SeaIsle1 and SeaIsle2000 Keep Your Irrigation Options Open

Option A

Streams, Canals, Rivers, Ponds Lakes, Wells & Brackish Water

When irrigated with high quality water, SeaIsle 1 produces high quality fairways and roughs and SeaIsle 2000 produces top-quality greens. Both also thrive on many medium-to-poor-quality water sources. As with other grasses, Paspalum management will vary depending on water quality, rainfall and season.

Option B

Recycled Water, Gray Water and Effluent Water Sources

Recycled water quality varies by location, season and nutrient content. Depending on the uniformity of your source, you may need to monitor water quality daily, weekly or monthly. Both SeaIsle 1 and SeaIsle 2000 will do quite well with up to four, five and even eigth thousand TDS.

Option C

Even Blended OceanWater with Aggressive Management

Fresh water is a must during the grow-in phase for both SeaIsle varieties, but mature turf can be irrigated with ocean water/fresh water blends for short periods of time. This requires a comprehensive aeration and leaching program to move excess salts downward through the soil profile.

•Excellent Salt Tolerance •Tolerates Gray Water & Effluent
•High Tolerance to Salt Spray, Water Logging and Periodic Inundations
•Low Fertilization and Minimal Pesticide Requirements •Good Rooting in Sandy, Clay or Muck-Type Soils
•Darker Green Color Than Bermudagrass •Excellent Low Light Intensity Tolerance •Excellent Winter Hardiness
• Tree-Shade Tolerance Similar to Bermuda •Can Be Overseeded with Bentgrass-Ryegrass-Alkaligrass Blends
•Recommended pH Levels: 5.5-8.0

For More Information Visit Our Websites

SeaIsle 1
Certified Seashore Paspalum
www.seaisle1.com

SeaIsle 2000
Certified Seashore Paspalum for Greens
www.seaisle2000.com

More Than Business Partners

Ohio golf course owners Arnold and Todd Ingraham are father and son first and foremost

BY LARRY AYLWARD, EDITOR IN CHIEF

While a golf course brought Arnold Ingraham and his son Todd back together after being separated by many miles and many years, that amazing thing called unconditional love also played a role in their reunion.

Todd was 6 years old when his parents divorced in 1979. A year later his mother moved him and his sister, Heather, from Ohio to Georgia and later to New Jersey and Southern California.

"It was not a happy time," Arnold recalls of the family's breakup.

Shortly after the divorce, Arnold joined the family business, Bunker Hill Golf Course, in Medina, Ohio. Arnold's mother needed assistance in running the course, which she and her late husband had purchased in 1940.

Arnold knew the course, which wasn't in great shape, needed some attention to remain competitive in the area. He invested some money into it to improve its marketability. He began developing leagues to bring in more business.

Todd and Heather, meanwhile, would visit their father, who lived in a house on the course's rolling property, for a few months every summer. Life was like a rollicking ride on a merry-go-round when Todd was with his dad at the course. He loved playing the game and hanging out at the course. When the summer ended, it was sometimes difficult for Todd to go home.

Arnold knew his son would excel at running the family business, but his offer wasn't just a business one.

"Dad wanted us to live with him and he would have happily had us there," Todd says. "But kids went to live with their moms back then. That's just the way it was."

Todd understood that then and he understands it now. For the record, Todd has a loving relationship with his mother and still refers to his stepfather as "Dad."

Arnold also understood the situation, and he tried to make the best of it.

"I really tried to stay involved with them," he says of his kids. "There was some hard times, especially when they were young. I don't think divorce is ever a happy situation. But it has worked out."

Actually, it has worked out wonderfully for father and son. In 1996 Arnold called Todd and Heather with a proposition.

"He said, 'I've been running this business for nearly 20 years, and I've had enough. I'd like some help or I might sell it,' " Todd remembers.

Heather declined her father's offer, but Todd was intrigued. He was 22 at the time and at a period in his life when he wanted to make a change.

While Arnold knew that Todd loved the course and would do well in helping to run the family business, his offer wasn't just a business one.

"I wanted to pass it on to him as a legacy," Arnold says.

While Todd viewed his father's proposal as an opportunity to join the family business, he also saw it as a sign of his endearment.

