

Course Consulting Service ON-SITE VISIT REPORT



Delray Beach Golf Club Delray Beach, Florida

Visit Date: April 18, 2017

Present:

Ms. Sharon Painter, CEO, JCD Sports Group
Mr. Tom Roegner, Assistant CEO and Operations Director, JCD Sports Group
Mr. Gene Garrote, CEO Partner, JCD Sports Group
Mr. Pete Arvantis, Corporate Superintendent
Mr. Mike Shields, Golf Course Superintendent
Mr. Tommi Ylijoki, Director of Golf
Mr. Todd Lowe, USGA Agronomist
Mr. Steve Kammerer, Director, Southeast Region, USGA Green Section

United States Golf Association

Steve Kammerer, Director/ Agronomist | Green Section | Southeast Region
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USGA Green Section Mission: The USGA Green Section develops and disseminates sustainable management practices that produce better playing conditions for better golf.

The USGA Course Consulting Service (CCS) is a not-for-profit agency free from commercial connections that provides the impartial guidance your facility needs to make informed decisions. Backed by the largest private turfgrass research program in the world and equipped with scientific tools, USGA agronomists are trained to thoroughly identify key issues and offer site specific recommendations. Having no financial interest in any products or services, we operate with autonomy, so that the interests of the individual golf course are our first and only priority.

This was my first CCS visit to Delray Beach Golf Club for the USGA. I consulted the report compiled by John Foy in 2015 for background information prior to this visit. Todd Lowe, another USGA agronomist, accompanied me. The USGA visits thousands of golf courses each year communicating successes while also identifying areas of concern. We are a vested partner in the success of each and every golf course we work with.

The visit started with a short meeting where areas of concern were discussed, in addition to discussing recent soil and water analysis reports and a recent disease sample diagnosis. Scouting of the golf course followed, focusing on problematic greens.

Much dialogue and discussions occurred during this CCS visit. This report focuses on the highlights, as it is impossible to capture everything we talked about. For items of interest that were discussed but not in this report, please feel free to contact me.

Executive Summary:

- Florida and golf course turfgrass quality is being negatively impacted by a drought
- Delray Beach Golf Club has incurred some damage to putting greens due to:
 - Mechanical problems with the irrigation pumping station over a six week period of time
 - Inconsistent delivery of irrigation water due to limitations of irrigation system
 - Likely salt accumulation in the root zone from lack of rainfall, reliance on irrigation with effluent water, and inability to periodically leach these salts with heavy irrigation cycles
 - Recovering from heavy nematode infestations prior to an Indemnify[®] nematicide application
 - Recovering from diseases such as Pythium
 - A shallow root system due to heavy organic matter build-up in the root zone (and afore mentioned nematode and Pythium damage)
 - Cyanobacteria colonization of thin areas
- Consistent putting green quality is limited by antiquated pumping irrigation system and mature turfgrass on putting greens

WATER QUALITY

Florida is experiencing continuing drought conditions since November of 2016 following an extraordinary wet El Niño fall and winter in 2015 (see [12 Things You Should Know About El Niño](#)). Going from one extreme to another on a golf course requires constant diligence and switching of priorities and maintenance practices.

Water and irrigation efficiency, or lack thereof, becomes inherently pronounced under long periods of drought. Such is the case at Delray Beach Golf Club. Many golf courses in Florida utilize effluent, recycled water. It is important for golf courses to continually monitor this water, as its properties can fluctuate (see [Effluent Water: Nightmare or Dream Come True](#)).

The results of the two water analysis reports presented during our meeting had sodium and adjusted SAR levels that are slight to moderate in regard to restrictions for turfgrass use. Sporadic rainfall or occasional use of another water source helps to dilute or minimize any detrimental effects associated with continued reliance on this sole water source. Under drought conditions, continued irrigation without flushing or leaching with heavy irrigation events results in salt accumulation within the root zone. This can have a negative effect on root health, growth, and the efficiency with which turfgrass can take up water and nutrients. The USGA has funded research in this area that can be helpful in Florida, especially during these drought conditions (see [Using Recycled Water on Golf Courses](#)).

While sodium, salts, and bicarbonates can negatively affect turfgrass health, an efficient irrigation system with uniform coverage and high volume capacity can periodically flush or leach these salts out of the root zone. Unfortunately the irrigation system at Delray Beach is old, with limited capacity and questionable coverage. The putting greens at Delray Beach Golf Club are past their prime, containing a high level of organic matter, which adds to the complication of flushing salts through the root zone.

