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– Tessie, Superintendent
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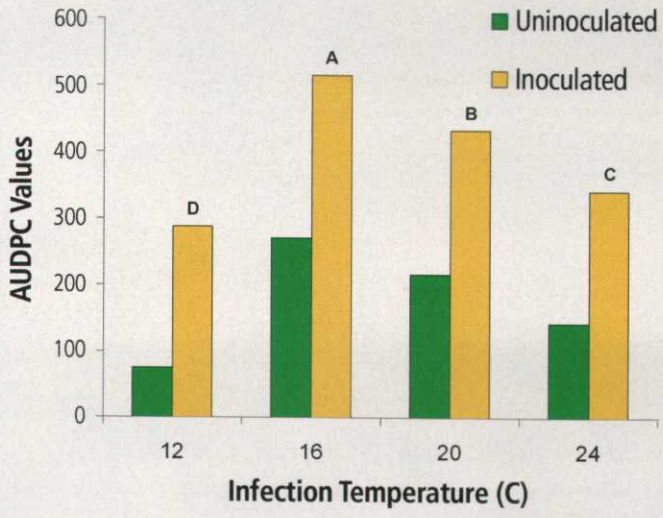
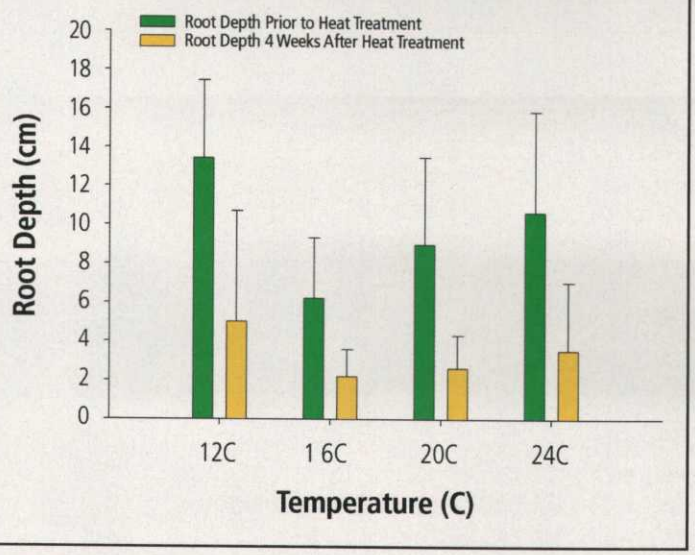
FIGURE 5



This graph shows the effects of infection temperature on Pythium root dysfunction severity. The severity of foliar symptoms was visually estimated 14 days after heat treatment. Area Under the Disease Progress Curve Values were calculated from disease severity ratings. Bars followed by the same letter are not significantly different, according to Waller-Duncan k-ratio t-test (k=100).

FIGURE 6



This graph shows the impact of Pythium volutum infections on creeping bentgrass root depth as affected by infection temperature. Green bars represent creeping bentgrass root depth prior to increasing the temperature in the growth chamber to 32 degrees Celsius/26 degrees Celsius (day/night). Yellow bars represent creeping bentgrass root depth four weeks after initiation of heat treatment.

Continued from page 70

ture was elevated, root dieback rapidly occurred (Figure 6).

Conclusions

Although *P. arrehenomanes* and *P. aristosporum* have been reported as causes of PRD, we have found that *P. volutum* is the most important causal agent of PRD in the southeastern United States. *Pythium volutum* infects creeping bentgrass roots in the fall and spring when soil temperatures are between 54 F and 75 F, yet foliar symptoms are not expressed until creeping bentgrass is subjected to periods of heat and/or drought stress. Therefore, to obtain effective preventive control of PRD, fungicides should be applied in the fall and spring when soil temperatures are in this favorable range. Finally, creeping bentgrass root depth and root mass is not adversely affected during infection. However, root dieback occurs rapidly during exposure to heat.

Lane Tredway is an assistant professor and extension specialist in the department of plant pathology at North Carolina State University in Raleigh. His appointment consists of 70 percent extension duties and 30 percent research. He can be reached at lane_tredway@ncsu.edu.

Jim Kerns is a plant pathologist in the department of plant pathology at the University of Wisconsin in Madison. He can be reached at jpk@plantpath.wisc.edu.

