THE HEAT IS ON

The first decade of the 21st century has seen ultradwarf bermudagrass varieties replacing bentgrass on putting greens in the Southeast.

BY CHRIS HARTWIGER

The motto of the Olympic games is "Faster, Higher, Stronger" (Citius, Altius, Fortius), but it could also apply to the selection of grasses on putting greens in the Southeast Region. Dating back to the early days of golf, the unique climate of the southern portion of the transition zone has never been an ideal fit for either bentgrass or bermudagrass for putting greens, nor has it excluded either species. The result has been an evolution of regrassing putting greens with improved grasses. The lineage roughly follows this pattern dating back to the early 1950s: common bermudagrass, Tifgreen, Tifdwarf, Penncross, more heat-tolerant bentgrasses, and ultradwarf bermudagrasses. Breeders develop the varieties, university researchers and superintendents perfect the management, and ultimately golfers determine which varieties come or go. And the process continues today.

The period since the early 2000s has seen the emergence of the ultradwarf bermudagrass varieties in the region. While the earliest adopters of the ultradwarfs were converting greens from Tifdwarf or Tifgreen, the period since 2005 has seen an acceleration in the number of courses removing their bentgrass putting greens and replacing them with ultradwarf bermudagrasses. Why is this occurring? There are several catalysts that led courses to consider and select ultradwarf bermudagrasses for their putting greens.

- Improved wear tolerance eliminates the need to overseed.
- Ability to peak the entire golf course at the same time. This is desirable for hosting important golf events in hot weather months.
- Management focus is shifted from multiple months of life support with bentgrass to a focus on playability.
- Fewer inputs (fans, fungicides, etc.) and fewer dollars spent compared to bentgrass for most courses.

The first courses to make the switch were ones that chronically struggled to keep bentgrass alive. They were not seeking perfection, simply wanting live grass by the end of the summer. The second wave is happening now, and they are the upper-end courses that desire to produce high-level golf conditions in the summer months. They want to provide the combination of higher green speeds and firmness that bentgrass greens cannot provide in the summer. The third group are courses looking to find a grass that meets golfer expectations on as low a budget as possible, and the ultradwarfs are filling this niche.

As the momentum of regrassing increases, superintendents face the challenge of learning the management of ultradwarf bermudagrass. Green committees and course officials familiar only with bentgrass need to be aware of the skills, tools, and maintenance calendar necessary to make ultradwarf successful. Fortunately, the early adopters and university researchers have helped hone the skills and practices necessary for success. We have learned that the method of management is just as important, if not more so, as the budget alone.

In addition to mowing, regular use of vertical blades to groom or lightly vertical mow is beneficial to surface quality over the long term. If vertical mowing is done too deeply, the healing time will be extended.

This article is dedicated to courses considering a change from bentgrass to ultradwarf in the transition zone. It is structured in two parts. The first part highlights the most common problems to avoid and solutions to assist, if these problems occur. The second part describes key practices that must be well executed to have a successful ultradwarf bermudagrass putting green.

PITFALLS TO AVOID

Overseeding

Problem: For decades, overseeding was a staple on Tifgreen and Tifdwarf bermudagrass putting greens, the goal simply being to provide a good putting surface in the winter and spring months. In most of the region, Tifgreen and Tifdwarf did not have the wear tolerance to provide an acceptable putting surface on courses with heavy winter and spring play. The downside of overseeding was and still is the significant disruption to the golf experience in the fall and during the transition in the spring. These courses become caught up in a late spring/early summer cycle of 1) fertilize heavily through June, July, and August to fill in bare areas after the overseeding died; 2) aerate heavily in midsummer to mitigate all the organic matter deposited by the overseeding and bermudagrass base; 3) fertilize heavily to recover from aeration; and 4) mechanically prep the greens for overseeding again in early fall. No wonder so many clubs jumped to bentgrass when pioneering superintendents proved they could keep bentgrass alive during the summer months!

