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Continued from page 89

Island and found fertilized lawn turf and an unfertilized oak-pine forest had soil water $\text{NO}_3\text{-N}$ levels of 3.7 and 0.54 ppm, respectively. Numerous other studies reporting $\text{NO}_3\text{-N}$ concentrations of soil water under cool-season turf are in close agreement with our findings (Petrovic 1990). Actually the turf $\text{NO}_3\text{-N}$ levels found in this study were a bit higher than those from earlier investigations by us and others (Jiang et al. 2002 & Petrovic 1990). Values less than 5 ppm $\text{NO}_3\text{-N}$ are more typical. It is possible that the presence of white clover in some of the turf sampling sites might have contributed nitrate to soil water in addition to that from the 50 pounds N/acre applied each spring as sulfur-coated urea. Soil water nitrate did exceed the minimum safe level of 10 ppm $\text{NO}_3\text{-N}$ in 20 percent of the water samples taken under turf. Other vegetation types that exceeded the 10 ppm $\text{NO}_3\text{-N}$ safety standard for drinking water were ground covers (39 percent) and unplanted mulched sites (10 percent).

Nitrate leaching

Nitrate leaching from the sampling sites was determined by multiplying the volume of rainwater percolating through the soil by the $\text{NO}_3\text{-N}$ concentration in water samples collected 24 hours following the rain event. Water percolation was calculated from precipitation and evaporation data obtained from the University weather station. Evaporation was converted to plant transpiration using conversion constants for each vegetation type derived from the scientific literature. Whenever rainfall exceeded that necessary to compensate for plant transpiration and to saturate the soil, the excess water was assumed to leach through the soil profile, carrying nitrate with it. The total

$\text{NO}_3\text{-N}$ leached from each vegetation type is summarized for the 15 months in which leaching occurred. The amount of nitrogen leached is expressed in kilograms N/hectare (kg N/ha), roughly equivalent to pounds/acre.

Nitrogen leaching over the 18-month study ranged from 0.17 kg N/ha for woodland to 34.97 kg N/ha for ground covers. The vegetation types separated into three statistically different $\text{NO}_3\text{-N}$ leaching groups. The low leaching group (less than 2 kg N/ha) included woodland, evergreen and deciduous shrubs and annual and perennial flowers. A medium leaching group (2 to 10 kg N/ha) encompassed deciduous and evergreen trees and turf. The high leaching group (>10 kg N/ha) consisted of ground covers and unplanted mulched soil.

The $\text{NO}_3\text{-N}$ leaching losses from woodlands and turf observed here are in line with those reported by others. Gold et al. (1990) reported a

woodland range in nitrogen losses of 1.2 to 1.5 kg N/ha/year that was roughly comparable to our annual loss of 0.14 kg N/ha/year . Our nitrogen leaching loss from turf averaged 2.81 kg N/ha/year that was within the range of 1.1 kg N/ha/year for unfertilized turf and 25.8 kg N/ha/year for turf fertilized at 150 lbs N/acre/year reported by Guillard and Kopp (2004). Gold et al. (1990) reported a turf N leaching rate of 1.9 to 9.3 kg N/ha/year that also encompass our 2.81 rate. We have no way to compare our estimates of $\text{NO}_3\text{-N}$ leaching from other landscape vegetation types with those of other investigators, but our agreements in turf and forests give us confidence that our values are reasonable.

Unplanted sites would be expected to leach more $\text{NO}_3\text{-N}$ because there are no roots present to absorb NO_3 mineralized from soil organic matter and nitrogen deposited from the atmosphere (10 kg N/ha/year). Nitrate leaching from vegetated

Unplanted sites would be expected to leach more $\text{NO}_3\text{-N}$ because there are no roots present to absorb NO_3 mineralized from soil organic matter and nitrogen deposited from the atmosphere.



