

# Fertility & Functionality

Superintendents constantly seek the right fertilization programs to keep on the cutting edge

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**ABOUT THIS SERIES**

Ask any golf course superintendent, and he'll tell you feeding the turfgrass is an art. It's not like simply placing a bowl of Lucky Charms in front of a cereal-loving, 7-year-old kid.

That's why *Golfdom*, in unison with AGROTAIN International and LebanonTurf, has embarked on this three-part report. We want to educate superintendents on the art of feeding turfgrass, among other fertilization issues.

**Part one**, titled "Fertility and Functionality," examines modern-day fertility management. Superintendents throughout the country discuss their fertility philosophies. In **part two**, "The Right Stuff," university researchers discuss the reasons why fertilization does more to improve poor quality turfgrass or maintain good quality turfgrass than any other management practice. In **part three**, "The Future of Fertility," we'll peek into the not-too-distant future – 2025 – to see what golf course superintendents will use as fertilizer and how they'll be using it. We'll also discuss the impact environmental restrictions will have on future fertilizer technology.

PHOTO BY: LARRY AYLWARD

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# Understanding the Many Forms of Nitrogen

It was just nine years ago that the Lange-Stegmann Co., a family-owned business since 1926, had the opportunity to purchase a technology that improves nitrogen efficiency. This would ultimately be the birth of AGROTAIN International, as well as the start of UMAXX, UFLEXX and HYDREXX Stabilized Nitrogen products.

Over the years, it's not a coincidence that AGROTAIN has come to be known as the nitrogen management experts. Stabilized nitrogen products provide superintendents with maximum nitrogen control, and our people strive to educate superintendents on the benefits of our technology and its ability to improve nitrogen efficiency.



By Mike Stegmann

Every turf professional understands the importance of nitrogen. It influences turf health and quality more than any other nutrient and, for this reason, nitrogen efficiency is a key component of every turf management program and a top concern among turf professionals. But to get at the root of nitrogen efficiency, it's important to understand

the many forms of nitrogen used in today's fertilizers.

Water-soluble nitrogen fertilizers, such as ammonium nitrate, ammonium sulfate and urea, supply a form of nitrogen that's immediately available for the plant to use. Although these options provide a quick-greening, quick-release nitrogen has many drawbacks. It readily leaches, can cause lush growth and has a limited response time. It also has a high potential to burn if applied in hot or dry conditions. For all these reasons, quick release is best for small areas where frequent applications are possible or even desirable, and when used in combination with control products or growth regulators.

The consequences of quick-release nitrogen can be avoided and the benefits of nitrogen prolonged with an enhanced-efficiency fertilizer. While most turf professionals are familiar with fertilizer products commonly referred to as "slow" or "controlled" release, it's important to recognize another category of enhanced-efficiency fertilizer.

In 1994, the Association of American Plant Food Control

Officials (AAPFCO) and The Fertilizer Institute established the Slow Release Fertilizer Task Force. In addition to clarifying the slow-release category, the task force acknowledged a similar but separate category of enhanced-efficiency nitrogen: stabilized nitrogen.

Stabilized nitrogen is a urea product that provides results much like comparable slow-release nitrogen sources. The fertilizer products called slow release are those that release, or convert to a plant-available form at a slower rate than quick-release nitrogen. Stabilized nitrogen is plant available as soon as it's watered in. What the plant can't use is held. In this plant-available form, the potential loss from volatility, denitrification and leaching is minimized.

In essence, stabilized nitrogen products deliver a long-lasting, consistent source of nitrogen to plants regardless of soil temperature or moisture with minimal escape into the air or groundwater. These traits make stabilized nitrogen products the ideal all-weather choice for turf professionals.

Regardless the season, stabilized nitrogen products make predicting the weather — especially cold weather or major swings in rainfall — a thing of the past for turf professionals. Because stabilized nitrogen doesn't rely on microbial activity for nitrogen availability, cold soil temperatures have little effect on its efficiency. The stabilized nitrogen that's applied is available to the plant as soon as watering — either through rainfall or irrigation — takes place. What the plant doesn't immediately use will be held onto the soil colloid as a reserve for future use, ensuring a consistent even feed.