This soil profile is now more than eight years old. The green was constructed using straight sand, and management was difficult until some organic matter had accumulated in the upper rootzone.

Solution: There are several reasons not to overseed an ultradwarf. The first one is its improved wear tolerance due to the more stoloniferous growth habit of ultradwarf grasses. Champion bermudagrass is a good example. Champion has 93 percent greater shoot density than Tifdwarf, and the number of stolons for Champion is 2.6 times greater than Tifdwarf and 2.8 times greater than Tifgreen (Beard and Sifers, 1996). A wear study showed Champion to be far more wear tolerant than Tifdwarf, with 32 percent more surviving green leaves and shoots than Tifdwarf after 1900 revolutions on a wear simulator (Beard and Sifers, 1996). In the field, all the ultradwarf bermudagrasses hold up well under winter play, assuming there are not compounding stresses such as shade.

A second reason not to overseed is nitrogen management. For overseeding to be successful, it is fertilized at a time of the year not beneficial for the bermudagrass base. All the nitrogen is not released during the overseeding period, and residual nitrogen released the next summer is likely to give the superintendent problems with unwanted growth.

A final reason to avoid overseeding is the elimination of shade, and details are included in the next section.

Shade

Problem: Whether sunlight is blocked by clouds, trees, or taller turf, reducing light quality and length will take its toll on ultradwarf bermudagrass. Too much shade will make it difficult, if not impossible, to produce desired conditions. The symptoms of excess shade are not hard to spot: thin turf that is not able to withstand and recover from stressful events, including golfer and equipment traffic, turf diseases, and routine cultural practices such as mowing, grooming, and core aeration.

Regular topdressing will smooth the surface and aid in dilution of organic matter.

Solution: Assessing how much shade is too much is difficult for golf course superintendents who are making the switch from bentgrass to ultradwarf bermudagrass. Although results from Dr. Grady Miller indicate that "TifEagle and Champion bermudagrass are capable of sustaining quality better than other dwarf grasses," superintendents converting from bentgrass to bermudagrass need to remember that bentgrass has better shade tolerance than ultradwarf bermudagrass (Miller and Edenfield, 2002). If shade is a problem on a bentgrass putting green, it is a given that the problem will be magnified with an ultradwarf putting green. However, there are sure to be other marginal areas where shade is likely to influence an ultradwarf putting green. What is a golf course to do? The following observations from the field and research results can help.

- Increase the quantity and quality of light a putting green receives through selective removal of trees. Dr. Bert McCarty and Todd Bunnell found that a minimum of eight hours of sunlight is required to provide acceptable turf quality in TifEagle bermudagrass in a Clemson research project (Bunnell and McCarty, August 2004). They also found that 12 hours of sunlight was optimal for an ultradwarf bermudagrass (Bunnell and McCarty, October 2004).
- There are situations where no more trees can be removed and sunlight is still limited. Bunnell and McCarty found that applications of the plant growth regulator Primo and an increase in mowing height improved the quality of TifEagle bermudagrass (Bunnell and McCarty, October 2004).

Extremes in Nitrogen Fertilization

Problem: Memphis Country Club has a reputation for some of the finest ultradwarf bermudagrass putting greens in the region. When discussing management strategies, Memphis Country Club superintendent Rodney Lingle commented that ultradwarf bermudagrasses are much more efficient users of nitrogen than their predecessors, Tifgreen and Tifdwarf. In other words, a little nitrogen goes a long way. This is confirmed in the field by far more frequent observations of mower scalping than lean, off-color putting greens.

Too much nitrogen is easy to identify because mower scalping will occur, and it can occur quickly. Many times an employee will report back to the maintenance facility that something must be wrong with the mower because it is scalping severely. Usually the mower is fine, but the growth of the grass has accelerated to the point of scalping. Mild cases of scalping can be detected on the downhill side of the mower pass when mowing on a slope.