QUICK TIP

Weeds are opportunistic plants — if you give them the opportunity they will flourish. Eliminate the opportunity by establishing the densest turf possible through optimal nutritional management and turfgrass health. Floratine offers products and tools designed to meet this goal, including balanced nutritional products, soil testing and analyses, Turf Action Plans tailored to a wide variety of conditions, and Floratine University events that bring industry leaders together to offer sound turfgrass management education. To learn more about Floratine's proactive approach to managing turfgrass health, or for a list of distributors, please visit www.floratine.com.

PHOTO 2



Suction lysimeter inserted in soil to a depth of 20 inches. Rubber stopper at top is removed to evacuate the lysimeter tube and withdraw soil water sample.

sites seem to be inversely related to the density of roots within the upper soil layers. Mixed stands of annual and perennial flowers produce a dense mass of roots capable of absorbing most available NO_3 . The same can be said for both deciduous and evergreen shrubs especially when they are well established. Mature trees have massive root systems but most fine absorptive roots are beyond the drip line not under the canopy where our soil water samples were collected and NO_3 leaching is likely.

The high leaching rate from ground cover vegetation was not expected but not unreasonable. Our sampling sites for ground covers were in the open so as not to be confounded by roots from over-story trees. Thus, these shade-adapted plants were growing in greater than optimum light and were likely stressed. This could result in photosynthetically inefficient foliage and less dense root systems. Superficial observations of these plants during mid-summer droughts suggested they were experiencing stress and likely not absorbing soil nutrients effectively.

It is evident that there are differences in the amount of $\text{NO}_3\text{-N}$ that can leach from the various vegetation types that constitute most managed landscapes. These differences can be moderated by appropriate plant placement and management practices. Our results also indicate that nitrate leaching from landscape plantings might be minimized by avoiding unplanted bare ground (even if mulched), large areas planted to ground covers exposed to full sun, and by concentrating on multi-species plantings of herbaceous flower-

ing plants and shrubs. Clearly, this study is just the beginning of what should be a new research area on environmental horticulture.

Richard J. Hull, Ph.D., is professor emeritus of plant physiology at the University of Rhode Island, and an adjunct professor of horticulture at Clemson University.

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TURFGRASS TRENDS

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■ Top Assistants

Golfdom goes one on one with Chris McCutcheon, assistant superintendent of Stonewall Golf Club in Gainesville, Va.

*Editor's note: We've been reporting on superintendents for years. Of course, that's why **Golfdom** exists. But we want to give assistant superintendents more due. That's why we're introducing this new feature, Top Assistants, which will feature a question-and-answer session with an assistant superintendent every month. If you'd like to nominate someone for the feature, please send an e-mail to Larry Aylward at larryward@questex.com.*

Golfdom: What's your favorite part of the job?

McCutcheon: Starting the day before a majority of people get out of bed. I've often said that people in the golf industry get more accomplished before lunch than most people do all day. Another part of the job that is fascinating is that we are faced with challenges every day, from the weather to an employee not showing up, so we always have to be ready for the unexpected.

Golfdom: Who has been the biggest influence on your career and why?

McCutcheon: Charlie Fultz, the former superintendent of Shenvalee Golf Resort. He showed me the ropes and taught me so much about the industry. He never once left me out of the circle and treated me as an equal from day one. He was always willing to sit down and discuss not only golf course management, but life in general.

Golfdom: What's your favorite product or piece of equipment and why?

McCutcheon: Primo Maxx. I see the product as a seasonal crew member, except that

I don't have to train it to run a piece of equipment or worry if it is going to make it in on time. I just think it's cheaper and more cost-effective [than an employee] in the long run — not to mention it helps with turf density.

Golfdom: How many years have you worked in the golf industry?

McCutcheon: Five.

Golfdom: If you could change something about the industry right now, what would you change?

McCutcheon: The job market is not the best right now for superintendent positions. Everyone seems to be content where they are, which in turn makes it difficult for the assistants to move up. I'm not sure what the solution is, but I know that employers are always looking for experience when hiring, and that is tough when assistants are not given the opportunity to advance.

Golfdom: Describe yourself in one word:

McCutcheon: Ambitious.

Golfdom: What is your favorite hobby and why?