Perhaps, most importantly, given constant budget constraints, the switch to stabilized nitrogen products can also provide superintendents with time, labor and cost savings. ■

*Stegmann is president of Lange-Stegmann Company and AGROTAIN International.*



# One Size Does Not Fit All In the Plant Nutrition Field

**F**ertilization practices and technologies have come a long way since the seeds for what would become LebanonTurf were first sown in Lebanon, Pa., more than 60 years ago. In those early days, research into the chemical elements that promoted healthy turf was not nearly the science that it has become. Nor were golf course superintendents and landscape managers the turfgrass geniuses that many are today.

Modern fertilization still incorporates the basic chemical elements — plus the help of Mother Nature — as essential ingredients for plant growth and vitality. But how those elements are combined and delivered to the plant is now based on advanced technologies never imagined 60 years ago.

Today, there's a growing understanding of the need for a comprehensive approach to plant physiological fitness. Our company is committed to bringing a complete line of products and the expertise required to help superintendents and turf managers find the solutions that meet their needs.

We understand that today's turf questions are far more complex than whether a foliar or granular approach is the best solution. At times a straightforward combination of basic ingredients is what's needed. At other times, the solution requires in-depth understanding of turf's metabolic function, photosynthetic rates and capacities, which has spawned the emerging field of biological plant nutrition.

This belief that one size does not fit all is the underlying motivation that has reshaped our company in the past several years.

In 2002, LebanonTurf introduced its patented Composite Technology to the fertilizer manufacturing process. Starting with premium forms of nitrogen sources and fusing them with phosphorus, potassium and micronutrients to create a homogeneous granule proved to be the breakthrough that produced improved particle dispersion, granule integrity and nitrogen activity.

In late 2008, parent company Lebanon Seaboard announced the acquisition of the Emerald Isle line of premium foliar fertilizer products. Emerald Isle True Foliar products produce excellent turfgrass playing conditions — consistent surfaces, ideal color and outstanding turf density — while providing seaplant extract and other beneficial supplements for root

growth, stress tolerance and disease resistance.

Complementing the Emerald Isle acquisition, Lebanon added Novozymes' turf and landscape business, including the Roots products and technologies, last July. In combination, the acquisitions reinforced LebanonTurf's commitment to the emerging field of biological plant nutrition, says Kathy Bishop, CEO and president of LebanonTurf. "Biology and microbes are fundamentally changing agronomic science and how nutrition is viewed and applied. This acquisition puts us on the front edge of that change," she adds.

"We now can offer customers access to the broadest and most complete offering of nutrition and physiological fitness products today — from fundamental N-P-K offerings to highly advanced biotechnology-based products," adds Dave Heegard, vice president and general manager of LebanonTurf.

The always-changing landscape of modern fertilization provides a rich subject for *Golfdom's* Fertility Report. Our company is pleased to help bring readers the insights of successful superintendents and landscape managers in the ongoing effort to answer not only the question of "What's working?" but also the logical follow-up query, "Why?" ■



**By Mike Sisti**

*Mike Sisti is marketing manager for LebanonTurf, a division of privately held Lebanon Seaboard Corp.*



# Philosophy *and* Fertilization

**Superintendents put  
a lot of thinking into  
their fertility programs**

**BY ANTHONY PIOPPI,  
CONTRIBUTING EDITOR**

**T**HERE ARE MANY VARIABLES that determine the fertilization methods of a golf course superintendent — from soil type, to the demands of members and owners, to water quality.

Knowing the particular situation is key to feeding turf in a way that keeps the plants and players happy. To ensure their fertilizers are being utilized as best as they can, many superintendents are taking care to take care of their soil, as well.

