

Turfgrass Color and Quality

Averaged over the season, turfgrass color and quality were statistically similar for all treatments (Table 2). In general, turfgrass quality was near 7 on a 1-9 scale, with 6 representing the minimally acceptable quality. Similarly color hovered near 300, which represents a healthy, adequately fertilized putting green based on our several years of experience using the color measuring device.

No statistical differences in color or were observed on any one particular date, however, differences in quality were observed on three individual dates (Table 3). There are very weak trends on these dates that suggest turf quality is highest with Revolution and lowest with APSA-80.

It would be premature to draw any conclusions from the results on these two dates considering differences were not observed in the other 17 dates. It is not surprising that few differences in turfgrass color or quality were observed because wetting agents have little effect on turf unless moisture stress is evident. However, some wetting agents are known to be phytotoxic and cause visible damage to the turf, or burn, shortly after application. This was not observed for any of the treatments based on daily inspection, and the color and quality results confirm that there is low potential for phytotoxicity with the wetting agents tested.

Soil Moisture and Soil Hydrophobicity

Like color and quality, soil moisture was not statistically different among the treatments (Table 2). This indicates that for this particular root zone, the wetting agents did not increase or decrease the moisture holding capacity compared to the non-treated control. We have observed that most wetting agents will significantly decrease soil moisture compared to the control in wet conditions on a sand root zone with low organic matter. This sand root zone had a moderate level of organic matter (~3%) which probably decreased the ability of the wetting agents to influence soil moisture under the wet conditions.

The water drop penetration test is particularly useful in the absence of moisture stress because we can predict the potential for localized dry spot to develop by pulling soil cores and allowing them to air-dry. Dry soil will show some resistance to penetration by a water drop placed on the surface, and the time it takes for the water drop to penetrate the soil is recorded and used as an indication of potential for localized dry spot to develop in actual moisture stressed conditions, and also can show the efficacy of the applied wetting agents.

Table 2. Average turfgrass quality (1-9, 9=best) and green color index as measured by Spectrum CM-1000, with a range of 0-999, 999 being greenest. Column means are averages of over 19 weeks. Means within columns followed by similar letters are not statistically different at the 95% confidence level. Means separated by Fisher's Protected LSD_{0.05}. Results for July 15 are presented because this was the only single date when statistical differences were observed.

Treatment	Average Turfgrass Color	Average Turfgrass Quality	Turfgrass Quality on July 15	Avg. Soil Moisture
Control	295 A	7.04 A	7.33 AB	24.0 A
Revolution	304 A	7.45 A	7.50 A	24.2 A
APSA-80	290 A	7.11 A	6.17 B	25.2
Tournament Ready	293 A	7.08 A	7.17 A	26.1 A

Table 3. Average turfgrass quality (1-9, 9=best) for the three dates during which significant quality differences were observed. Means followed by similar letters are not statistically different at the 95% confidence level. Means separated by Fisher's Protected LSD_{0.05}.

Treatment	July 15	July 25
Control	7.33 AB	7.33 AB
Revolution	7.50 A	7.50 A
APSA-80	6.17 B	7.00 B
Tournament Ready	7.17 AB	7.50 A

Dekker and Ritsema (1999) proposed the following classification scheme that characterizes soils based on the time required for water drop penetration:

Class	Water Drop Penetration Time (s)	Nomenclature
0	<5	Wettable, non-water repellent
1	5-60	Slightly water repellent
2	60-600	Strongly Water Repellent
3	600-3600	Severely Water Repellent
4	>3600	Extremely water repellent

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Water drop penetration tests revealed that no statistical differences existed before the trial was initiated (Table 4), most water drops took 70-100 seconds to fully soak into the soil between the thatch/air interface and 2 cm, and about 15-50 seconds at the deeper depths indicating a strongly water repellent soil surface and a slightly water repellent soil beneath the surface. This is a common phenomenon because hydrophobicity is associated with high soil organic matter and soil organic matter is more concentrated near the soil surface. After the treatments were imposed, fairly dramatic decreases in water drop penetration time were observed for Tournament Ready and Revolution, where the soil was lowered from strongly water repellent to slightly water repellent (Tables 5). Table 5 is an average of monthly data, and is representative of all months. APSA-80 had no effect on water drop penetration time, indicating that this

product may not perform adequately under drought stress conditions, but we would need to confirm this result in a year with heavy moisture stress before making this proclamation confidently.