"I think he saw an opportunity to get me closer into his life, which he always wanted," Todd says. "And I've always appreciated that. I've always felt love from

"I WANTED to pass it on to him as a legacy," Arnold Ingraham (left) says of his proposal to son Todd.

him, even though there was the divorce."

In Bunker Hill's modest clubhouse, there's a small, framed picture on a shelf that celebrates Arnold's and Todd's relationship. The photo, taken in 1980, shows Arnold presenting a trophy to a beaming Todd.

Actually, the trophy had been awarded to Arnold years before for his performance in a golf tournament. Todd received a few of such trophies from his dad. The story goes that when Todd would break a certain score for nine holes, Arnold would dust off one of his old trophies, place a new placard on it with Todd's name and reward him with it.

Now, as business partners, Arnold and Todd are winning awards together. The National Golf Course Owners Association named Bunker Hill as the Ohio Golf Course of the Year in 2004.

Todd says he and his father have clicked largely because of their love of the game.

"I've talked with other owners who really aren't that interested in golf," Todd says. "It's just a business to them, but it's a passion to us."

They are business partners, but their true bond is their blood. After all, it was their unconditional love for each other that brought them back together to the golf course. ■

FROM FATHER to son, trophies were often passed in recognition of improving nine-hole scores.

Gettin' the Dirt

Renowned professor Beard offers tips for proper soil testing

By Larry Aylward, Editor in Chief

The topic is soil testing. Who better to talk shop about this vital agronomic subject than James B. Beard, professor emeritus of turfgrass science at Texas A&M University? Beard, the author of "Turf Management for Golf Courses," has been living this stuff for much of his distinguished career. Like Bo Jackson knew baseball and football in his day, Beard knows greens, tees and fairways.

We asked Beard, who recently received an honorary doctorate of agriculture from Purdue University, to wax on three key points of soil testing that he discusses in his book.

In his first point Beard reports that accurate chemical soil testing depends on a collection of representative soil samples. But what constitutes such a collection?

Beard says a golf course might include soil types with different textures and classifications, such as clay, loam, muck and sand. "So you would want to take a separate sample from each of those areas," he adds.

Also, the history of fertilization plays an important role in gathering appropriate soil samples for testing, Beard stresses. If the fairways were on a different fertilizer program than the greens, a superintendent needs to take soil samples from both.

Beard says about 15 soil samples conducted with a soil probe and taken randomly throughout the course should be enough to conduct a well-rounded test. A 2- to 4-inch-deep sample should be adequate. The turf should then be separated from the core, and the latter placed in a clean container.

In his second point Beard says a "reputable" soil-testing lab should be used to analyze turfgrass samples. Beard says superintendents searching for reputable labs should consult their experienced peers for direction.

Beard says some superintendents take soil samples and send them to multiple labs for testing. Then they're surprised when they get back different results.

"That's entirely possible and each lab could be correct in that different labs in different states may not always use different extraction procedures for certain nutrients depending upon the dominant soils in their areas," Beard states.

He explains that labs in different regions also have different soils. Those soils, whether alkaline- or acidic-based, will dictate extraction procedures for phosphorous, potassium, iron and other nutrients.

Hence, superintendents shouldn't be surprised if they received different results.

Despite different results, what's important across the board, Beard stresses, is what a lab judges as a proper nutritional level in the soil. "And those [results] should be reasonably in the same ballpark," he adds.

The key, Beard notes, is that results are only as good as the sample that's drawn.

In his third point Beard states that proper

interpretation of results is crucial. So what are the keys to proper interpretation?

Superintendents should make sure the labs they're sending soil samples to are not just strictly agricultural labs that lack expertise in interpreting turf test results.

"First of all, you hope a lab has efficient expertise to make recommendations on their analysis for given situations," Beard adds.

It all starts with a superintendent who should have provided efficient information along with the soil sample to help the lab with a proper interpretation. That information could include turfgrass species and cultivar, irrigation practices and whether clippings were removed from the soil sample being tested.

"These types of things are needed for a lab to make an overall assessment and recommendation," Beard stresses.

Proper interpretation also lands with a superintendent, who must be able to read a report and act accordingly. And that includes trusting in the information collected.