With the irrigation water quality concerns, it is important to treat the soil with amendments to maintain excellent plant health. Use of gypsum, wetting agents, micronutrient packages and sand topdressing, coupled with the current needle tine venting, is being performed on a regular schedule to alleviate stress.

PUTTING GREENS:

The putting greens are the primary concern at Delray Beach Golf Club. A number of greens exhibited varying levels of turfgrass loss. Ms. Painter and Mr. Roegner inquired as to: 1) what was the principal reason behind the turfgrass loss, and 2) what can be done to rectify the problem. Putting green maintenance and turfgrass quality is different from golf course to golf course and most often is due to more than one factor. Such is the case at Delray Beach. The environment (drought), limitations of the current irrigation system and age of the putting greens all contribute to the turfgrass problems.

Stresses

There are approximately 65,000 rounds of golf played each year. While this is great to see, this is also a major stress on turfgrass health, causing turf wear due to traffic and compaction.

After taking profile samples from putting greens on Holes 1, 6, 7, 8, 10 and 16, turfgrass areas that were thin or dying were discovered to be very dry. It was communicated that the pumping station was down or operating below capacity for six weeks up until the 14th of April (four days prior to our visit). Some of these areas may require resodding.

There is likely an accumulation of salts, sodium and otherwise in the root zone as a result of little rainfall and the inability to flush the greens as needed due to the limitations of the existing irrigation system.

There are also some irrigation delivery and coverage issues. While investigating a weak localized area on the putting green of Hole 16, it was found the area was outside the range of three irrigation heads and was powder-dry.



Picture 1: Putting green Hole 16 exhibiting localized patterned area of declining, dying turfgrass

It was communicated that this area had experienced problems in the past and had been resodded. Such special care was taken prior to laying the sod that the problematic organic matter was removed and fresh mix added. Inadvertently this created a soil profile with less organic matter that is more prone to drying out,

compared to the adjacent areas. This was apparent upon taking a soil profile, bridging a healthy area with a line of dying turfgrass (see [picture 2](#)). Two of the three heads did not arc over this area. The center head closest to this area threw the bulk of its water over the damaged turfgrass, while a shorter tail stream of water missed this area as well.

Nematodes

The golf course has a history of nematode problems. Until the later part of 2016, there were few options for nematode control (see Appendix A for more information on nematodes and control options). Indemnify has given the most consistent beneficial results on golf courses visited. This product was just applied three weeks prior to our visit and a positive response was observed. As a nematode damaged root system is more apparent under dry conditions, this additional biotic stress is also affecting the ability of the turfgrass to recover.



Picture 2: Comparison of soil properties of dying square of previously laid sod (right portion of profile) adjacent to existing soil

Putting greens maturity

The greens were regrassed with TifEagle® bermudagrass in 2002. While there is no standard lifespan for bermudagrass greens in the Florida environment, there is approximately 0.5 inches of organic matter that accumulates every year. For

this reason, routine core aeration along with solid pencil tine aeration and subsequent sand topdressing is essential in keeping the organic matter diluted. The putting greens at Delray Beach Golf Club exhibited a deep zone of organic matter which affects oxygen levels, drainage and water percolation (see [picture 3](#)). The depth of organic matter is beyond the depth of the hollow tines, limiting their benefit in improving percolation. In the perimeter areas where lateral movement of water off the green is impeded by raised collars from years of sand topdressing, these areas hold water and typically will thin first and underperform compared to other areas.



Picture 3: Putting green profile down slope on putting green Hole 6 exhibiting over 8 inches of organic matter and a black layer accumulation at the bottom

Putting greens with deep layers of organic matter are also more susceptible to diseases like Pythium blight and root rot. Delray Beach Golf Club was diagnosed with Pythium blight in March, and this is just another contributing factor to the weak areas observed.

Some of the older damaged areas of putting greens such on Hole 8 exhibited cyanobacteria colonization, sometimes termed black algae. Cyanobacteria are not algae or fungal and as such do not respond well to most fungicides. Their colonization exacerbates turfgrass recovery, as an impermeable mat develops, limiting water penetration to nearby turfgrass roots. See Appendix B for more information.