Like Kevin Smith, for instance, whose task at Bryan Park Golf & Conference Center in Greensboro, N.C., is not easy. The certified superintendent oversees two 18-hole courses at the municipally owned facility and is also the head agronomist for the management company, Pinnacle Golf Properties,

PHOTO BY: ISTOCK INTERNATIONAL INC.; PHOTO COURTESY: PETE SERMINI (OPPOSITE)

which runs Bryan Park. Smith has a mishmash of greens on the two courses with which he must deal. The George Cobb-designed Players Course opened in 1971, and the Rees Jones-designed Champions Course opened in 1991. A portion of the Players Course was used for the Champions layout. In the late 1990s, the greens of the Champions course were regrassed with L-93. In 2005, the Players course greens underwent a major renovation as the turf was stripped away and straight sand was tilled into the profile that was then seeded with a mix of Penn A-1 and Penn A-4 bentgrass from Tee-2-Green.

“We subscribe to soil management, and turf feeding is a real close second,” Smith says, with the goal to produce “the most durable, healthy turf we can achieve.”

Greensboro, with its heat and humidity, is not the ideal area for turf other than bermudagrass.

“We’re in an intense bentgrass environment here,” Smith says.

On the Players Course, where the root zone on the young greens is 100 percent sand, Smith’s focus is to foster organic activity through such methods as tank mixing a molasses-based product to “promote healthy microbial activity.”

Confounding matters for Smith is the water at Bryan Park is pure (in his words), meaning it contains virtually no minerals, and he can end up stripping nutrients from the soil as a result during heavy irrigation. Because of that, Smith keeps a sharp eye on the potassium levels in his soil.

According to Smith, in his 20-plus years as a superintendent, one of the biggest changes he has seen is in the quality of foliar fertilizers.

“They have the ability to get into the plant in a very effective manner,” he says.

As for how he’s changed, according to Smith, he’s not as easy to jump at what’s new.



‘Fifteen years ago, we’d put down 1 pound of nitrogen per year. In those days, if you wanted fast greens, you didn’t feed them.’

– PETE SERMINI

“I’m less susceptible to the flavor of the month,” Smith says.

### Fertilizing for fast greens

At Lazy Swan Golf and Country Club Village, a nine-hole public golf course designed by architect Barry Jordan that opened in 2008, Pete Sermini has tended to the turf since he arrived with about three months remaining in the grow-in process. His greens are a combination of A-1 and A-4 while the tees and fairways are T-1 creeping bentgrass from Jacklin Seed.

“It’s an extremely aggressive grass; the divots heal quickly,” Sermini says, adding that T-1 requires a lot of maintenance and aeration.

Sermini says he manages his greens for speed and has them Stimping more than 10 feet daily. To do that, he walk mows them daily and rolls them three times a week. He also has a defined fertilizer plan.

“Fifteen years ago, we’d put down 1 pound of nitrogen per year. In those days, if you wanted fast greens, you didn’t feed them,” says Sermini, who adds the program also led to problems with anthracnose and moss.

Now his fertilizer applications are more frequent and lighter.

Sermini also applies an organic blend of humic and amino acids as well as a kelp-based product to help build up organic levels in his all-sand greens.

On the fairways, Sermini uses about 3.5 pounds of nitrogen over the course of the season and a little iron as well. He also applies plant growth regulators. He ups his application to 5 pounds on tees.

“I really have the tees jumping; I want them healing,” Sermini says. “I do get surges in growth, but the growth regulators help.”

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## What members want

At Wannamoisett Country Club in Rumford, R.I., superintendent Mark Daniels' fertilizer philosophy is driven by the desires of his members.

"They want green, and green is good," Daniels says of his membership. "We don't want any big flushes and we limit growth."

Wannamoisett is a 1915 Donald Ross design that's home to the Northeast Amateur and hosted the 1931 PGA Championship. The large greens have plenty of swells, dips, knobs and shelves that make putting very difficult, especially when they're kept as fast as Daniels is directed, which is 11 feet during the week and more than 12 feet on the weekend.

The turf varieties on the putting surfaces are many, including South German bentgrass. *Poa annua* makes up about 80 percent of turf. Daniels uses mostly a foliar application on the greens, switching to a granular when he dormant feeds. In the summer it's a weekly application in tiny amounts.

"We're trying to starve them as much as we can to keep up speeds, but we give them a touch of nitrogen to battle anthracnose," he says, noting the pathogen strikes almost yearly but in small areas.