Too little nitrogen is more difficult to identify. Typically, color will be poor, although if iron, magnesium, or manganese have been applied recently, color may not be the best indicator. Density may become more open, and there will be slower recovery from mechanical stress.

Solution: How much nitrogen to use each year depends on multiple factors, including rootzone

Plenty of leaf tissue, but few stems will be brought up when grooming or vertical mowing is done at the proper depth.

nutrient holding capacity, the length of the growing season, seasonal rainfall, and desired level of playability. Refer to the section on nitrogen management for details.

Poor Quality Water

Problem: Poor quality water is a major hurdle to anyone hoping to successfully manage ultradwarf bermudagrass. Elevated levels of sodium, soluble salts, and/or bicarbonates all can cause serious turf quality issues. Books have been written about the impact of water quality on turf, and if your golf course has poor water quality, careful study and analysis are needed before selecting an ultradwarf.

Solution: The most effective option to overcome poor water quality is to find a better water source for the putting greens, but this may not be possible in most cases. Because of the complexity of this topic and the constraints of space, a list of references for further study is noted below. In extreme cases, ultradwarf bermudagrass may not be sustainable and it may be advisable to consider seashore paspalum.

Carrow, R. N., M. Huck, and R. R. Duncan. 2000. Effective use of seawater irrigation on turfgrass. *USGA Green Section Record.* January/February. 38(1):11-17.

Carrow, R. N., M. Huck, and R. R. Duncan. 2000. Effluent water: Nightmare or dream come true. *USGA Green Section Record.* March/April. 38(2):15-29.

Carrow, R. N., M. Huck, and R. R. Duncan. 2000. Understanding water quality and guidelines for management: An overview of challenges for water usage on golf courses for the 21st century. *USGA Green Section Record.* September/October. 38(5):14-24.

Carrow, R. N., M. Huck, and R. R. Duncan. 2000. Leaching for salinity management on turfgrass sites. *USGA Green Section Record.* November/December. 38(6):15-24.

Carrow, R. N., and R. R. Duncan. 1998. Salt-affected turfgrass sites: Assessment and management. Ann Arbor Press, Chelsea, Mich.

Construction Issues: Straight Sand Rootzone and Variable Mix Depth

Problem: In this section there are two rootzone issues to deal with. Variable mix depth describes a condition in a single putting green where the depth of the rootzone mix varies significantly throughout the putting green cavity. The depth of the rootzone mix has a big impact on the amount of water that will be held at field capacity. The USGA Guidelines for Putting Green Construction recommend a rootzone of 12 inches. Deeper rootzone mixes have a higher gravitational head and will hold less water, thus being prone to droughtiness. Shallower rootzone mixes will hold more water and be prone to excess wetness. Both shallow and deep mix can exist in a single putting green, making water management difficult.

A second rootzone issue for ultradwarfs is a straight sand rootzone mix. Straight sands typically have low nutrient holding capacity (CEC) and low water holding capacity. Research at Clemson University on ultradwarf establishment in greensmixes with differing water holding capacity found that the length of establishment increased on a mix with a blend of 95:5 sand/peat mix compared to mixes with 85:15 sand/peat. This is confirmed in the field, as superintendents experience difficulty managing water and nutrients in straight sand or near straight sand rootzone mixes.

Solution: Variable mix depth must be dealt with through irrigation freqency and quantity. Absent rainfall, the two greatest influences on soil moisture are the uniformity of coverage by the irrigation system and the depth of the rootzone mix. It may be beneficial to conduct an audit of irrigation coverage and a study of rootzone depth for each putting green. Although time consuming, it is important to know the areas of the green that receive more or less water than desired and how they match up with shallower or deeper areas of rootzone mix. Set up irrigation cycles based upon the wettest areas on each green. It will be necessary to add supplemental hand watering to provide an appropriate amount of water for the ultradwarf plants.

The difficulty in managing a straight sand rootzone will become less over time, as more

organic matter is deposited from plant growth. Some have achieved success by adding amendments to increase nutrient holding capacity.