Recommendations:

1. The existing irrigation system should be evaluated via an irrigation audit to identify problem areas, and in longer term, planning for irrigation modifications or replacement.
 - a. Mr. Russell Geiger, 239.571.4619, rgeiger@hydrologic-irr.com, started in this business following years of experience working as a superintendent.
2. A soil moisture meter such as the [FieldScout® TDR](#) is needed to monitor and identify dry areas in need of increased irrigation.
 - a. Quick couplers added to the irrigation system improves the ability to hand water dry areas not adequately covered by the existing irrigation heads.
3. At least two putting green core analyses are recommended to fully identify percolation and performance of the existing putting greens. Be careful to select areas undisturbed by sod replacement, where the existing mix from the 2002 regrassing was not impacted.
 - a. See information for methodology and submission for sample analysis at [Turf & Soil Diagnostics](#).
4. Utilize a DryJect® application to force sand deep into the organic mat layer to improve aeration and percolation beyond the typical hollow tine aeration.
5. Perimeters impacted by sand dams should be addressed to improve lateral water movement off of problem greens (see [Level Collars Improve Playability and Turf Health](#) for more information).
6. Treat greens colonized by cyanobacteria with sequential applications of a hydrogen peroxide product. See Appendix B for additional information and directions on removing existing infestations. Treat prior to sand topdressing.

FAIRWAYS

The fairways at Delray Beach Golf Club, like most golf courses that have had bermudagrass for many years, is a mixture of hybrid and common bermudagrass. It was communicated that many of the fairways are high in sand and drain quickly. However, in other areas there are higher areas of organic matter (see [picture 4](#)). This organic soil is beneficial during dry periods, as it holds water and fertilizer longer than sand. However, during periods of heavy rainfall, these areas can be slow to drain and are soft. Depending on golfer demands, core aeration followed by heavy sand topdressing can help improve drainage and ball roll in these heavier organic matter areas, especially during wet periods.

Goosegrass infestation was present along the edges of the fairways following sequential applications of Specticle® herbicide at 4.5 ounces per acre every 90 days. Specticle at labelled rates can cause damage on soils high in sand, so this sequential approach helps alleviate this risk. With the high levels of organic matter on some of the fairways and adjacent roughs, the herbicide, which is fairly water soluble, could have moved laterally resulting in higher areas lacking in control. As goosegrass has a wide window of germination, the 90 day timing may have resulted in some breakthrough.

Golf courses in the south with similar concerns are utilizing multiple low rate applications of Specticle, four applications at 3.0 ounces, each spaced 45 days between applications (between late April to October). For existing goosegrass, with the loss of MSMA, control has become more difficult and expensive. Sencor[®], Illoxan[®], Surge[®], and Revolver[®] have given the most consistent results. Combining 20 ounces of Revolver with 2 ounces of Dismiss[®] has performed well for postemergence control of goosegrass with minimal phytotoxicity risk. [Tribute[®] Total](#) is very effective, as is a lower cost alternative promoted as (Princep[®] + Tenacity[®] + Pennant Magnum[®]). These two options should be used with caution, as some transient phytotoxicity is possible.



Picture 4: Soil profile of fairway of Hole 1

Mites, a rare occurrence on bermudagrass, are being observed on many Florida golf courses due to the extremely dry conditions. Mites were observed on many areas at Delray Beach Golf Club. Loss of turfgrass is rare, but localized affected areas exhibit witch-broom, chlorotic growth of new bermudagrass tissue. There are few to no products labeled for mite control on bermudagrass because they are seldom a problem. Syngenta has recently received a [Divanem 2\(ee\) label](#) for mite control on bermudagrass.

CLOSING STATEMENTS

Budgeting capital expenditures for irrigation replacement versus repair or updating, and putting green renovation, would remedy some of the continuing problems experienced on the putting greens at Delray Beach Golf Club. The combination of mature greens, heavy organic matter build-up and reduced drainage, coupled with irrigation limitations, collectively limits the performance and consistency of the putting greens. The continuing costs of resodding, labor, heavy fungicide use, and limiting the price ceiling for golfers

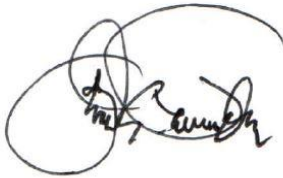
should be weighed versus the cost of these capital improvements. Putting green renovation can be a major undertaking that requires diligent planning to ensure long term performance and consistency. An option of a partial renovation of some of the putting greens versus doing the entire golf course was discussed. Most golf courses renovate all 18 greens at the same time, as piecemeal renovation of some greens but not others presents additional problems such as:

- Different irrigation and surface management practices
- Different fertilization and disease management practices
- Risk of contamination of new greens with off-type bermudagrass from old putting greens through the movement of equipment (core aerifiers, groomers, mowers, etc.)
- Movement and inoculation of new greens with pests and diseases such as nematodes from older greens
- Potential variability in play (ball-roll, impact, bounce, etc.)