When feeding fairways, it's mostly granular applications.

Wannamoisett underwent a renovation in 2008 by architect Ron Forse that features a new irrigation system, which includes a fertigation system Daniels is still learning to use.

Daniels says the experience he gained at other golf courses he worked plays a large role in the regime he uses to feed his turf in his first head job.

"I worked for a bunch of great supers, and I've taken bits and pieces from all of them and adjusted them to this piece of land," Daniels says.



## It's about the soil

On the land of Stone Creek Golf Course in Oregon City, Ore., superintendent David Phipps manages a rare stand of turf for his area of the country. His fairways are a blend of four varieties of fescues — creeping red, chewings, hard and slender — along with perennial ryegrass. The 9-year-old greens are 90 percent bentgrass by Phipps' estimation, as he has been able to keep the *Poa annua* from invading. They were originally seeded with Penn Links but for the last five years Phipps has interseeded them with A-1 and A-4.

Phipps, like Sermini at Lazy Swan, makes sure his soil is best suited to sustain turfgrass using amino acids made from plant extracts. "This has enabled the soil to work for itself," Phipps says.

For greens, that means as little as less than one-tenth of a pound of nitrogen

“I’m not so big on the (rates). I’m putting down N-P-K, but it’s how I’m treating my soil.”

— DAVID PHIPPS

every two weeks — except in July and August, when he may shut off nitrogen applications while continuing to put down phosphorous and potassium. In the rough, which is the same turf blend as his fairways, Phipps applies between 1 pound and 1.5 pounds of nitrogen a year. On fairways, it's 2.5 pounds of 32-0-10 in two applications, usually in early June and September. Phipps says he's careful not to give the turf too much nitrogen or the ryegrass will dominate the fescue.



### A minimal approach

Then there is Mark Clark, the certified superintendent at Troon Country Club in Scottsdale, Ariz., whose fertilization program is connected to his irrigation program. “We have bad water here, and everything revolves around that,” Clark says.

Because of the high levels of sodium in the reclaimed water, he says fertilization is fourth on his tier of cultural practices. First on the list is water, followed by mechanical ways to move the salt through the soil that include flushing and topdressing greens tees and fairways. He also aerates frequently.

“We aerify like crazy in the summer to get those channels open,” Clark adds.

Third on the list are amendments, such as applications of gypsum and wetting agents. Then comes fertility. Clark, who has been at Troon for 12 years, tries to minimize plant feeding.

“Fertilizer is a salt,” he says. “Why would I add to my salt problem?”

When Clark does put down nutrients, it’s a foliar product delivered with light, frequent applications. In the winter, Clark puts down more fertilizer to keep up the color on his annual ryegrass.

Other than that, Clark can only hope for rain to come and wash away his problems while keeping a sharp eye on his turf and knowing when precisely to feed it.

### Final advice

Smith, whose two courses at Bryan Park are hosting the 2010 USGA Public Links, offers some simple advice: The key to correct feeding is to develop a plan that works for each location, he says.

“Find a program and stick with it,” he says. “Stick with the basics and don’t go off on some tangent.”

That doesn’t mean, however, once a plan is formulated, a superintendent can ease off it.

“You just can’t put it on cruise control,” Smith says. “You really have to pay attention to what’s going on.” ■

*Pioppi is a contributing editor to Golfdom.*



‘We have bad water here, and everything revolves around that.’  
— MARK CLARK

**M**OST DON'T JUST USE ONE TYPE. Golf course superintendents use a combination of granular and liquid fertilizers to achieve desired results.

Liquid and granular fertilizers are taken up into the plant the same way under normal conditions — through stolons, rhizomes and roots. But a better understanding of the nutrients applied can help superintendents improve their fertility programs.

For instance, many superintendents confuse foliar fertilization with liquid fertilization, says Jeff Higgins, Ph.D., chief agronomist for ValleyCrest Golf Course Maintenance in Calabasas, Calif.

“Liquid fertilizer and foliar fertilizer are totally different, yet many superintendents think they’re the same,” Higgins says.

