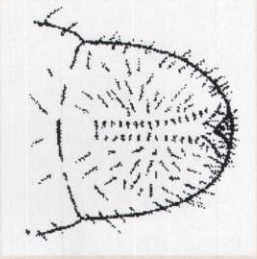
Beetles are also found in most towns along the Connecticut River in Connecticut and Massachusetts, and perhaps even into southern Vermont and New Hampshire. In addition, populations have been

FIGURE 1

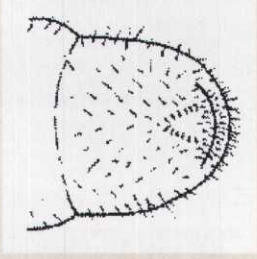
The raster patterns for common turfgrass grubs:



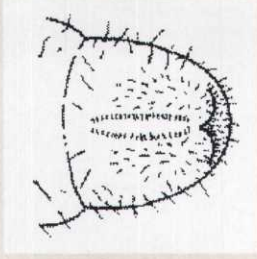
Asiatic Garden Beetles: Action thresholds are higher than for Japanese beetles, at 10 to 20 grubs per square foot because they're significantly smaller.



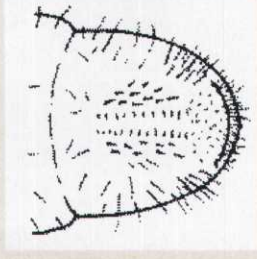
Europe Chafers: Action thresholds usually are slightly lower than those for Japanese beetles, at five to 10 grubs per square foot.



Japanese Beetles: Action thresholds typically range from six to 15 grubs per square foot in moderately maintained turfgrass.



Green June Beetles: Action thresholds are usually a bit higher than for the direct root-feeding species, like the Japanese beetle.



Oriental Beetles: Action thresholds typically range from six to 15 grubs per square foot in moderately maintained turfgrass.

reported in nursery areas east of Cleveland and in western North Carolina.

Scientists have developed a pheromone which they are using to determine the current distribution of oriental beetles. My guess is the more we look, the more we will find them. Action thresholds are about the same as for Japanese beetles.

Asiatic garden beetles

Asiatic garden beetles have a branched anal slit and a distinct semicircle of spines just in front of the slit. The beetles are active throughout the Northeast and Midwest, and adults are often found in the soil in home gardens. There is evidence that their activity is increasing in several locations.

In many cases, these locations are places where imidacloprid had been used repeatedly, but we do not yet have irrefutable proof that the chemical is forcing a species shift. These grubs are markedly smaller than Japanese beetle grubs, so action thresholds are higher, at 10 to 20 grubs per square foot.

Northern and Southern masked chafers

Northern- and Southern-masked chafers have a transverse anal slit, while the spines are scattered with no obvious pattern. These chafers occur throughout the Northeast and Midwest, but are much more common in the Midwest and Plains States (Indiana, Illinois, Nebraska and Kentucky).

While these insects are slightly larger than Japanese beetles, they are more likely to feed on organic matter in the thatch and cause less direct damage to turf roots. Therefore, action thresholds tend to be slightly higher than for Japanese beetles at 8 to 20 grubs per square foot, depending on agronomic conditions.

Not all beetles emerge at the same time. The earliest ones may begin laying eggs in early to mid July, while others may not begin to oviposit until sometime in August.

Green June beetles

Green June beetles have a transverse anal slit and two fairly compact parallel rows of spines. These grubs have short legs that are not used for locomotion. Each grub has several ridges on its back with short, stiff hairs used to grip the substrate.

These beetles are widely distributed in the eastern United States, from southeastern New York to Florida and westward to Texas and Kansas. Because the grubs feed more in the thatch and not as much on the roots, thresholds are usually a bit higher than for the direct root-feeding species like the Japanese beetle.

Vittum is a professor of entomology at the University of Massachusetts. She is primarily an extension entomologist and teaches turf entomology every spring, as well as a course in "Pesticides in the Environment" every fall. She is the senior author of "Turfgrass Insects of the United States"(Cornell University Press).

criticism isn't put forth in a constructive way you will feel like you were attacked and will probably not like this person because you think he or she doesn't like you. And most of us would want to exact some sort of strange revenge to prove ourselves right and the other wrong to save our dignity.