Beard says he has met superintendents who conduct soil tests but doubt their results. Then they end up not acting accordingly and having problems with their turf.

"That amazes me, quite frankly," Beard says with a chuckle. "They end up paying consultants a lot of money to come in and tell them, when they already have the information right there from their soil tests."

Beard says state laws could force more soil testing in the future. That could be a good thing for golf courses, especially if they're accused of over-fertilizing by environmentalists and are innocent of such charges. Then all they have to do is reveal the results of soil tests.

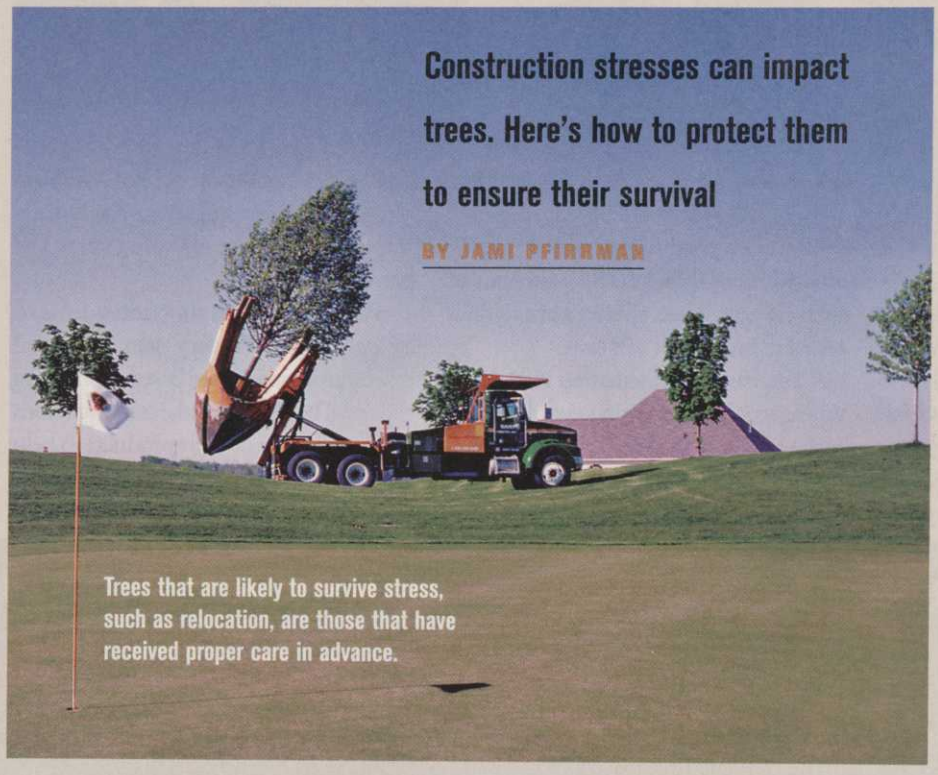
"You have documentation record that you haven't been fertilizing excessively but to the needs for the particular type of culture and the grass involved," Beard says.

Beard says soil testing has "greatly improved" over the past 40 years.

Beard says most labs today are reliable. A 1957 graduate of The Ohio State University, he says soil testing has "greatly improved over the 40-some years I've been around."

But Beard warns superintendents to be wary of the "slippery" labs whose soil test interpretations are based on making money. They might make interpretations just to sell some of their products to help correct a problem that doesn't exist. ■

Protect the Lumber



Construction stresses can impact trees. Here's how to protect them to ensure their survival

BY JAMI PFIRRMAN

Trees that are likely to survive stress, such as relocation, are those that have received proper care in advance.

Challenge

Your course, which has its share of trees, is undergoing a renovation that will include a lot of construction. How do you protect the trees from getting damaged during construction?

Solution

Simply, prevention is the best cure for construction damage to golf course trees.

Before any change is made on a golf course — whether it's to improve playability or increase challenges for golfers — it's important to lessen the negative impact on the surrounding portions of the course. This is particularly necessary for trees, which can be sensitive to alterations made on golf courses.