Foliar fertilization is the application of liquid fertilizer at low water volumes, so it adheres to the foliage and enters the plant that way, Higgins says. Ideally, the water volume for foliar fertilization would be 15 gallons of water per acre or less. With foliar fertilization, there’s also a risk for burn.

“If you apply liquid-soluble fertilizer at the water volumes for true foliar fertilization, the fertilizer more than likely will dry on the leaf surface, and the salt properties will attract water out of the plant and desiccate it,” Higgins says. “You need to apply the fertilizer in sufficient water volume to ‘wash’ it off the foliage down to the stolons, rhizomes and roots, where it’ll be absorbed.”

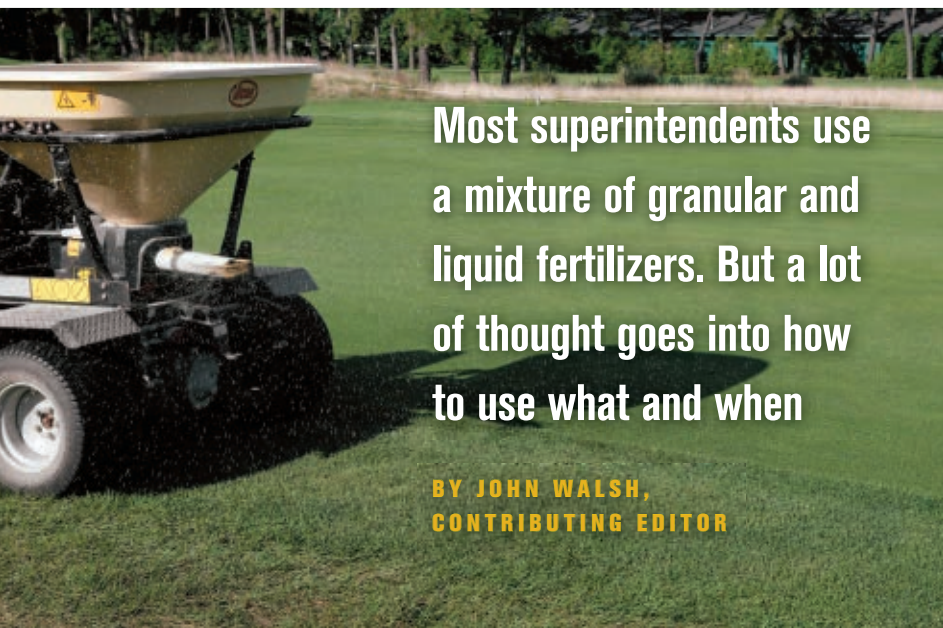
Most superintendents use liquid and granular fertilizer, and a minority use

strictly liquids, Higgins says. Those with *Poa annual*/bentgrass greens are more likely to use more liquid; and those with bermudagrass greens are more likely to use more granular because there’s more growth on bermudagrass greens and more fertilizer is needed. However, with the ultradwarf bermudagrasses, superintendents need to use liquid fertilizer to get down into the canopy and avoid the mower pickup that sometimes comes with granular usage, Higgins adds.

Superintendents can achieve more growth with a granular product because of the ability to apply higher nitrogen rates, which is one advantage over a liquid fertilizer. There’s a time and place for granular fertilizer on greens, but superintendents need to watch for particle size, Higgins says, adding they

PHOTOS COURTESY: AGROTAIN

# The Combo-Meal







need to know how the product work, whether mower baskets will be removed and determine if the product will alter the greens' performance.

"It goes back to the objective," he says. "If you're aerifying and trying to heal the turf quickly, you can apply granular fertilizer to get the plant moving."

Many superintendents use slow-release or organic granular fertilizers as a base once or twice a year, supplementing them with liquid, Higgins says, adding that most superintendents use granular fertilizer in the fairways because it's easier and quicker to apply.

Tissue and soil testing help determine the timing of fertilizer applications based on the needs of the turfgrass.

"I'm a fan of doing tissue testing (primarily on greens) to quantify how effec-

tive your fertilizer program is," Higgins says, adding that most superintendents don't tissue test enough.