McCutcheon: I don't have a lot of time right now for hobbies since my 21-month-old twin girls take up a lot of my time. But when I do get free time, I enjoy playing summer-league softball. It gets me away from the golf course, but I still get to be outdoors and get some exercise.

Golfdom: What's your favorite vacation spot?

McCutcheon: My wife and I went to Puerto



Vallarta, Mexico, for our honeymoon five years ago. We hope to go back soon.

Golfdom: What's your favorite golf course besides your own?

McCutcheon: I have always enjoyed Augusta National. I would say that Augusta is as close to perfect as they come. We all know that perfection is hard to come by with all the different challenges that we face in this industry.

Golfdom: If a movie were made about your life, what famous actor would play you?

McCutcheon: This is a tough question because I have never thought about a movie being made about me. I guess I would want someone like Mel Gibson. In his roles, I see not only a good family man but also someone who is an excellent leader with a desire to fight for his beliefs.

Golfdom: It's your last day on Earth. What would you do?

McCutcheon: Definitely not drag a hose or sit on a spray rig. I'd spend the entire day with my family and remember all the good times we've had together. I would also track down the people who have been influential in my life and thank them. ■

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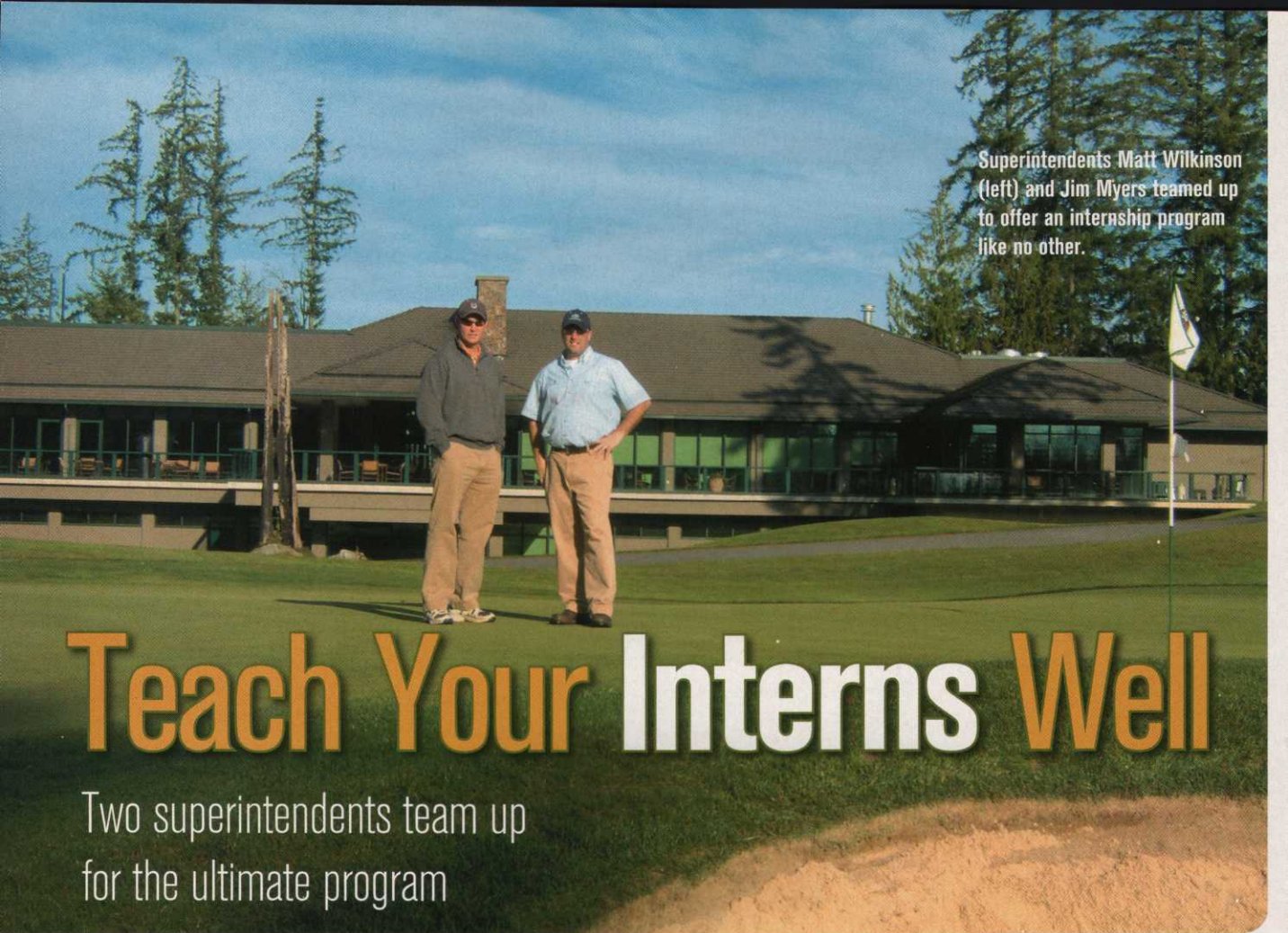