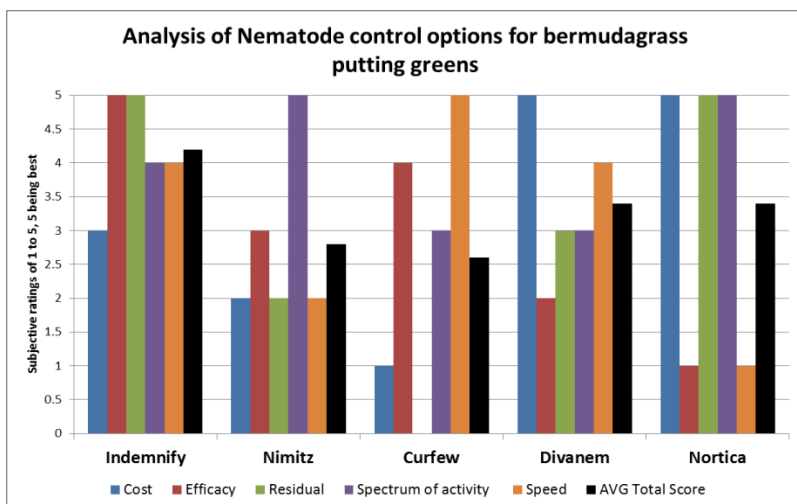
If Delray Beach Golf Club were to decide to plan a renovation, you are encouraged to contact me for additional information on what questions to ask and services to request before deciding which turfgrass and sprig supplier to use.

I enjoyed the opportunity to visit and discuss your golf course maintenance operation at Delray Beach Golf Club. When a golf course commits to a USGA CCS visit, they are invited to contact us anytime throughout the year for additional advice or assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven J. Kammerer", with a large, loopy flourish above the name.

Steven J. Kammerer, Ph.D.
Director, Southeast Region, USGA Green Section



Turfgrass Parasitic Nematodes – Control options for bermudagrass putting greens

- There are a limited number of effective nematicides available for use in turfgrass
- No one nematicide controls all parasitic nematodes of significance
- Planning should start with:
 1. Quantifying impact of nematodes on turf performance, health (roots)
 2. Soil sampling using good methodology (see [General and Mist Extraction](#)) to determine nematodes of significance
 3. Budget, as costs can be significant

Long term (2 – 5 year) Nematode Control Strategies:

- Treat only when necessary:
 - Based on sampling and [nematode analysis](#), 2 to 4 times a year (based on growing season)
- Monitor for significant increases in any one nematode species – adjust treatments accordingly
- **Resistance Management – Indemnify®** (fluopyram is an [SDHI, FRAC Code 7](#) with medium to high resistance risk, over 12 pathogens with confirmed resistance):
 - Do not apply more than 5 to 6 SDHI chemical applications in 1 year (including Indemnify)¹
 - Emerald®, Exteris®, Honor®, Kabuto™, Lexicon®, Prostar®, Velista®, Xzemplar®
 - Carefully consider when these products are most useful and position them accordingly
 - Ex's: Spring Dead Spot, take-all or bermudagrass decline, Fairy ring, Rhizoctonia leaf and sheath spot (*R. zeae*)
 - Do not apply more than two SDHI materials sequentially before alternating to different chemical class active against same disease
 - Ex's: [Qol or strobilurin fungicides](#) FRAC Code 11, or DMI's (FRAC Code 3)
 - **FOR NEMATODES ONLY** - Do not apply Indemnify more than three times (over 1 to 2 years) without alternating to another nematicide. Should be based on nematodes of priority:
 1. Nimitz® has good overall spectrum of efficacy and systemicity as alternation (should make 3 applications)
 2. Curfew® is excellent knock-down but residual and lack of control of lance and root-knot nematodes inside roots are weaknesses
 3. Divanem® has good activity on root-knot and sting, but lack of systemicity and movement through thatch to soil limits coverage (good in conjunction with Indemnify)
 4. Nortica® can help alleviate some of the population pressure [if application is timed correctly](#) (good in conjunction with Indemnify)

• Cultural Practices:

- Reduce overall stresses such as:
 - Shade
 - Low mowing height
 - Drought stress – ensure good irrigation coverage
- Maintain balanced fertility (avoiding over-use of nitrogen)
 - Avoid excessive plant growth regulator use as substitute for fertilization
- Ensure good oxygen penetration to root system
 - Keep organic matter diluted with frequent hollow and solid tine aeration

• Nematode Control Products:

- Indemnify – a good overall nematicide to build program around (see analysis chart):
 - Strengths include efficacy and residual, disease control side benefit
 - Weaknesses are poor control of lance nematodes and cost
 - Belongs to SDHI chemical class:
 - Resistance may be impacted by fungicides in same chemical class
- Nimitz - systemic, activity on lance, granular is easy for spot treatments
 - 3 applications recommended
- Divanem – low water solubility, activity limited to top 1.5 inches of soil only, but good on root-knot and sting nematodes
 - Four applications every 2 weeks at 6.25 fl oz/Ac
- Curfew - fumigant with quick knock down of most ectoparasitic nematodes

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¹Exteris is a combination fungicide product awaiting registration and containing fluopyram, the same active ingredient in Indemnify.