In conclusion, in this trial where localized dry spot did not develop due to consistent rainfall, all wetting agents treatments had statistically similar color, quality, and soil moisture compared to the non-treated control. When subjected to the water drop penetration test, Revolution and Tournament Ready were equally effective at reducing the hydrophobicity of the air-dried soil cores, while APSA-80 had no effect on time to penetration compared to the non-treated control. This suggests, but does not prove that APSA-80 would not be effective for preventing localized dry spot under drought stress conditions in the field, while Tournament Ready and Revolution would.

Table 4. Water drop penetration test results prior to the initiation of the trial. Cores were taken on May 10, 2010. Statistics were analyzed using log transformed values to meet equal variance assumptions and values converted back to seconds for ease of interpretation. Means within columns followed by similar letters are not statistically different at the 95% confidence level. Means separated by Fisher's Protected LSD_{0.05}.

Treatment	Depth of Water Droplet on Soil Core					
	0 cm	1 cm	2 cm	3 cm	4 cm	5 cm
	Time until water drop penetration - seconds					
Control	126 A	123 A	86 A	46 A	39A	20A
Revolution	133 A	127 A	107 A	37 A	20A	13 A
APSA-80	117 A	119 A	67 A	54 A	24 A	18 A
Tournament Ready	151 A	104 A	117 A	115 A	36 A	42 A

Table 5. Water drop penetration test results averaged over the season. Statistics were analyzed using log transformed values to meet equal variance assumptions and values converted back to seconds for ease of interpretation. Means within columns followed by similar letters are not statistically different at the 95% confidence level. Means separated by Fisher's Protected LSD_{0.05}.

Treatment	Depth of Water Droplet on Soil Core					
	0 cm	1 cm	2 cm	3 cm	4 cm	5 cm
	Time until water drop penetration - seconds					
Control	161 A	160 A	144 A	82 A	47 A	31 A
Revolution	25 B	28 B	80 B	80 A	44 A	32 A
APSA-80	186 A	173 A	117 AB	67 A	36 A	29 A
Tournament Ready	35 B	54 B	104 B	42 A	27 A	25 A



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Spring Business Meeting

By Scott Bushman, Golf Course Superintendent, Fox Valley Golf Club

The Wisconsin Golf Course Superintendents Association held its annual Spring Business Meeting at the Ramada Plaza Hotel in Fond du Lac on Monday February 28th. The event had 57 attendees there to see the presentations of John Miller of the GCSAA, Kristy Rogers with the DNR and Tom Emmerich of TJ Emmerich Assoc. Inc.

John Miller, CGCS is the Great Lakes Regional Representative of the GCSAA Field Staff. His presentation was titled "GCSAA: Members Matter Most", What is the GCSAA doing for you? John talked about the economy and the affects on the state of the golf industry. Number of people playing golf is less, golf course openings are down and golf course closings are on the increase. The GCSAA is trying to help ease the problems of "doing more with less" issue we all face. He pointed out many of the challenges golf courses and Superintendents have and the GCSAA resources available to deal with some of these issues. The GCSAA website has been improved to increase functionality and new web based tools are available. Some of the tools available are GCSAA TV, GCSAA radio, GCSAA industry spotlight just to name a few. John ended his presentation with a question and answer session with the audience.