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Superintendents Matt Wilkinson (left) and Jim Myers teamed up to offer an internship program like no other.

Teach Your Interns Well

Two superintendents team up for the ultimate program

BY JIM MYERS

As a superintendent with more than 10 years of experience from the tourist town of Vail, Colo., I had the ability to attract several interns to such a beautiful area. Our internship program provided our interns with valuable knowledge and experience that I passed on from my many years in turfgrass management and being a member of the Golf Course Superintendents Association of America.

From the inception of the internship program that I offered at my club in the Vail Valley beginning in 1999, I would always ask for feedback from the interns.

Their responses have enhanced the program as well as the intern's level of experience, and personal and professional growth. As each season turned, the internship program improved to emphasize work ethic, a maniacal eye for detail and the desire to continue along the career path of becoming a golf course superintendent. Over the years, I've learned that a superintendent's role is

very expansive, but his or her level of contribution to his or respective golf club may not be at the level it can or should be without the basic fundamentals.

Last year, I embarked on a new opportunity and took a job in Sammamish, Wash., as superintendent of The Plateau Club, which is owned and managed by Oki Golf (other Oki Golf properties include The Golf Club at Newcastle, The Golf Club at Echo Falls, Washington National Golf Club, Trophy Lake Golf & Casting, The Golf Club at Hawks Prairie and Indian Summer).

I reached out to our neighboring Oki Golf property, The Golf Club at Newcastle and its superintendent Matt Wilkinson, to discuss internship programs in the area. Wilkinson was interested in what I had accomplished with my internship program, and, coupled with his own internship program, we sought to create a program above all others — one that would help students prepare for their futures in the turf industry so they could hit the grass running upon gaining their first jobs.

A unique feature of our internship program is that the selected interns are exposed to two different dynamics — a private 18-hole golf club and a public 36-hole golf club.

The Plateau Club is a private 18-hole golf club facility with a championship golf course carved out of a classic Northwest setting. In addition to the golf course, members enjoy a 37,500-square-foot clubhouse and a recreational facility that boasts an outdoor competition-sized swimming pool, outdoor tennis courts, fitness equipment, exercise classes, day care, massage therapy and full locker rooms.

The Golf Club at Newcastle is a 36-hole public golf facility (Coal Creek and China Creek golf courses) with a 45,000-square-foot clubhouse showcasing incredible views of Mount Rainier, the Seattle skyline and the Puget Sound region.

We decided to offer student housing to minimize commute time while providing easy access to stores, shops and local restaurants from each golf club property so mid-summer transitions from one golf club to the other was easy.

A lot to learn

The Golf Club at Newcastle has a pure stand of Providence bentgrass greens and Colonial bentgrass fairways. Under Wilkinson's direction, students receive the opportunity to learn how to manage bentgrass and management practices of eradicating *Poa annua*. The Golf Club at Newcastle hosts numerous corporate events. Coupled with daily-fee play, it receives more than 55,000 rounds annually. Maintaining and continuously improving both courses with the volume of rounds offers great insight and an invaluable experience.