Cyanobacteria colonization of putting greens

- Cyanobacteria are usually introduced and establish on golf course putting greens from irrigation ponds.
- Mancozeb and chlorothalonil products were tested in [trials in 1997](#) and found effective, but rates of these products have since dropped significantly, reducing their curative effectiveness.
- Hydrogen peroxide based products applied on short intervals (7 to 14 days) have been the most effective and economical means of controlling existing populations with a high degree of turfgrass safety.

Educational Tips for Success:

- Modify cultural practices first
- Some fungicides, especially systemic fungicides and those with PGR side effects, can lead to increased cyanobacteria colonization
 - If problem is pervasive, substitute or alternate to contact fungicides containing chlorothalonil or mancozeb for prevention
- Utilize hydrogen peroxide (dioxide) products for curative control
 - Hydrogen peroxide is an oxidizing agent, so it is important to apply these products as quickly as possible following their addition to the spray tank (water)
- Apply fungicides with nozzles that deliver coarse to very coarse spray particles and at spray volumes of 2 gallons per 1,000 ft² to maximize soil coverage (see [Spraying for Success](#) for additional information)

Cyanobacteria or blue-green algae

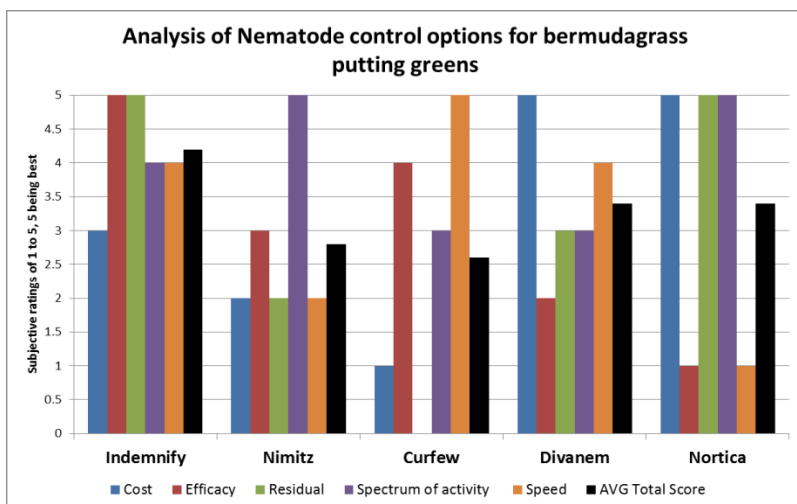
- Sometimes referred to as algae or algal slime
- Not a pathogen but an opportunistic colonizer of close-cut putting greens
- Can “seal” soil surface, preventing water penetration into soil (hydrophobicity) for turfgrass roots
- Produce toxins which can slow recovery
- **Symptoms:**
 - Black or greenish-black mats under turfgrass surface or in canopy
 - With high powered hand lens, green tendrils apparent under leaf sheaths
- **Conducive environmental conditions:**
 - high and prolonged surface and soil moisture
 - high nitrogen and phosphorous levels
 - high shade, limited air movement

Cultural Practices:

- Frequent aeration to promote venting, drying and to facilitate drainage
- Prevent collar sand “dams” that impede surface drainage from green
- Avoid high levels of readily-available nitrogen or phosphorous
- Prevent turfgrass loss from other diseases, nematodes, insects or scalping
- Frequent sand topdressing helps shade out low-levels of cyanobacteria
 - Perform after fungicide applications

Fungicides:

- Prevention:
 - Mancozeb products such as Fore® or Dithane® at highest rates every 14 days
 - Chlorothalonil products such as Daconil® at highest rates every 14 days
- Curative (and preventive):
 - Hydrogen peroxide products such as ZeroTol® or JetAg®
 - ZeroTol 2.0 at 3 – 6 fl oz/1000 ft² every 7 days (curative) at 2.0 gallons spray volume, 14 days preventive



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