Trees, like hazards, are an integral part of every course. So they must be protected to ensure their survival during changes that require a great deal of construction. Superintendents need to remember that construction damage can impair growth and eventually lead to a tree's decline and death.

As is the case in many things in life, prevention is the best cure for construction damage to golf course trees. Before ground is broken, it is wise to plan how to take care of trees before and during construction.

A professional arborist can be called in to evaluate the site and review construction details to determine impact on trees.

The first step is an inventory. It is important to record the trees that fall in the path of construction and the status of their health. This gives superintendents and/or arborists a baseline of information from which to monitor the trees following construction.

Soil compaction and root damage are the most common causes of damage to trees during construction. Leveling, cutting and filling of the terrain can damage roots, change soil content and depth and change the natural water flow, all of which can cause tree decline. Irrigation or drainage systems may be needed.

Occasionally, damage from equipment does occur. This is typically seen on the trunk s of trees. To protect the portion of trees above ground, physical barriers should be erected around them.

The trees that are most likely to survive construction stress caused by changes are those that have received proper care well in advance.

Trees that are routinely pruned, fertilized and protected from pests and other stress have a greater chance of survival than those that are not. ■

Jami Pfirrman is a communications specialist with the Davey Tree Expert Co.

Golfdom's PRACTICAL RESEARCH DIGEST FOR TURF MANAGERS

TURFGRASS TRENDS

FERTILIZATION

A Precision-Sensing Fertilizer Sprayer

By Justin Moss

Golf course turf is intensively managed in order to provide acceptable playing conditions. Many golf courses consist of bermudagrass (*Cynodon* spp.) tees, fairways and roughs and creeping bentgrass (*Agrostis stolonifera L.*) greens.

Superintendents may apply as much as 49 kilograms (kg) of nitrogen (N) per hectare per month (1 pound per 1,000 square feet) to the turf during the growing season. Nitrogen is typically applied in granular form using a broadcast fertilizer spreader but may also be applied in liquid formulation using a spray rig.

Agricultural researchers recently learned that significant differences in soil test results can occur at distances less than 1 meter (m), or about 39 inches (Raun et al., 1998), and Solie et al. (1999) suggested that soil, plant and indirect measurements should be made at the meter or sub-meter level. Raun et al. (2002) conducted a study to determine the validity of using optically sensed in-season estimates of grain yield (INSEY) and a response index in winter wheat (*Triticum aestivum L.*) at the 1 square meter level.

Nitrogen-use efficiency was improved by greater than 15 percent when N fertilization was based on optically sensed INSEY determined for each square meter and a response index compared to traditional practices at a single N rate. The use of optical sensors may

Continued on page 68

Sensors may be used with a variable rate nitrogen applicator (shown here) to maintain healthy turf by applying prescribed rates in areas as small as 2 square feet.

IN THIS ISSUE

OUR SPONSORS

Continued from page 67

help golf course managers increase or maintain adequate turfgrass quality while reducing the total amount of N fertilizer applied. However, turfgrass managers are not concerned with increasing yield. Turfgrass managers are concerned with improving or maintaining adequate turfgrass quality for their particular playing conditions.

The red normalized difference vegetative index (RNDVI) can be calculated using the following equation: $NIR_{reflected} - Red_{reflected} / NIR_{reflected} + Red_{reflected}$ where, $NIR_{reflected}$ = magnitude of reflected near infrared light and $Red_{reflected}$ = magnitude of reflected red light.

As recent research has shown, RNDVI may be a useful tool for turfgrass managers to indirectly measure turf quality and turf N status (Bell et al., 2002a; Bell et al., 2002b; Trenholm et al., 1999; Tucker 1979).

The objective of this research was to develop a Nitrogen Fertilization Optimization Algorithm (NFOA) for use in a turfgrass variable rate N applicator (see photograph) on bermudagrass fairways and creeping bentgrass greens in Oklahoma.

Materials and methods

Plots (0.9 x 1.5 m) were established at the Oklahoma State University Turfgrass Research Center in Stillwater, Okla., on a sand-based Crenshaw creeping bentgrass green and a Norge silt loam (fine-silty, mixed, active, thermic Udic Paleustolls) common bermudagrass fairway in a randomized, complete-block design with 10 replications.