Kristy Rogers with the Wisconsin Department of Natural Resources presentation was "Water Use Program: Sustaining Wisconsin's Water Wealth". Wisconsin's mission is sustainable water use. One-third of the population of Wisconsin falls in the Great Lakes Basins. Any person with the capacity to withdraw an average of 100,000 gallons per day must register with the department. Withdrawal capacity is the cumulative total of all the capacities of all your withdrawals on one property. This includes all wells and surface water withdrawals. Kristy spoke about the registration, reporting, fees and permitting. Any questions can be directed to one of the following three venues. The website is <http://dnr.wi.gov/org/water/dwg/greatlakes/registration.htm> E-mail address is dnrwateruserregistration@wisconsin.gov and the phone number is 608-266-2299.



Todd Severud, Turtleback Golf & Country Club and Scott Schaller, North Shore Golf Club were on hand to receive their 25 Year Membership Plaques.



Monroe Miller with Michael Rzadski winner of the 2011 Monroe Miller Literary Scholarship given to the best student written article in the previous years *The Grass Roots*. Rzadski's article "Interns Can Learn A lot From Old Men" appeared in the January / February issue.

The final speaker of the day was Tom Emmerich of TJ Emmerich Assoc. Inc. Tom's presentation was on "Irrigation Systems, Renovate or Replace". He talked about the various factors that go into deciding whether renovating an irrigation system is a possibility or replacement of the system is the best alternative. Tom went in depth about all the aspects of an irrigation system from the fittings to the piping and sprinkler heads to the pumping stations.

After lunch the association had its annual business meeting. President of the association Jeff Millies presented the agenda for the meeting and his report. Chapter manager Brett Grams highlighted the activities of the association including par4 research updates. One of Wisconsin's very own, Steve Stricker has agreed to endorse Par4 research! Jim Vanherwynen presented the treasurer's report. Recipients of the 25 year plaques are as follows: James Crothers, Michael Kactro, Scott Schaller, Tod Severud, Randy Slavik, and Dan Williams. Congratulations to these gentlemen!

Danny Quast briefly spoke on behalf of the Wee One Foundation. The foundation, a tribute to Wayne Otto, CGCS, was formed to aid families in the golf course industry who face financial burdens due to medical issues. Since its inception the foundation has gifted over \$410,000.00 to those in need. The majority of the money raised comes from fundraisers and memberships in the Wee One Foundation. There year there will be four fundraisers held in the states of Wisconsin, Minnesota, Michigan and Virginia. More information is available at www.weeone.org This years golf fundraiser is scheduled for September 19th at Pine Hills Golf Course.



Tom Emmerich addressed the group on the factors that go into deciding on irrigation replacement or renovation.



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Golf and Luxury in Guatemala: Touring a New Pete Dye Course on the Side of a Volcano

By Paul Koch, Manager, Turfgrass Diagnostic Lab &
Dr. Douglas Maxwell, Professor Emeritus, University of Wisconsin - Madison

If Pete Dye can build Whistling Straits from a flat, clay airstrip near Sheboygan, WI then imagine the possibilities if Mr. Dye were given mountainous terrain, active volcanoes, and land overlooking the coastal plain towards the Pacific Ocean. There is no need to imagine, as the Pete Dye Signature design of the Fuego Maya 18-hole golf course at La Reunion Golf Resort and Residences opened just outside of Antigua, Guatemala in January of 2009 (Figure 1).

As part of a University of Wisconsin-Madison class trip to learn about tropical agriculture, UW Emeritus professor Dr. Doug Maxwell set up a side trip for us and his wife, Martha, to tour and learn about golf and golf maintenance in Guatemala. Our guides for the day were La Reunion Superintendent Edgar Marroquin and his mentor and consultant Greg Bozek, an American Superintendent at San Isidro Golf Club in Guatemala City (Figure 2).

As is the case at most golf courses around the world, nothing drives the maintenance at La Reunion more than the weather. At an altitude of 3,500 feet above sea level, the temperature remains remarkably consistent year round with daily highs between 70-80°F and nightly lows between 50-60°F. As Greg so aptly put, “it’s where turf goes to heaven.”