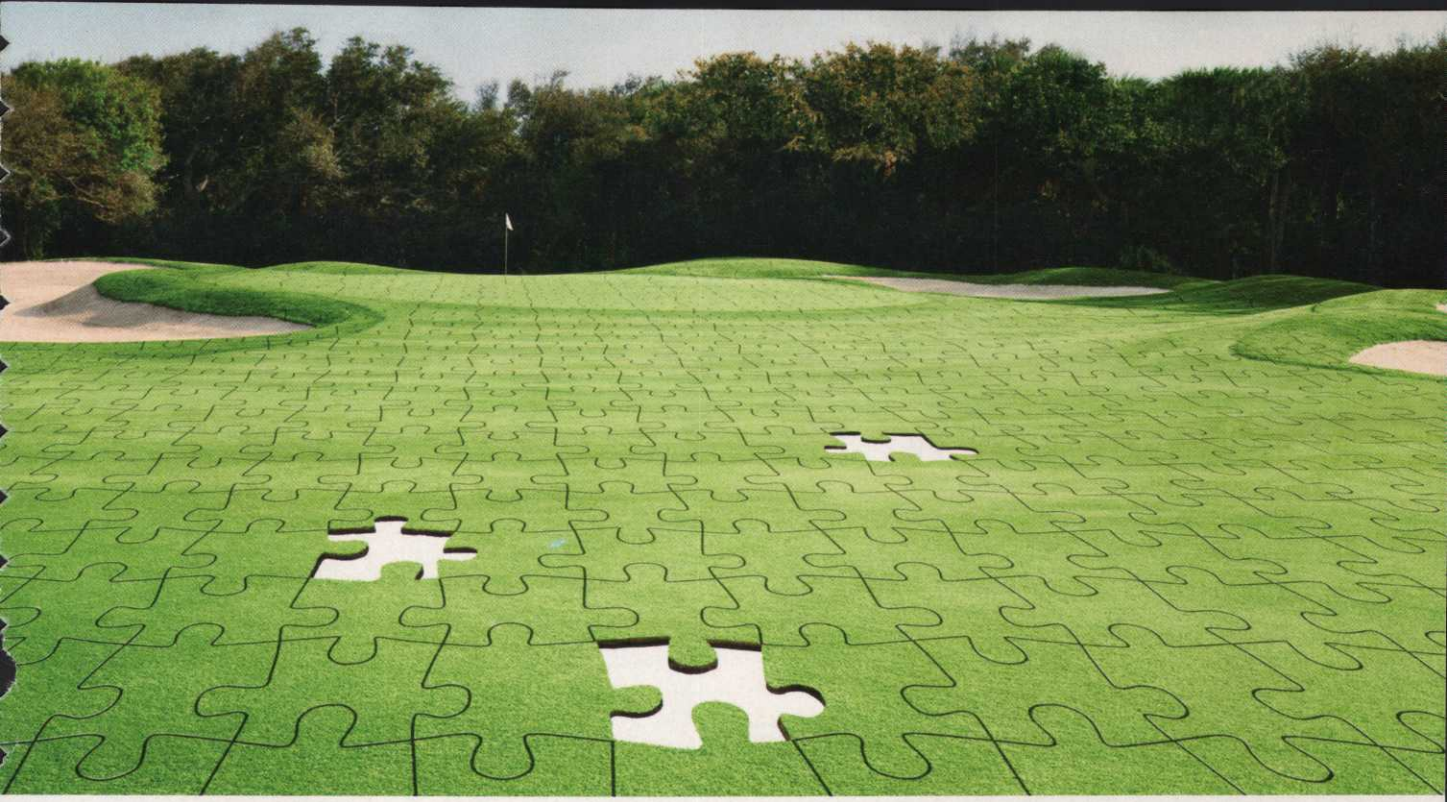
See more articles on this topic by searching for "Pythium" at www. turfgrasstrends.com.

REFERENCES

Feng, Y., and Dernoeden, P.H. 1999. Pythium species associated with root dysfunction of creeping bentgrass in Maryland. Plant Dis. 83: 516-520.

Hodges, C.F., and Coleman, L.W. 1985. Pythium-induced root dysfunction of secondary roots of Agrostis palustris. Plant Dis 69:336-340.

Hodges, C.F., and Campbell, D.A. 1994. Infection of adventitious roots of Agrostis palustris by Pythium species at different temperature regimes. Can. J. Bot. 72:378-383.