Mechanical Injury

Problem: One of the go-to maintenance practices of Tifgreen and Tifdwarf bermudagrass varieties was an aggressive dethatching once or twice a season. The putting greens would appear destroyed, but with a shot of fertilizer, water, and warm weather, the putting greens came back thicker and denser than before. Ultradwarf bermudagrass varieties do not like this type of treatment at all, and they will rebel in the form of extended recovery and bumpy surfaces for several *months*. Research by Dr. Wayne Hanna of the University of Georgia showed that despite differing rates of nitrogen or plant growth regulator, aggressive dethatching required a minimum of at least six weeks of recovery. This is too much recovery time, given the requirements of play.

Solution: Aggressive dethatching is not advised. Refer to the section on surface management for alternatives.

KEY PRACTICES

With a few hurdles out of the way, the final section discusses several key practices that are the basis for excellent ultradwarf bermudagrass putting greens. Superintendents who can refine these practices over time, in response to results on their golf courses, will be rewarded.

Frequent Watering

This may be a shock to many and heresy to others, but it doesn't take long to dry down in the top inch. Ultradwarf bermudagrasses are shallow-rooted, and most observed in the Southeast have root systems of two inches or less, with a predominance of roots in the upper inch. Also, the density of many ultradwarf stands is incredibly tight, and it is common to see water running off slopes and not into the soil. The best results in the field result from superintendents watering their ultradwarf putting greens every day or two during the growing season.

Frequent watering does not have to mean overwatering. Set up the irrigation cycles relative to the wettest portion of each green. Hand water slopes and chronically dry areas. Use wetting agents, too. Research at Clemson University and in the field has shown that wetting agent use does improve ultradwarf turf quality on sand-based rootzones (Martin and Camberato, 2002).

Mowing Practices

The quality and attention to detail of a mowing program has a profound impact on the quality and playability of an ultradwarf bermudagrass putting green. Once thought to be the domain of walking mowers only, there are numerous courses in the region that have achieved their standards with triplex mowers. Given the difficult economy, this number is certain to increase in the years ahead.

Hand watering remains an integral part of an ultradwarf management program.

Regardless of mower type, keep several considerations in mind. First, ultradwarf bermudagrasses do perform well at low heights of cut when the weather is cooperative (temperatures and adequate sunlight). Leaf texture and density appear to improve as the height of cut moves down. However, as height of cut moves down,

the amount of work behind the scenes increases dramatically. A few factors to consider as mowing height is decreased are included below.

- More skill, precision, and time are necessary to set up the mowers, requiring the mechanic to allocate more of his time to mowing equipment. It may mean that the mechanic must delegate other tasks.
- Inconsistencies in a mower are magnified when it is used on a putting green.
- Sharpness becomes more important. More time will be spent on bedknife and reel sharpening and adjustment.
- At lower heights of cut, more sand will be picked up, necessitating the use of backup mowers after topdressing or requiring more time on reel and bedknife maintenance.
- Expenditures for parts will go up.

Rotary brushes on a walking mower are a good tool to promote upright growth and minimize the impact of grain.

An excellent summary of the considerations for long-term success can be found in an article by Tom Cowan called "Going Low with Ultradwarf Bermudagrass Putting Greens," which appeared in the November/December 2001 issue of the *Green Section Record*.

Surface Management

As noted earlier, aggressive vertical mowing or dethatching is not advised. When most superintendents think of the practice of vertical mowing, a corrective practice is brought to mind. Instead of waiting for a situation to occur that would warrant a corrective practice — in our case an excess of undiluted mat at the surface — success can be achieved by a preventative approach through frequent grooming. Grooming in this article refers to the depth of the blades, not the equipment used. Frequent grooming helps reduce the influence of grain and results in additional clipping removal by a follow-up mowing. The three-step regimen of 1) a morning mow, 2) light grooming with vertical mower blades on a triplex mower, and 3) a second mowing, has worked well in the field. Small, shallow channels may be noticeable, but they are not disruptive to play and not injurious to the turf because the depth is so shallow. The grooming practice helps stand up the grass between the small channels, and the second mowing is effective in removing even more clippings without an adjustment in mowing height. These channels also aid in future light topdressing incorporation. For a more complete discussion of this topic, refer to an article by John Foy of the USGA Green Section that appeared in the January/February 2008 issue of the *Green Section Record*.