The turf was maintained under well-irrigated conditions during the course of the experiment. Treatments consisted of plots fertilized with 0, 12.2, 24.4, 36.6, 48.8 and 61 kg N per hectare (0, 0.25, 0.50, 0.75, 1.0 and 1.25 pounds / 1,000 feet^2). The experiment was performed once during August 2004 and repeated during September 2004. Handheld GreenSeeker sensors (from NTech Industries Inc. in Ukiah, Calif.) were used to obtain RNDVI readings twice during each month.

The RNDVI values for each plot were recorded before the experiment and the plots were blocked from lowest RNDVI values to highest RNDVI values. After determining the blocking areas, the fertilizer treatments were randomly assigned to each block. Each treatment was applied using 18-6-15 (2.34 percent ammoniacal N, 5.72 percent urea N, 5.85 percent other water soluble N from methylene ureas and 4.09 percent water-insoluble N) fertilizer. RNDVI readings for each plot were recorded again at 14 days following treatment.

Multiple regression analysis ($\_ = a + b_1X_1 + b_2X_2$) was performed with SAS version 8 where _ = RNDVI of turf 14 days following fertilization (Target RNDVI), a = intercept, b_1 = regression coefficient for N application rate, X_1 = N application rate in kg N per hectare, b_2 = regression coefficient for RNDVI prior to fertilization and X_2 = RNDVI prior to fertilization (Current RNDVI).

Results

The results to date indicate that under well-irrigated conditions, RNDVI readings from the GreenSeeker sensors may be very useful for estimating the N application rate required to maintain creeping bentgrass greens and bermudagrass fairways.

These sensors can be used on the go with a variable rate N applicator to maintain healthy turf by applying prescribed rates in areas as small as 2 square feet. Target RNDVI readings could be obtained by maintaining a non-N-limiting plot of turf.

The preliminary NFOA would be as follows:

- determine your target RNDVI; and
- use the appropriate N application rate regression equation.

Further research is needed to determine if the NFOA and the turfgrass variable rate N applicator will provide similar turf quality when compared to a single-rate broadcast N application.

Justin Moss received a bachelor's degree in horticulture in 2000 with an emphasis in turfgrass management. He graduated with a master's degree in horticulture in 2002 and will graduate this year with a Ph.D. in crop science from Oklahoma State University. He plans to attain an assistant professorship with teaching and research responsibilities in horticulture or crop science after graduation.

REFERENCES

Bell, G. E., D. L. Martin, S. G. Wiese, D. D. Dobson, M. W. Smith, M. L. Stone and J. B. Solie. 2002a. "Vehicle-mounted optical sensing: An objective means for evaluating turf quality." *Crop Sci.* 42:197-201.

Bell, G. E., D. L. Martin, M. L. Stone, J. B. Solie and G. V. Johnson. 2002b. "Turf area mapping using vehicle-mounted optical sensors." *Crop Sci.* 42:648-651.