From a physiological standpoint, fall is the most important time to fertilize because all turf — cool season and warm season — builds up carbohydrate resources, Higgins says.

### Granular only

Steve Spears isn't applying fertilizer like most superintendents because he doesn't use any liquid products. Spears, the golf course superintendent at the 18-hole St. Germain (Wis.) Municipal Golf Course, manages Pennncross greens, bluegrass/fescue fairways and bluegrass/bentgrass tees without phosphorus.

The state legislature passed a law last year that disallows Spears from applying

or fourth week in April and continuing through the third or fourth week in October. He applies it once every three or four weeks at one-half to three-quarters of a pound per application. He uses two products — a 17-0-17 and a 19-0-15. The products, which are water-dispersible granules, are applied right behind the mowers early in the morning. After the application, he runs the sprinklers three to five minutes.

Spears also uses a 0-0-25 product, which has magnesium and manganese, to help build chlorophyll and helps the plants physiologically. It also helps with drought tolerance and compaction and helps maintain the plants' water balance.

In fairways, Spears uses a 24-0-10 fertilizer. He makes four applications, each at one-half pound of nitrogen per 1,000 square feet, in the spring and fall. In the middle of the summer, he makes two applications of 20-0-20 at three-quarters of a pound of nitrogen that lasts six to eight weeks. Spears makes the fairway applications based on the color and quality of the turf. After six weeks, he starts to see the bluegrass turn yellow. In all, he's applying fertilizer in the fairways every seven weeks from mid-May to mid-September.

Tees are fertilized once a month using a 23-0-10 product, which provides three-quarters of a pound of nitrogen per 1,000 square feet.

"I want to achieve the same turf quality with different products at a less expensive cost," says Spears, citing the 15 to 20 percent increase in the cost of fertilizer last year.

### Improving deficiencies

Unlike Spears, Travis Livingston doesn't have to work around a phosphorus ban. Rather, he's worried about phosphorus and potassium deficiencies.

The golf course superintendent at the private, 18-hole Sewickley Heights (Pa.) Golf Club uses liquid and granu-

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# Approach



phosphorus anywhere unless a soil test determines it's needed. (He can apply phosphorus if he's seeding.)

"The grass doesn't look as good, but golfers don't know," he says. "Actually, we've had some purpling of the plant, which indicates a lack of phosphorus."

Spears, whose maintenance budget is \$330,000, re-evaluated his entire fertilizer program, and is using different products in different rotations. He begins in the spring with one application of a 18-9-18 on greens when interseeding with Pennncross. He interseeds as a result of winter damage and to increase bentgrass population.

Spears, whose fertilizer budget is \$23,000, applies 4 pounds of nitrogen a year on greens, starting in the third

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lar fertilizer on *Poa annua*/bentgrass fairways, greens and tees. Livingston, whose overall maintenance budget is \$980,000, makes granular applications in late spring and early fall mainly for nitrogen. He uses a 10-20-20 product because the soil has been deficient of phosphorus and potassium. In between those applications, he applies potash two or three times a year.

Livingston's granular applications occur around the time he aerifies, which is twice in the spring and twice in the fall. After aerification, he waters in the fertilizer and waits one to three days before mowing.

Livingston, whose fertilizer budget is \$65,000, foliar feeds the greens once a week, using 2 gallons of water per 1,000 square feet. The amount of fertilizer changes based on conditions and what's needed. Part of his program is based on a schedule, and part is based on turf conditions.

Livingston applies a wide range of fertilizer on greens. Some weeks he applies nitrogen, others weeks he doesn't. Some weeks it's a bit of potassium. Typically, he applies twice as much phosphorus and potassium as nitrogen.

"When I got here three years ago, I didn't put nitrogen in the tank for a while," he says. "We're not seeing the flush of microbial activity because we're introducing sand into the profile through aerification. The N-P-K balance has taken years to achieve. We'll start backing off the phosphorus because we're not deficient anymore."