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Wetting Agents Provide Ways to Manage Summer Stress of Bentgrass in the Transition Zone

By W.G. Sarvis, H. Liu, L.B. McCarty, and J.E. Toler

Creeping bentgrass is the most widely used cool-season turfgrass species on putting greens in the United States. When grown on sand-based putting greens, such as those built to United States Golf Association specifications, bentgrass summer decline and occurrence of localized dry spots (LDS) quickly become one of the most overwhelming hurdles for superintendents. The use of wetting agents or soil surfactants has gained recent popularity with turf managers by increasing water infiltration and retention of drought stricken putting greens.

Localized dry spots are thought to be caused by the *Basidiomycete* fungi (McCarty, 2005). As the fungi decompose, they release organic and hydrophobic fulvic and humic acids (Miller and Wilkinson, 1978; Roberts and Carbon, 1972). Localized dry spots are areas several inches to several feet across and irregular or serpentine in shape. They are characterized by having soils that are extremely hydrophobic and very difficult to re-wet upon drying.

Wetting agents have been used to increase water-holding capacity of turfgrass soil media for some time. Wilkinson and Miller (1978) determined the severity of localized dry spot caused by hydrophobic soil can be reduced by improving moisture retention and infiltration when under wetting agent treatments. Karnok and Tucker (2001) reported that one application of a wetting agent significantly reduced the MED (molarity of ethanol droplet, a test for water repellency) of a hydrophobic soil for up to 12 weeks.

The study

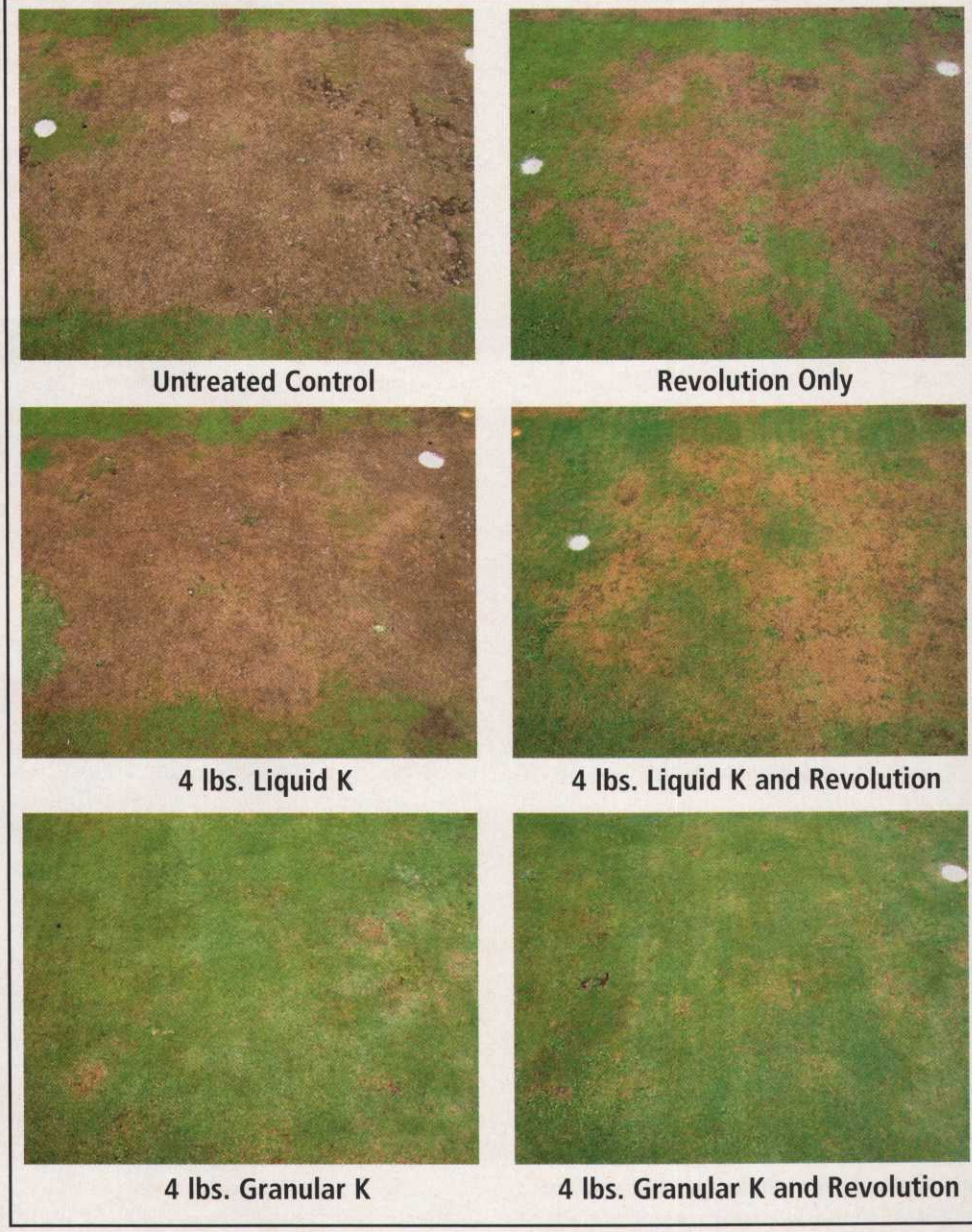
A two-year field study was conducted in 2006 and 2007 at Clemson University to evaluate effects of a wetting agent (Revolution by Aquatrols Corp.) and both liquid and granular potassium (K) fertilization on the alleviation of summer stress associated with creeping bentgrass during summer months. Plots were arranged in a randomized split-block design with four replications.