Additionally, with two courses comes a large maintenance crew with seasoned superintendents, assistant superintendents and staff that provides great insight and support to the interns. Under Wilkinson's supervision, internship students can learn drainage work (surface and subsurface), how to make plant growth regulator applications, irrigation repair, pump station fundamentals and much more.

As a private club, the Plateau Club's 12,000 annual rounds are significantly less

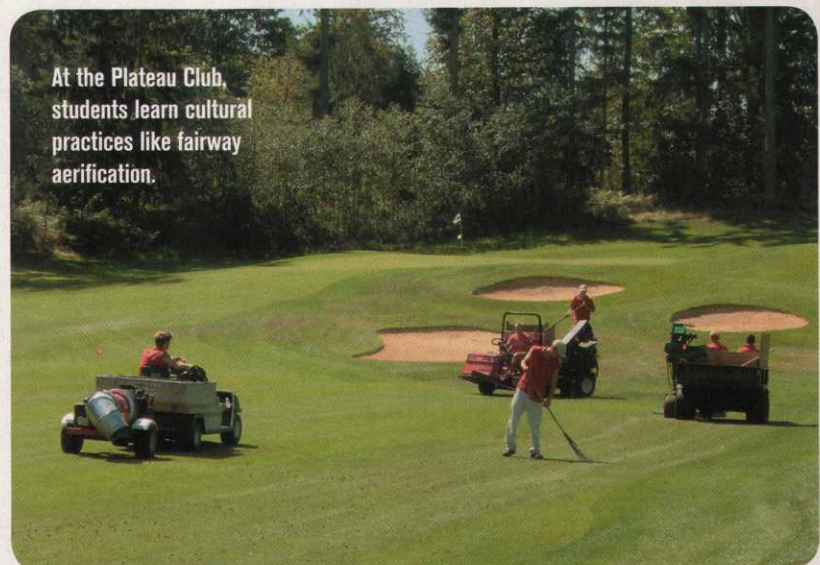
than the Golf Club at Newcastle. High standards must be maintained while improvement opportunities are continuously identified and acted upon. Under my direction, students learn to manage *Poa*-bentgrass greens at a competitive level as well as *Poa*-bentgrass fairways.

The Plateau Club has a large summer staff with a seasoned year-round crew, from whom interns can learn the valuable skill of properly scheduling for course projects and daily-maintenance practices. Additionally, students are taught how to identify various weeds, as well as budgeting, forecasting and equipment maintenance (preventive and actual). They are also taught fertility and cultural and integrated pest

Continued on page 98



Students study the pump station at The Golf Club at New Castle.



At the Plateau Club, students learn cultural practices like fairway aerification.

Teach Your Interns Well

Matt Wilkinson (right) and his senior staff at the Golf Club at New Castle includes Tracey Hawkins, Dave Sandman and Matt Patton.



Continued from page 97

management practices to maintain the level of excellence that club members expect.

One of the unique aspects of this internship program is that students experience two very different dynamics of turfgrass management under two very different circumstances in one summer.

Other components

On their first days, we ask interns to complete a self-assessment to identify their areas

of strength and where they saw their opportunities. Additionally, we ask students to document their long-range plans and identify their particular areas of interest. This helps establish a baseline to work from and identify how the internship will be most rewarding for the students as well as the club.

On a monthly basis, Wilkinson and I conduct a classroom setting to review some of the many areas of turfgrass management — bunker and weed management, cultural practices and fertility programs, just to name a few. The task taught is covered on a daily, weekly or monthly basis dependent on activity levels at each respective golf course. An example of the task outline is to the left.