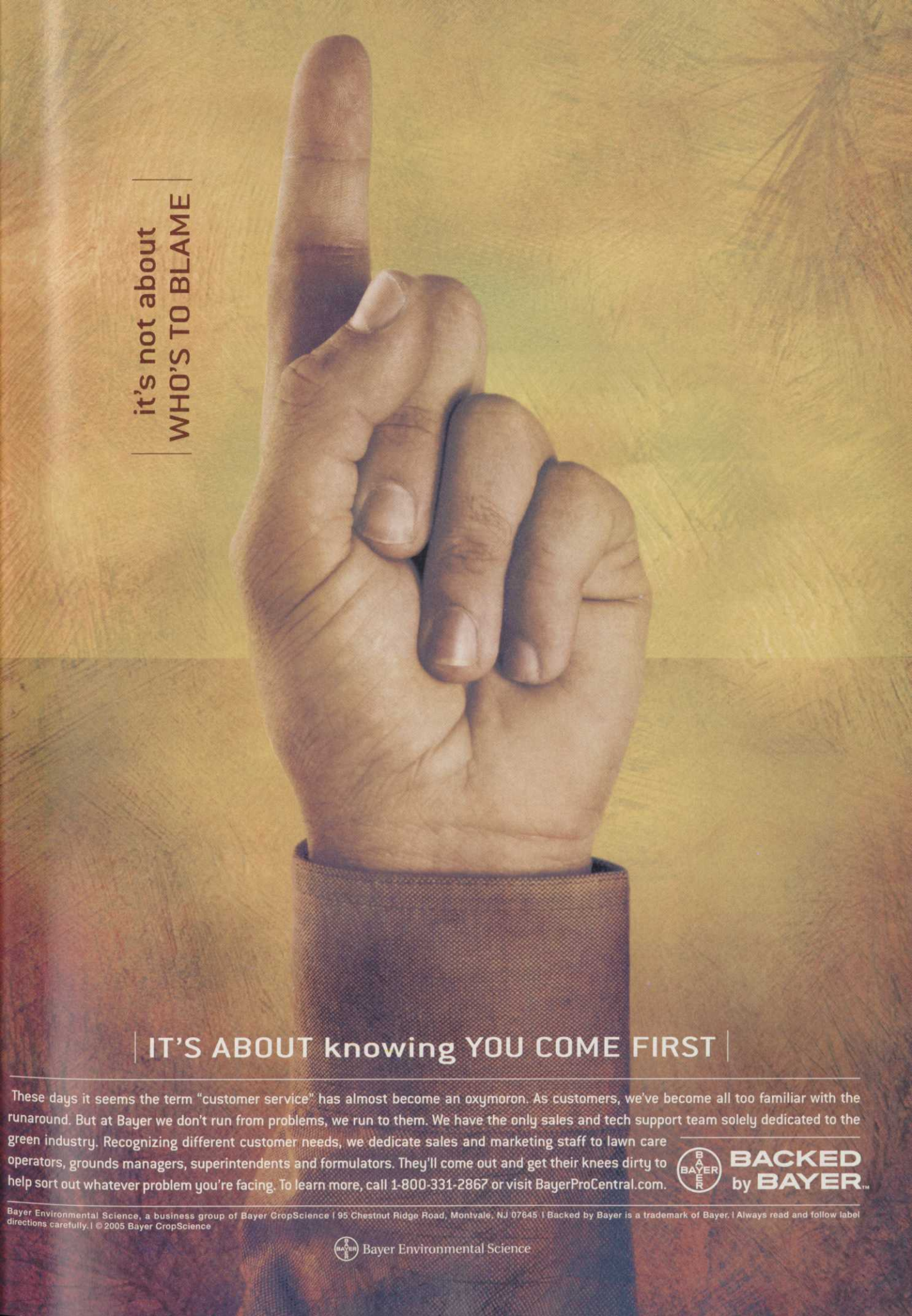
Raun, W. R., J. B. Solie, G. V. Johnson, M. L. Stone, R. W. Whitney, H. L. Lees, H. Sembiring and S. B. Phillips. 1998. "Microvariability in soil test, plant nutrient and yield parameters in bermudagrass." *Soil Sci Soc Am J.* 62:683-690.