Well, this is the ego talking, and it takes a lot of extra (wasted) effort to satisfy our egos' needs. It doesn't have to be this way, and I would like to offer up a new perspective for whomever is willing to listen.

First of all, consider yourself. Have you been doing your best? Remember that this is a highly visible customer-service position that you're in — you are there to serve the paying customer, no matter if you are at a public or private course. If you know in your heart that you've been doing your best, then rest assured that whatever that person's problem is, it's exactly that – his problem. Don't make it yours, too.

Secondly, consider the source. People are going to ask you questions and make complaints that seem utterly ridiculous. To them, though, they seem totally valid. You know why? Because they just don't know.

But instead of having contempt for them, try a little compassion. Gain a new perspective on the person with the question or complaint. The hardest part is to obtain that perspective in the moment you are talking to them.

What kind of golfer is he? Did he play poorly today? Did he have a bad fight with his spouse the night before? Did he lose the contract he was working on?

You see, even if someone comes in with a complaint about your work, it probably has absolutely nothing to do with you. You don't have to take it personally.

If you can learn to listen constructively, do the absolute best you can do with what you have to work with and leave your ego at the gate, you may be able to rid yourself of lots of unwanted (and unjustified) heartache and stress.

Jim Black is superintendent of Twin Shields GC in Dunkirk, Md.

Don't Forget Your Pond's Aeration System This Winter

If your course features ponds and lakes with aeration systems and is based in a cold-weather state, you'll want to read these tips offered by Otterbine Barebo to remove and store your aerator safely for the winter.

If your course's aerator is an oil-cooled unit, subsurface unit or diffused air system, it can remain in the water during the cold season (diffused air systems can only be kept in as long as there are no moving parts in the water). But if your course's aeration system is run by a water-cooled motor, it must be removed from the water and stored in an area where the temperature will remain above freezing. Freezing temperatures will cause the water inside the motor to expand and crush vital components. What's too cold? Otterbine Barebo offers a basic rule: If the water does not drop and remain below 30 degrees F, the unit can remain in the water.

OTTERBINE BAREBO

When cold weather hits, it's time to store your aeration system.

Removal of a surface-aeration system is based on whether the unit is anchored to the bottom or moored to the pond's shoreline. If it's anchored, disconnect the anchoring lines from the unit and flip it upside down. At this point, either hoist it into the boat or tow it to shore. If the system is moored, remove the mooring line on one side of the pond and then carefully tow the unit to shore. Anchoring the cable and mooring lines to a buoy is recommended for easy retrieval when it comes time to re-install it.

In both cases, once you have the unit on shore, remove the power cable and store it. For oil-cooled motors, simply store the unit indoors.

When the system is removed, a quick visual inspection should be performed. Glance over the float and spin the propeller to make sure the bearings are free.

Editor's note: This article was prepared by Emmaus, Pa.-based Otterbine Barebo.

Getting It Straight

Golfdom erred in its presentation of Stan Kinkead's comments in our October issue in the story "Rotary Club." The reporter accidentally reversed Kinkead's comments as well as a couple of numbers, which made him seem to be wholeheartedly endorsing rotary mowers over reel mowers.

The paragraph in question should have read:

"Reel mowers do take more time, money and energy to maintain than rotary mowers, but they last longer," says Stan Kinkead, president of National Mower Co. "Rotary mowers only last four to six years, where reel mowers last eight to 10 years."