Organic Matter Dilution

It has been said that the solution to pollution is dilution. The same can be said for organic matter management in the upper rootzone. Core aeration, surface sand topdressing, and judicious nitrogen applications are tools for managing the buildup of organic matter in the rootzone. Long-term success with any putting green in the region must include an appropriate core aeration and sand topdressing program.

A popular trend in the region, and one that is sound agronomically, is to complete all core aeration on one date in July or August, using a technique known as *close center aeration*. Either the putting green is aerated twice on two-inch centers, or an aerator with variable spacing is used to create a comparable number of holes per square foot. All disruptive aeration is performed on one date, which is far friendlier to the business of golf than multiple aeration dates. A more detailed discussion of this topic can be found in the article "Aeration and Topdressing for the 21st Century" that appeared in the May/June 2004 issue of the *Green Section Record*.

Use of Plant Growth Regulators and Wetting Agents

Trinexapac ethyl (Primo) continues to be the most popular plant growth regulator used on ultradwarf bermudagrass putting greens and is a staple on most of the best ultradwarf putting greens observed in the region. Primo is used to reduce the vertical growth rate and, in doing so, clippings are reduced and a higher quality of cut is achieved. Further dwarfing of the grasses occurs, with Primo producing an even tighter, denser surface. University research has documented some of these benefits, too (Bunnell and McCarty, 2004).

Wetting agent use is more sporadic throughout the region. The results of two studies are worth noting with respect to wetting agent use. Drs. Camberato and Martin at Clemson found that wetting agent use is appropriate for optimum turfgrass quality and localized dry spot avoidance. Dr. Keith Karnok (University of Georgia) offered two comments in a recent article that should get the attention of everyone who manages a sand-based rootzone. The first comment is, "Our research has shown that most sand-based rootzones 18 months or older will have some degree of soil water repellency." Also, "Research has shown that if water-repellent soil is found in one portion of a turfgrass area — in this case a green — almost without exception, soil water repellency will be present throughout the green even though localized dry spots may not be apparent." These are compelling arguments for the use of wetting agents.

Nitrogen Management

Managing the rate of growth appropriately has a major impact on playability. The most practical and successful approach observed in the field is to make an early season, slow-release nitrogen application to provide a small and predictable background level of growth. As the temperatures warm up, begin to spoon feed small amounts of nitrogen every 7 to 14 days to bring the growth rate of the grass in line with expectations. Start with smaller quantities, and if some scalping appears, back off. If vigor or growth response is not fast enough, gradually increase the spoon feeding amounts.

CONCLUSION

Managing ultradwarf bermudagrass in the transition zone requires a solid understanding of turfgrass management fundamentals, but it also requires the artistry of a craftsman. For superintendents who are switching from bentgrass putting greens to ultradwarf, less time will be spent on turf survival techniques and more time will be available for creating the best playing surface possible. Several stumbling blocks were presented in the first part of the article, and avoiding them is a great first step. The remainder of the article presented several key areas that will form the basis of the management program. Think of these areas as a path to success and a destination that will not be reached. Each season, it is likely that small modifications will be made based upon previous results. With diligence and an awareness of solid fundamentals, the new horizon will lead to a bright day for superintendents and golfers.

As an agronomist in the Southeast Region, CHRIS HARTWIGER *has the luxury of being able to hone his golf game on both bentgrass and ultradwarf bermudagrass putting greens.*

Winter wear tolerance of ultradwarf bermudagrasses is strong enough that overseeding can be avoided. The putting green in the foreground has been painted to add color. The green in the background is in the process of being painted.