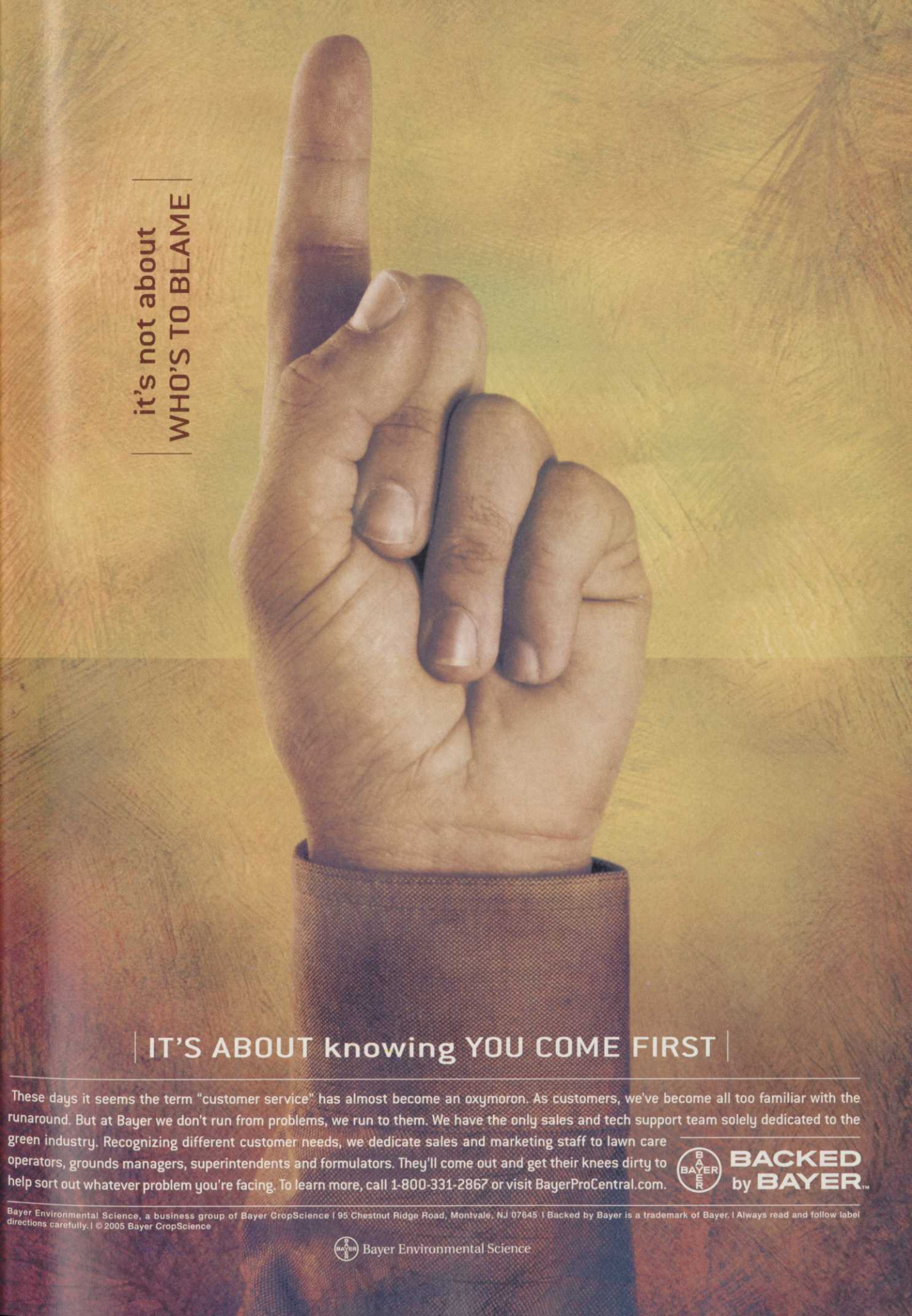
Raun, W. R., J. B. Solie, G. V. Johnson, M. L. Stone, R. W. Mullen, K. W. Freeman, W.E. Thomason and E. V. Lukina. 2002. "Improving nitrogen use efficiency in cereal grain production with optical sensing and variable rate application." *Agron J.* 94:815-820.

Solie, J. B., W. R. Raun and M. L. Stone. 1999. "Submeter spatial variability of selected soil and plant variables." *Soil Sci Soc Am J.* 63:1724-1733.

Trenholm, L. E., R. R. Duncan and R. N. Carrow. 1999. "Wear tolerance, shoot performance and spectral reflectance of seashore Paspalum and bermudagrass." *Crop Sci.* 39:1147-1152.

Tucker, C. J. 1979. "Red and photographic infrared linear combinations for monitoring vegetation." *Remote Sens Environ.* 8:127-150.