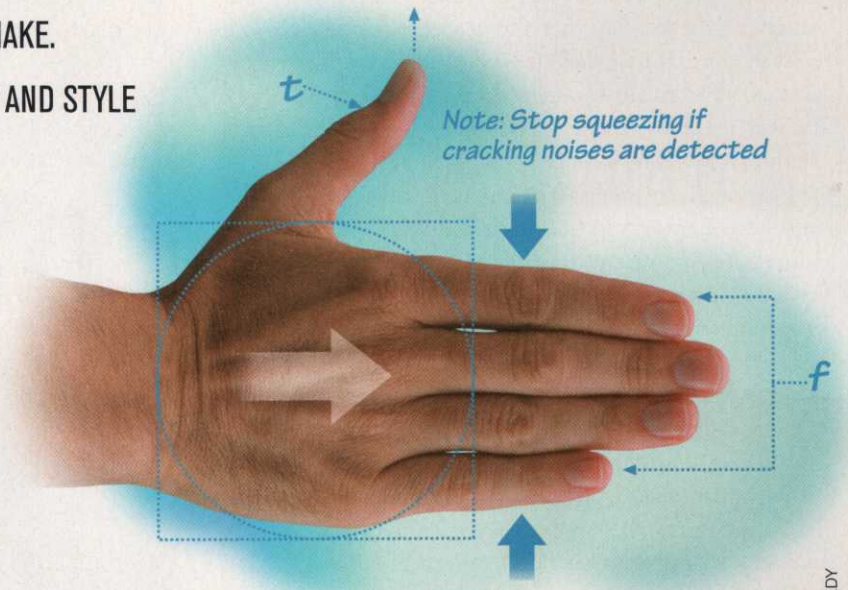
Golfdom regrets the error.

NATIONAL MOWER

Get a Grip

THERE'S SCIENCE BEHIND A HANDSHAKE. HERE'S HOW TO DO IT WITH DIGNITY AND STYLE

By James E. Guyette



DAN BEEDY

A handshake doesn't speak, but it says a lot of things nonverbally. On the golf course, a handshake can communicate key nonverbal messages that go far beyond the condition of a fairway. "It's a first impression, and it's hard to get around that," says Tom Kastler, superintendent at the Club at Runaway Bay in Runaway Bay, Texas.

For superintendents meeting potential new employees, an applicant with a wimpy handshake can be quickly squeezed out of the hiring process. Kastler has some gripes about the proper grip, and he offers up two rules of thumb for golf course greeting. "I don't like somebody who tries to crush all 20 bones in your hand, but I also don't like the 'wet paper towel' handshake," he says.

The four-fingered handshake is a particular peeve — an example of soggy salutation that Kastler considers "pretty wormy" in a business setting. "That wears me out," he says.

The experts agree. A study by psychologists at the University of Alabama has scientifically proven what most people already know: A firm handshake helps make a solid first impression for both men and women.

"A person's handshake is consistent over time and related to some aspect of his or her personality," according to William F. Chaplin, the study's lead author. "Those with a firm handshake were more extroverted and open to experience, and less neurotic and shy than those with a less firm or limp handshake." Chaplin adds that the measure of a handshake is its strength, vigor, eye contact and completeness of grip.

Not surprisingly, men typically have firmer handshakes than women — but women who shake with determination do have a hand up on those who don't.

"Women who are more liberal, intellectual and open to new experiences were found to have a firmer handshake and made a more favorable first impression than women who were less open and had a less firm handshake," Chaplin reports. "For men, the opposite was found. More open men had a slightly less firm handshake and made a somewhat poorer impression than less open men."

Thus for men, it's apparently best to be slightly less open during that debut handshake. It's all in the touch, according to Kastler, who also advises against the high five, low five or any other form of fancy fingerwork.

"If they start to move that direction, I just follow them. It's kind of like a dance," he says. "But most people will not do that at a job interview."

That's right. And make sure that it's your hand doing all the shaking. "Hugs and kisses are taboo in the business arena," according to Etiquette International, a business manners consulting firm based in New York.