The wetting agent was applied monthly from May to October each year at a rate of 6 ounces per 1,000 square feet (oz/ft^2). Applications of the wetting agent were immediately watered in by hand.

Potassium (K) was supplied to the research plots as either liquid or granular sources. Liquid K was applied every two weeks from May to October each year at 0, 2 pounds, or 4 pounds K/1,000ft^2. Liquid K was applied using a carbon dioxide backpack type sprayer. Granular K was applied at times of aerification; one spring and two fall aerification dates each year. After aerifying and removing cores, a granular K was swept by hand into each plot in order to incorporate fertilizer into soil. Granular K was also supplied at 0, 2 pounds, or 4 pounds K/1,000ft^2 annually.

Parameters measured included leaf and root tissue nutrient concentrations, clipping yield, root weight, volumetric soil water content, soil hydrophobicity using the water droplet method at 1.5-centimeter (cm) and 3-cm depths, and turf quality (TQ). Turf quality was measured on a 1 to 9 scale; 1 being dead turf, 7 being acceptable, and 9 being of optimal turf color and quality.

FIGURE 1



Soil hydrophobicity of a 85:15 sand-peat mixture as affected by Revolution wetting agent during the summers of 2006-07.

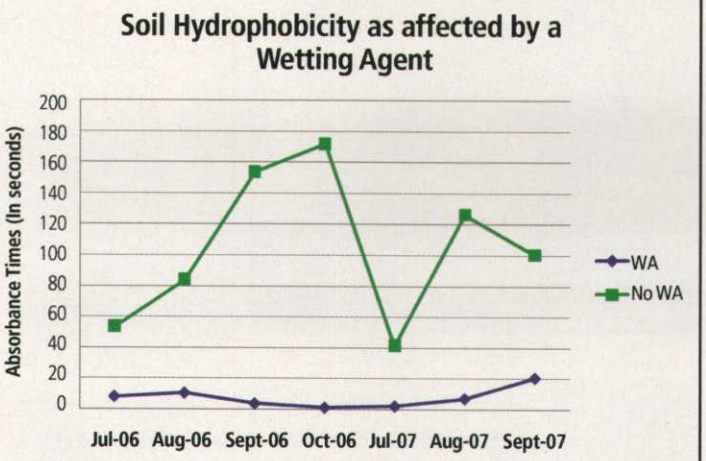
Plots receiving wetting agents showed better turf quality under drought conditions.

For soil hydrophobicity testing, two cores were removed from each plot two weeks after each wetting agent application. Cores were allowed to air dry for four weeks, and a droplet of water was placed at 1.5-cm and 3-cm depths. Time taken for core to fully absorb the droplet was recorded in seconds.

All statistical computations were conducted using the analysis of variance (ANOVA) procedure within the Statistical Analysis System (SAS Institute, 1999). Means were separated using Fisher's Least

Continued on page 76

FIGURE 2



Soil hydrophobicity of a 85:15 sand-peat mixture as affected by Revolution wetting agent during the summers of 2006-07.

Continued from page 75

Significant Difference (LSD) test at an alpha level of 0.05.

The results

In 2006, the greatest TQ was shown on plots receiving granular K at 4 pounds K/1,000ft² annually and no wetting agent. Interestingly, in 2007, the highest TQ was on plots receiving Revolution and 4 lbs granular K/1,000ft² per year. This change in results from 2006 to 2007 is most likely due to the extreme drought that plagued the southeastern United States during the summer of 2007. In 2006, the plots received 24 inches of rainfall from June to October. In 2007, only 10.4 inches of precipitation was recorded. The wetting agent apparently retained excessive amounts of soil moisture in 2006, preventing nighttime soil cooling. Plots receiving a wetting agent in 2007 demonstrated much better turf quality under drought conditions due to its ability to maintain soil moisture throughout the summer months. The lowest TQ readings were from liquid K treated plots, primarily due to phototoxicity of liquid potassium.