it's not about
WHO'S TO BLAME
IT'S ABOUT knowing YOU COME FIRST
These days it seems the term "customer service" has almost become an oxymoron. As customers, we've become all too familiar with the runaround. But at Bayer we don't run from problems, we run to them. We have the only sales and tech support team solely dedicated to the green industry. Recognizing different customer needs, we dedicate sales and marketing staff to lawn care operators, grounds managers, superintendents and formulators. They'll come out and get their knees dirty to help sort out whatever problem you're facing. To learn more, call 1-800-331-2867 or visit BayerProCentral.com.
BAYER
BACKED by BAYER™
Bayer Environmental Science, a business group of Bayer CropScience | 95 Chestnut Ridge Road, Montvale, NJ 07645 | Backed by Bayer is a trademark of Bayer. | Always read and follow label directions carefully. | © 2005 Bayer CropScience
Bayer Environmental Science


it's not about
WHO'S TO BLAME
IT'S ABOUT knowing YOU COME FIRST
These days it seems the term "customer service" has almost become an oxymoron. As customers, we've become all too familiar with the runaround. But at Bayer we don't run from problems, we run to them. We have the only sales and tech support team solely dedicated to the green industry. Recognizing different customer needs, we dedicate sales and marketing staff to lawn care operators, grounds managers, superintendents and formulators. They'll come out and get their knees dirty to help sort out whatever problem you're facing. To learn more, call 1-800-331-2867 or visit BayerProCentral.com.
BAYER
BACKED by BAYER™
Bayer Environmental Science, a business group of Bayer CropScience | 95 Chestnut Ridge Road, Montvale, NJ 07645 | Backed by Bayer is a trademark of Bayer. | Always read and follow label directions carefully. | © 2005 Bayer CropScience
Bayer Environmental Science

Just a Grain of Salt

As salinity increases, turfgrass management will need to increase, too

By Ron R. Duncan and Robert N. Carrow

Effluent, recycled, reclaimed, reuse water — all are common terms for the irrigation water being used on courses today.

The escalating demands for potable water use solely for human and industrial use and the shift to decreasing water quality varying in salinity and nutrients for golf course use has increased the management challenges required to maintain acceptable turf performance.

The quality of water applied to recreational turf is as good as it will ever be and over the next decades will get worse. Since salt is the ultimate growth regulator, maintaining turf growth and development, acceptable putting standards on greens and grass survivability will be long-term goals.

The interactions

As irrigation water quality decreases and salinity increases, interactions among the water, soil type and profile, turfgrass species and cultivar and the environment also increase. This four-way interaction is what makes salinity so confusing and complex, and the impact on turfgrass performance becomes increasingly site-specific, where management must be focused on specific "micro-sites."

In the past, such microsites were referred to as "indicator spots." But with salt/nutrient-laden irrigation water, almost every area on a golf course can differ from surrounding areas and from nearby courses. So, instead of considering only a few indicator spots, the entire turf area on the site has a greater chance of exhibiting considerable site-specific differences.

As salinity increases, turfgrass management will subsequently need to increase. If it does not parallel the increase in salinity, the grass performance will eventually decrease, and grass death is usually the result.

Management of salts before, during and after managing the grass should be the top priority; otherwise, salt loading in the soil will result.

Monitoring of a soil's nutritional and salinity status, water quality parameters and their fluctuations and tissue nutritional status becomes critical information for management decisions as salinity increases. Standard soil tests will provide basic information on nutritional implications in the soil.

Additionally, a superintendent must ask for other salt-related tests, such as the saturated soil paste extract (SPE) analysis to get proper information on the salinity status of the specific soils on the course. The SPE provides data on sodium adsorption ratio (SAR), exchangeable sodium percentage (ESP) and other ions such as sodium, sulfates and bicarbonates that are not routinely analyzed in regular soil tests.

The quality of water applied to recreational turf is as good as it will ever be and over the next decades will get worse.

Sampling of soils at 0 inches to 2 inches and 2- to 6-inch bulked samples will provide some information on movement of salts through the soil profile and how effectively the soil is leaching (moving salts down below the root system).

Ideally, periodically sampling soils from the bottom of the root system or just below this area in the rhizosphere can provide critical indicator information on areas that first exhibit potential salt stress. A superintendent can also ask the analytical laboratories for a salinity analysis of irrigation water; not only the water coming out of the wells, rivers, ponds or lakes but also the water actually coming out of the sprinkler heads on the golf course.

Finally, superintendents need to collect clippings from good and bad turf areas on the course and submit the tissue for a wet chemistry analysis to provide proper information on nutritional balances and imbalances caused by increasing salinity.

Data from the water, soil and tissue analyses can then be used to adjust the fertility program

Continued on page 72