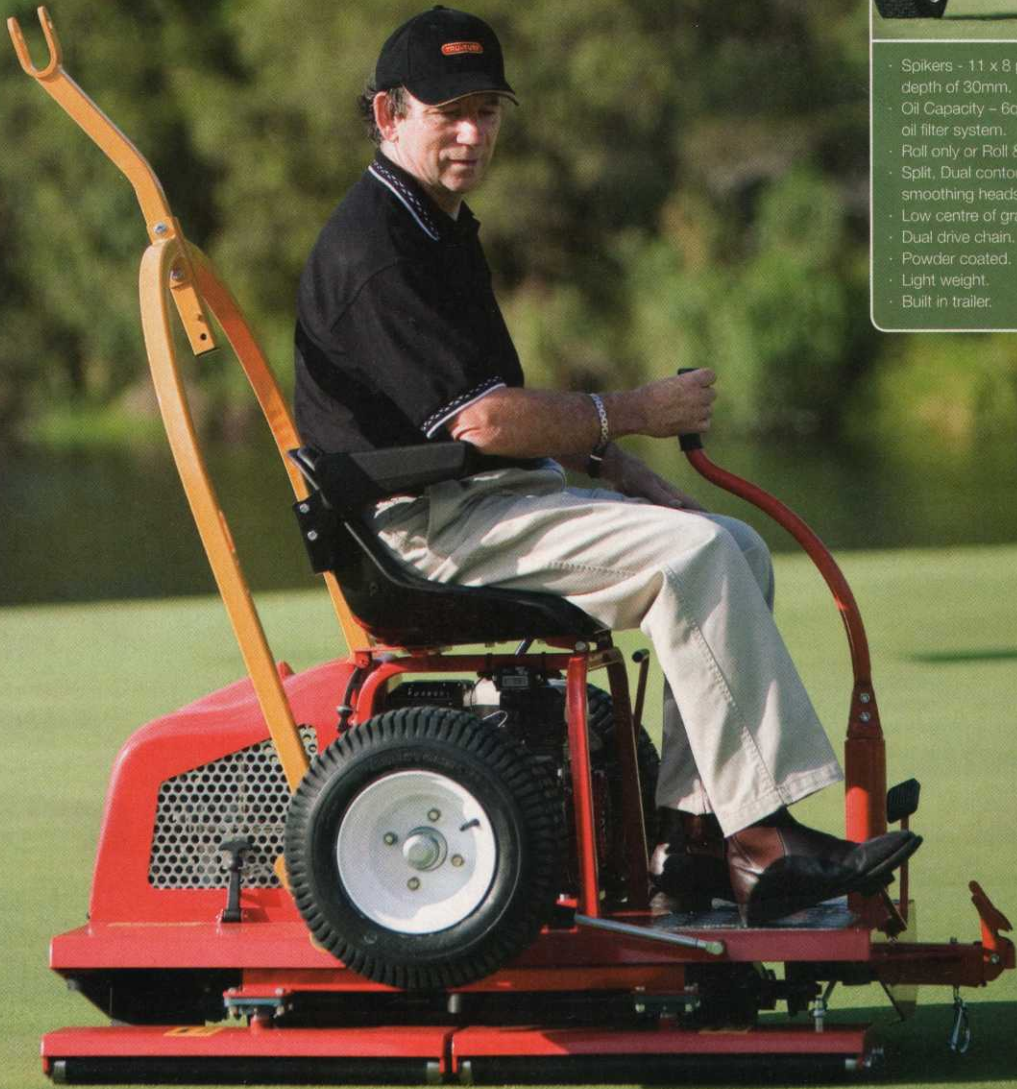
This outline is a valuable tool for the students because it provides immediate feedback on each student's area of success and opportunity. In addition to Wilkinson and myself providing instruction and feedback, many staffers (assistant superintendents, irrigation and spray technicians and head mechanic) are valuable resources.