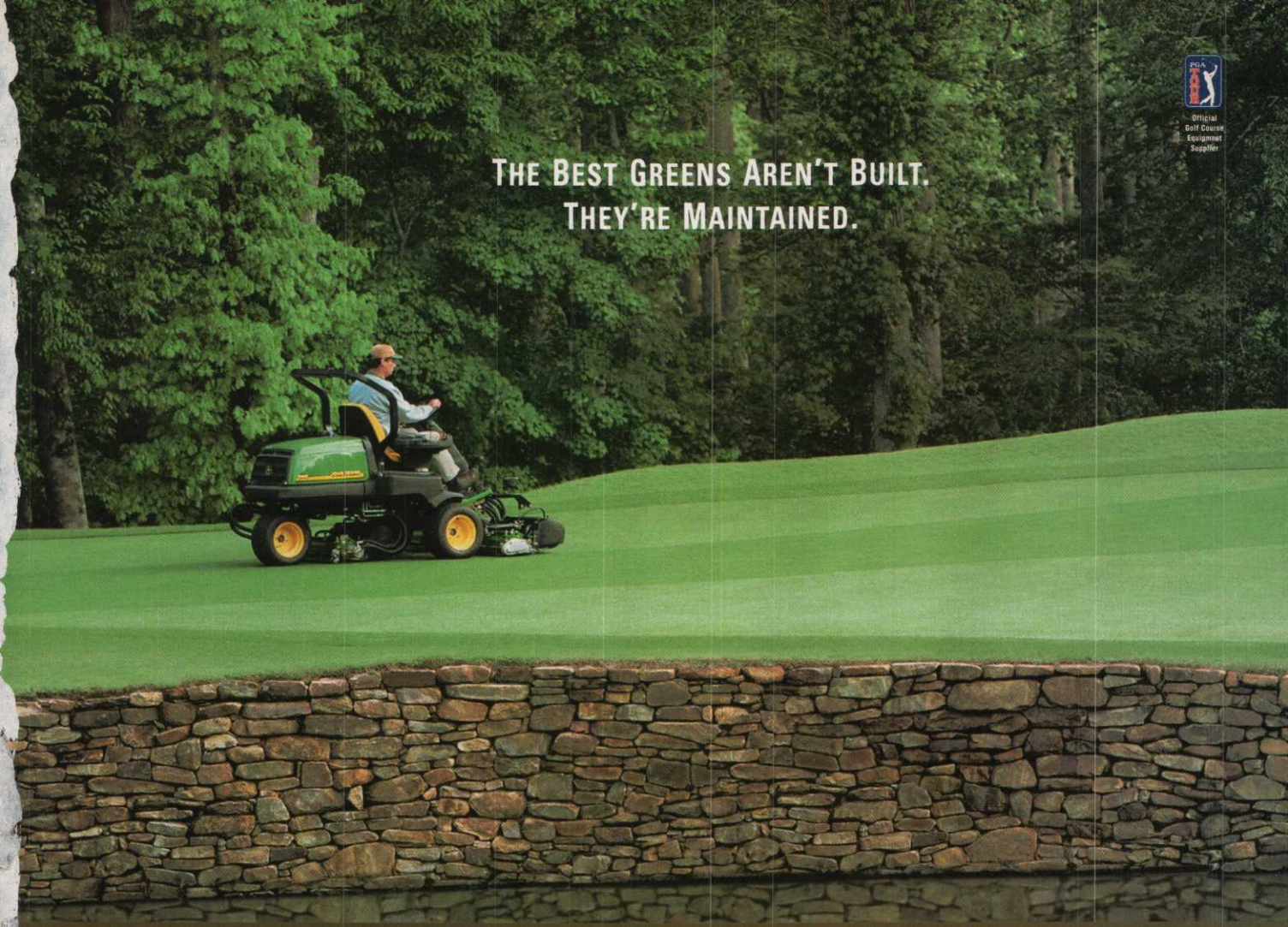
The company advises that for a good handshake:

- Keep the fingers together with the thumb up and open.
- Slide your hand into the other person's so that each person's web of skin between thumb and forefingers touches the other's.
- Squeeze firmly.

A proper handshake, says Etiquette International, is firm, but not bone crushing; lasts about 3 seconds; and may be "pumped" once or twice from the elbow and then released after the shake, even if the introduction continues.

Oh yeah, if you suffer from clammy hands, the company suggests a form of Brut force: "Spray them with antiperspirant at least once a day." And carry your drink in your left hand.

Guyette is a free-lance writer from Cleveland.



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