Other aspects of the climate in Guatemala aren’t so consistent, namely the moisture. As in most tropical regions of the world, there aren’t four distinct seasons but two; wet and dry. The dry season runs on average from November to April, while the wet makes up the remainder of the year. Because of its perch on a volcano facing the Pacific, La Reunion is subject to the winds blowing moisture off the ocean and then dumping rain as they blow up the side of the volcano. In the rainy season La Reunion averages an astonishing 300 inches of rain, while in the dry season a laughably low 3 inches.

As you would expect, this makes for vastly different irrigation programs in the two seasons. In the dry season, an average of 600,000 gallons of water are pumped per day. While in the wet, the system is run maybe 10 times over a 6 month period. One cost associated with the rainy season that might be a surprise to some is the cost of replacing irrigation parts due to lightening strikes. Since the course opened just over two years ago Edgar and Greg have had to replace 200 decoders, and they now budget \$20,000 per year to replace them.



Figure 1: ‘Fuego’ makes his, or her, presence known at La Reunion at all times



Figure 2: Our hosts for the day Edgar Marroquin (left) and Greg Bozek (center) posed with Dr. Doug Maxwell.



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Despite being a half world away, many similarities exist between golf course maintenance in Guatemala and Wisconsin. The maintenance shop could pass for any new shop in the U.S. (Figure 3), complete with Jacobsen equipment and staff boards that would make any American superintendent feel at home.

Putting surfaces at La Reunion were seeded to 'L-93', fairways and tees are 'Penncross', and the roughs are a mixture of Kentucky bluegrass and fine fescue. Surprisingly, not a blade of annual bluegrass was found amongst the playing surfaces. Target green speeds are approximately 9.5. Nitrogen fertilization averages 4-4.5 lbs of nitrogen per 1,000 ft² annually, the major disease is dollar spot, and white grubs are the significant insect pest. Throw in the fact that they spray Primo on a weekly basis and I could have described any number of maintenance regimes in Wisconsin and throughout the Midwest.

This isn't to say that maintenance is the same though.



Figure 3: The shop at La Reunion would make nearly any American superintendent envious.

Edgar and Greg have 48 employees at their disposal for an 18 hole golf course, paying a base wage of \$9.00 per day (minimum wage in Guatemala). With 300 inches of rain during the rainy season, excellent drainage is imperative to the quality of the course, and few things can impede drainage the way thatch can. In fact, thatch was the most significant problem encountered once the course opened.

A recommendation from Dick Psolla of Brookside Labs, New Knoxville, OH to use molasses to increase microbial activity in the soil has been extremely effective in reducing their thatch problem. Molasses is a product of sugarcane, which is a major export product of Guatemala and available in abundant (i.e. cheap) quantities just a few miles away. The molasses gets applied to all 18 fairways 4 times per year. Like any good thatch reduction program, topdressing is applied on a consistent basis. One hole is topdressed each day and upon completion of all 18 the process starts again with hole #1.



Figure 4: Tough to miss your tee time when you can beat the traffic by taking your helicopter to the course.



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Figure 5: A portion of the men's locker room at La Reunion.

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Obtaining turf and ornamental pesticides can also be more difficult, as your friendly soft goods representatives are not present in Guatemala. To bring in commonly-used pesticides like Daconil® or Merit®, an import license must be obtained for every single product, which is costly and time consuming. This overbearing process means pesticide applications are truly made only as a last resort, something that probably can't be said for most courses in the U.S. Oh and of course there is the issue of the active volcano, aptly named Fuego (or fire), which spews minor amounts of ash several times per day. According to both Greg and Edgar though, when a large release of ash covers much of the course it makes for great topdressing!

The contrasting styles of management reflected the varied backgrounds of our two hosts. Greg Bozek is an American who came to Guatemala 16 years ago after an invitation from a friend in New York. He oversaw the construction and grow-in at La Reunion, and still consults 2 days per week at the course in addition to his time at San Isidro GC. His style could be construed as old school, using the mantra “don't kill the turf” and preferring not to make it more complicated than that. Edgar Marroquin worked several jobs before entering the United States and obtaining a job at Chevy Chase Golf Club in Maryland.