Lastly, our shared passion for our profession and desire to positively impact future superintendents help make this program successful. Collectively, we hope that prospective golf course superintendents and those passionate in turfgrass management not only benefit from our program, but use it to implement similar programs for the benefit of the profession and the larger industry. ■

Task Taught	Days/Week	Trainer	Evaluation
Mowing practices (mowing heights)	daily		
Cultural practices (verticut, aeration, etc)	1/week		
Irrigation scheduling (evapotranspiration rates)	daily		
Hand watering/syringing	daily		
Irrigation repair (pipe and pump house)	as needed		
Staff supervision (leading crew)	weekends		
Sodding and seeding (overseeding/slit seeding)	as needed		
PGR applications	bi-weekly		
Disease diagnosis (scout and identify pathogens)	daily		
Fungicide applications (preventive and curative)	bi-weekly		
Fertilizer applications (liquid and granular)	1/week		
Analyze soil tests and reports	daily		
Turfgrass math (convert square feet to acres, etc)	daily		
Calibration	as needed		
Turfgrass identification	daily		
Weed identification	daily		
Herbicide application (pre- and postemergent)	1/week		
Budgets (variance reports/forecasting)	1/week		
Equipment maintenance (reel grinding)	1/week		
Bunker maintenance	1/week		
Drainage (surface and subsurface)	1/week		
Course setup (pin positions, tee markers)	1/week		
Game of golf (play, rules and etiquette)	1/week		



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Leaders

PEOPLE ON THE MOVE

Lebanon Seaboard Corp. named **Dave Heegard** as executive director of sales and marketing for Lebanon Turf. Heegard will be responsible for the sale of all Lebanon Turf branded fertilizers and seeds into the golf, landscape and professional markets.

Standard Golf Co. added **Jim Nygren** to its marketing team at the company's Cedar Falls headquarters. He joins the company as a market analyst.

John Bruce is a regional sales manager for Pittston, Penn.-based Redexim Charterhouse. He formerly served in several sales positions within the turf industry for Wiedenmann NA and Dakota Peat & Equipment.

Certified superintendent **Thomas J. Schlick** joined The Davey Tree Expert Co. Golf Maintenance division as Southeast division manager. He will focus on Florida and the southern United States.

Vera Gasparini brings 25 years of industry experience to Quali-Pro as its area sales manager in Florida.

Grigg Brothers Foliar Fertilizers has added former Virginia golf course superintendent **Charlie Fultz** to its staff as the company's technical and distributor representative for the Southeast. Fultz has worked as a



Heegard



Dal Pozzo



Galvin



Nelson

course superintendent in Virginia for the past 13 years, most recently at Shenbalee Golf Resort in New Market, Va. Grigg Brothers also named former United States Golf Association Green Section senior agronomist **Matt Nelson** as a member of its technical staff. Nelson spent three years in the Green Section's Northeast office and the last nine at its Northwest headquarters.

AGROTAIN International hired **Brian Wade** as regional manager of Europe, Middle East and Africa. He has 12 years of experience in both the technical and commercial management of agricultural businesses.

E-Z-GO hired **Ronald L. Otten** as vice president of engineering. He joins E-Z-GO from Mitsubishi Caterpillar Forklift America, where he served as director of product development and corporate quality and led the company's engineering function.

Target hired **Chuck Dal Pozzo** as a new sales representative.

RDC Golf Group Principal and Executive Vice President **Matthew Galvin** was elected to the board of directors of the National Golf Course Owners Association. Galvin directs financial, acquisitions and business development matters for RDC, which owns and operates golf facilities in New Jersey and Florida.

Leah Brillman, director of research & technical services for Seed Research of Oregon, a division of Pickseed, was one of 10 people named a 2007 fellow of the Crop Science Society of America.

Arysta LifeScience North America named **Michael Maravich** as marketing and product manager of turf and ornamentals. Maravich is accountable for marketing and product management functions for current and future fungicide, insecticide and herbicide products. The company also hired **Michael Owen** as its turf and ornamental territory sales manager in the Southeast. His territory spans from Virginia to Florida and surrounding southeastern states.

Northbrook, Ill.-based KemperSports promoted President and COO **Steve Skinner** to CEO after co-founder **Steve Lesnik** stepped down from the post last month. Lesnik will continue as chairman of the board of directors.

Henry DeLozier, vice president of golf for Pulte Homes for the past nine years, was made a principal of Global Golf Advisors, an international golf consultancy that provides a wide range of consulting and support services to golf course owners, operators and the investment community.

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