Soil hydrophobicity was significantly reduced at every measurement date in 2006 and 2007 at both the 1.5-cm and 3-cm depths. Also, the soil was found to be less hydrophobic at a depth of 5 cm to 6 cm or lower. Tucker et al. (1990) reported similar findings where hydrophobic soil was confined to the upper 5 cm of soil on a bentgrass putting green.

Clipping yields were not found different among fertility treatments or wetting-agent treatments. However, liquid K-treated plots yielded the highest leaf tissue K concentrations. While spoon-feeding potassium to bentgrass during the summer months led to the highest leaf K concentrations, our study suggests that liquid K fertility can have profound negative effects on turfgrass quality during the hottest summer months.

The results of this study proved interesting for two reasons. First, in 2006, the use of a wetting agents yielded unfavorable results. By retaining high amounts of soil moisture, the wetting agents apparently prevented the cooling down of soil by maintaining excessively high soil temperatures. Secondly, in the drought of 2007, wetting agents applications consistently sustained enough soil moisture to greatly increase turf quality through the summer. Our research suggests that with proper planning and careful use, wetting agents are a valuable tool turf managers can arm themselves with in the battle against bentgrass summer decline.

Acknowledgement:
The authors would like to thank the Aquatrols Corp. for funding our research of summer stress management through wetting agents.

William G. Sarvis is a masters of science candidate in turfgrass science and management. Haibo Liu is an associate professor and Lambert B. McCarty is a professor of horticulture specializing in turfgrass science and management. Joe E. Toler is a professor of Statistics. All are located at Clemson University in South Carolina.

Environmental Stewardship Produces Economic Advantages

By Anthony L. Williams

The term "environomics" is a reference to a synergistic blend of environmental stewardship and economics. The superintendent who elevates his programs to this level is truly setting a high standard of excellence.

The debate continues as to the actual value of a detailed environomic program. So how do you measure the value of stewardship? The first step is to establish environomic milestones (case studies) that are based on three factors: the protection and enhancement of natural resources; the establishment of quality playing conditions while creating a memorable overall golf experience; and the implementation of financial strategies.

It is critical that these milestones are documented with detailed records and pictures. This will allow you to make critical decisions based on property-specific data.

We will review three environomic milestones at the Stone Mountain Golf Club by Marriott (SMGC) in Stone Mountain, Ga. As a result of these programs, the SMGC was the recipient of the National Public Course and Overall Winner of the 2006 Golf Course Superintendents Association of America/GolfDigest Environmental Leaders in Golf Award, the Grand Award in the golf course category of the 2006 Green Star Contest sponsored by the Professional Grounds Management Society, and most recently, the 2007 "Because Green Matters Award" presented by Project EverGreen.

These environmental and green industry successes coupled with quality playing conditions and outstanding financial results create a powerful business model.

Continued on page 78

PHOTO 1

This native grass and wildflower area (Yellow Daisy, Helianthus porteri) on No. 11 of the Lakemont course at the Stone Mountain Golf Club is a designated no-spray zone that provides habitat and forms a vegetative buffer around the water feature.

PHOTO 2

General Manager Randy McMichael, Director of Grounds Anthony Williams and Director of Engineering Patty Gomer place the 80th nest box at the Evergreen Marriott Conference Resort/Stone Mountain Golf Club commemorating Marriott's 80th anniversary and deep environmental commitment on Earth Day, April 22,2007.

Continued from page 77

Nest box program

The first SMGC environomic milestone we will evaluate is the nest box program. This program was implemented with less than $750 invested in construction materials.

The construction and monitoring of the boxes was conducted by volunteers and management staff. The nest box program consists of 80 nest boxes. The 80th nest box was installed with a special logo celebrating Marriott's 80th Anniversary in the spring of 2007. There are seven different designs in the nest box inventory to encourage the nesting of blue birds, screech owls and bats.

The SMGC nest box program housed more than 300 fledglings last year. This program was instrumental in the SMGC becoming certified in the Audubon Cooperative Sanctuary Program and also helped generate more than 50 articles/press items. These articles were featured in many leading magazines and newspapers, including *GolfDigest* and the *Atlanta Journal and Constitution*.