Upon returning to Guatemala he worked on Greg's maintenance staff, rising to Superintendent following Greg's departure and now working with Greg on a regular basis. Edgar resembles the younger superintendents around today, nearly always responding to the crew and the clubhouse on his cell phone and doing his best to please a wide variety of demands in what is often a very demanding position.

While golf is certainly growing in popularity in many foreign markets, namely in Asia, it is still of relatively minor importance in Guatemala and most of Central America. La Reunion is one of six golf courses in Guatemala, and all cater to a relatively wealthy crowd. With a helipad to accept incoming golfers from Guatemala City an hour away (Figure 4), and a men's locker room that would be the envy of even some of your members (Figure 5), luxury rules at La Reunion.

In a country where a significant proportion of the population lives below the poverty line, pristine fairways and immaculate putting surfaces may seem a foolish waste of resources.



Figure 6: The private pool available in every hotel villa.



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A deeper look, though, shows that this public-private course provides jobs for local workers that pay significantly more than many other jobs available. Luxury in Guatemala can also be had at a relatively affordable price. Rounds of golf are \$150, though the course would easily surpass \$300 green fees in the U.S. Private hotel villas range in price but generally are priced around \$250-300 per night, and include amenities such as your own private pool, an outdoor shower where you can look up at Fuego, and access to the clubhouse facilities with a view from the patio that stretches out towards the Pacific (Figures 6, 7, 8, respectively). If you're looking to get away from another Wisconsin winter, this spot is tough to beat.

Dr. Maxwell and I would like to extend our sincere thanks to both Greg and Edgar for taking time out of their day to educate us and show us around the stunning property. For more information on the course and resort and play packages visit www.lareunion.com.gt/.

Where in the world is Dr. Maxwell?

Much of the Wisconsin turf industry fondly recalls working with Dr. Doug Maxwell for a number of years in the 1990's. It has been over a decade since he ran the UW's Turf Pathology program, and many are likely curious what he has been up to. Dr. Maxwell, Emeritus Professor of Plant Pathology and Interim Turfgrass Pathologist during the late 1990's still enjoys his golf contacts and even keeps up his 5 hole golf course at his farm, which is just a short drive west from the OJ Noer Turfgrass Research Center in Verona, WI. He retired from the university in July 2001 so that he could increase his international research activities supported by the US Agency for International Development

in the Middle East and Central America. These grants focused on breeding tomatoes for tropical plant diseases. During the time of these grants, Dr. Maxwell traveled to Morocco, Tunisia, Egypt, Israel, The West Bank of Palestine, Jordan, and many trips to Guatemala. From this effort in Guatemala, a small vegetable seed company, Semillas Tropicales S. A., was started in Antigua, Guatemala in 2004 and this company now sells commercial tomato hybrids that have been developed by Doug and his Guatemalan colleagues. His current activities include interactions with other seed companies such as Heinz Seeds and East West Seeds in Thailand. His grandchildren are getting older (11, 11, 13, 13) and he takes them on road trips to see the USA each summer. Nebraska was in 2010 and Colorado will be in 2011. Besides his activities with Tomato Breeding, Doug also serves as the Chair of the Technical and Advisory Committee for a large International grant on cowpeas and beans and this responsibility has taken him to Ecuador and South Africa in 2010.

Needless to say, Dr. Maxwell has kept himself busy since his "retirement." Despite his relatively short time running the UW Turfgrass Pathology program, Dr. Maxwell can still rattle off several golf course superintendents in the state and speaks fondly of his many experiences when he was with the turfgrass program. He wishes his friends the very best; and is especially proud of the turfgrass industry's continued support of the Turfgrass Diagnostic Lab, which he created with support from the Wisconsin Turfgrass Association in 1996. If you look hard at the next Summer Field Day, you just might see him checking out the latest research.



Figure 7: Why shower inside when you can shower outdoors and keep your eye on 'Fuego'



Figure 8: Through much effort, we were able to remove Dr. Maxwell from his perch looking over the valley.