Fairway fertilization is the same spring and fall routine as with greens. In between that, it's every two weeks with a foliar feed because it coincides with Livingston's Primo applications. He likes the foliar feed in the fairways because it allows more flexibility and allows him to be more consistent with water use. It also avoids the mower pick-up issue with

granular fertilizer. The labor cost to apply the liquid fertilizer is offset because it's timed with the Primo applications.

Tee fertilization mimics the fairways, but Livingston will add granular fertilizer because of different soil structures.

"You still have to feed the soil," he says. "I'm not 100 percent foliar. You need both. It's about how it fits, when it fits and where it fits."

### Most bang for the buck

Like Livingston, Adam Schultz uses liquid and granular fertilizer. However, Schultz spends one-sixth — \$10,000 — what Livingston spends annually on fertilizers. Schultz receives a discount on fertilizer because a club member works for a fertilizer company. The superintendent at the semiprivate Oakview Golf Club in Slippery Rock, Pa., maintains *Poa annua*/bentgrass fairways, tees and greens with a \$400,000 budget.

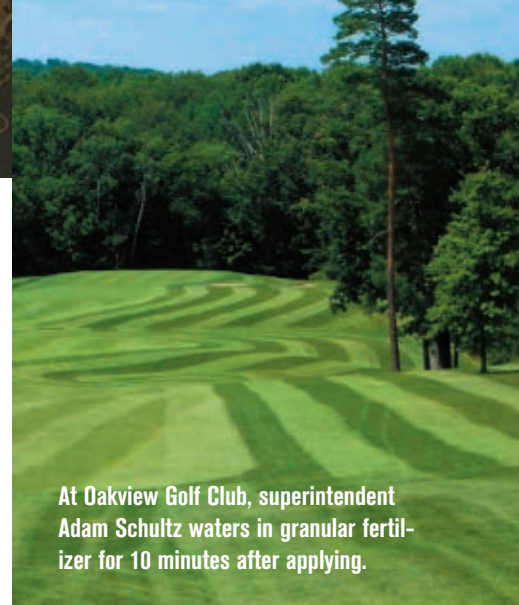
On greens, he applies a granular product as a base in early spring to thicken them up. From late spring to late fall, he uses liquid fertilizer.

"You can take the amount down low — 0.10 to 0.20 of a pound of nitrogen per 1,000 square feet every 10 days," he says. "It's hard to get down to 0.10 with granular. The liquid gives you what you need so there's no flush of growth. I can add or scale back as needed."

The liquid fertilizer (8-0-0, 10-0-10 and 18-2-5) is mixed with fungicides and usually applied at two-week intervals — sometimes earlier. Schultz uses a 150-gallon tank — 15 gallons is product, the rest is water.

"When there's a lot of play, I don't want a flush of growth, so I like the liquid applications," he says. "I've stuck with liquids on the greens for several years."

Schultz seldom applies liquid fertilizer in fairways because of cost. He uses a lot of slow-release product (24-5-10), so he can put down one application, lasting three or four months. For the



At Oakview Golf Club, superintendent Adam Schultz waters in granular fertilizer for 10 minutes after applying.

most part, he makes one application in the spring and one in the fall, using a 25-0-12 product.

"I'll do some of the approaches and pars more than twice a year to dress them up," he says. "There are times fairways can use more fertilizer. If I had a bigger budget, I'd go out earlier in the year with an application. I don't screw around with the greens but have tweaked the timing of the fairway applications because I need to get the best bang for the buck."

Schultz makes sure to water in the granular fertilizer for 10 minutes after applying because tip burn can occur if the product isn't watered in properly.

Schultz hits the tees more often — about once a month — than fairways because they get abused. He applies a granular (34-0-0) first then adds a liquid (the same one he uses on greens).

### In the know

Overall, Higgins says superintendents need to understand more about the nutrients they're applying. They should ask themselves these questions:

- What's the percentage of slow release in the fertilizer blend?
- In what forms can the plant take up the nutrients?
- How long does it take?
- Does the source of nutrients, whether liquid or granular, have to be converted to a form the plant can uptake?

"To truly use fertilizer effectively, you need to know the release characteristics," Higgins says. ■