The summary of this environomic milestone is simple. For a tiny investment, the SMGC expanded the usable habitat on the course, increased memorable wildlife sightings and began a community volunteer and outreach system. These programs culminated in a major marketing and public relations effort that spread the details of this worldwide work. Overall, not a bad first step toward a greener future.

The next step featured an aggressive integrated pest management program (IPM). This milestone is quite complex, but the rewards are worth the work.

The SMGC began its IPM program with an investment in human capital. Through internal and external training/testing, the club increased from two licensed chemical applicators in 2005 to six licensed applicators in 2006 and 2007. Three applicators are licensed in multiple categories. This extra training allows for better scouting and preventive programs while eliminating the use of outside contractors.

This philosophy led to a chemical-use reduction initiative, which included returning 12 acres of maintained areas back to native grasses and wildflowers (there was no seed expense in this program). These areas were designated as no-spray zones and considerably reduced the amount of chemicals applied at the property.

The club also improved documentation of agronomic factors such as pest histories, weather conditions, soil samples, tissue samples and water quality testing to allow precise

product and rate selection. The synergy created by this program resulted in a $28,000 savings in 2006 compared to the previous year's actual expense.

Industry service

The third SMGC environomic initiative is industry service. To help grow the golf industry, a property that is environomically sound will actively participate in a variety of industry events. These events can be local meetings or regional or national industry events. These events might or might not generate revenue for the property, but they always create opportunity for growth.

In 2006, the SMGC hosted environmental tours for superintendents from as far away as Spain, Japan, England and Russia, as well as welcoming local schools and civic groups. They also hosted two GCSAA regional seminars, as well as the Georgia Golf Course Superintendents Association annual meeting and trade show. They also hosted events for the Professional Grounds Management Society (Georgia Branch) and the Georgia Golf Environmental Foundation. These events allowed the SMGC to tap into a huge resource — the green industry. The SMGC established relationships that validated the club's successes and allowed training, education and fund raising to flourish.

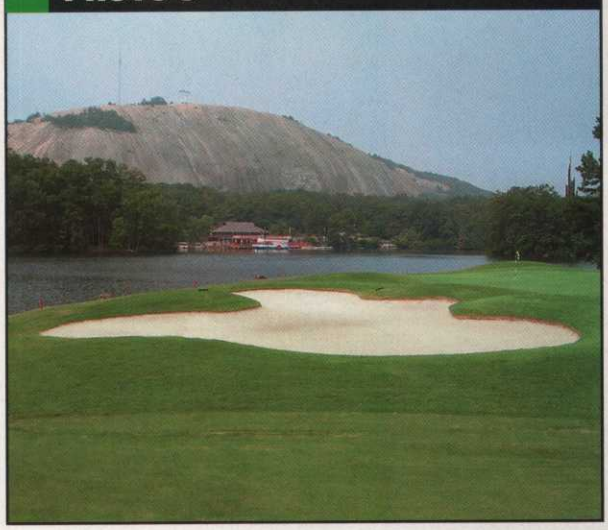
In summary, a strong environomic program starts with a basic commitment to environmental and economic excellence. Over time, these programs can grow and generate breakthrough results. In 2006, the total SMGC environomic program resulted in a $47,000 savings in expenses, improved playing conditions and three national awards. To truly succeed in the golf/green industry, you must be willing to go the extra mile. To experience breakthrough results and reach new environomic milestones, it will also require an extra degree of commitment and documentation throughout your operation.

Remember that at 211 degrees, water is merely hot — but at 212 it boils and creates steam. This 1 degree of temperature difference in water allows for a transformation so powerful that it can power a locomotive. The SMGC is an example of a property giving that extra degree of effort and achieving outstanding environomic results.

Will you commit to that extra degree of environomic excellence within your operation? Can you afford not to?

Certified golf course superintendent Anthony L. Williams is the director of grounds for the Stone Mountain Golf Club and is a 21-year veteran of Marriott Golf. He serves on the board of directors for the Georgia Golf Course Superintendents Association, the Georgia Golf Environmental Foundation, the Georgia Branch of the Professional Grounds Management Society and the Georgia Turfgrass Association.

PHOTO 3



The Stone Mountain Golf Club is able to operate a successful golf business in harmony with a unique ecosystem by implementing a plan that protects the property's natural resources while creating a memorable golf experience. This picture features the par-5 opening hole of the Lakemont course, Stone Mountain Lake and, of course, Stone Mountain in the background.

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