Tokens

According to **OSBORNE COINAGE**, laboratory studies show that copper alloys, including brass, bronze, copper-nickel and nickel-bronze have natural anti-microbial properties. In controlled tests, the company states, 99.99 percent of bacteria were killed within two hours of contact with copper alloys. TokensDirect, a division of Osborne Coinage Co., offers a full line of tokens through their online store. Over 250,000 tokens in a variety of designs and sizes are available for immediate shipment. Coins come stock or custom, and all orders ship from the Cincinnati mint. Metal choices include brass, red brass, aluminum and more, as well as nickel plating and bright color anodizing.

OsborneCoin.com

Iron product

UNITED TURF ALLIANCE announces the introduction of Optimizer Sweet Iron. This unique sprayable iron polysaccharide product boosts turfgrass color, enhances nutrient uptake and improves overall plant health by enabling both foliar and root absorption of the product by turfgrass plants. It is applied at a much lower rate than traditional iron products. Optimizer Sweet Iron combines a water-soluble form of iron with a complex natural polysaccharide to provide novel delivery and outstanding residual color without the use of urea. In addition, the new iron product contains plant-available amino acids to promote the optimum plant metabolism required for efficient nutrient uptake and utilization.

utaarmortech.com

Ad Index

Companies featured in this issue

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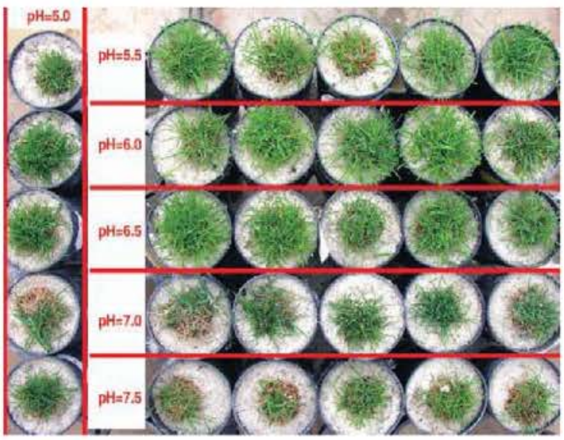
Super Science

//**SHOOTS AND ROOTS**

ROOT ZONE pH AND PENN A-4 CREEPING BENTGRASS SHOOT/ROOT GROWTH

By Derek T. Pruyne and Maxim J. Schlossberg, Ph.D.

Root zone pH influences nutrient availability, disease susceptibility and growth during both establishment and maintenance of Penn A-4 creeping bentgrass putting greens. While the optimal pH range for creeping bentgrass is considered to be 5.5 to 6.5, sand putting greens constructed in the Mid-Atlantic and Midwest containing slight to moderate (1 percent to 5 percent) calcite inclusions are buffered to higher pH values.



Replicate "conetainers" of Penn A-4 creeping bentgrass, arranged by soil pH treatment, 30 days following greenhouse study initiation.

Further alkalinization via topdressing sand or irrigation water inputs offsets natural acidification processes at the root zone surface. These issues beg a common question among superintendents: Is nutrient availability to Penn A-4 roots the primary limitation of supraoptimal soil pH levels, or are additional physiological/biochemical processes compromised?

To answer this question, Penn A-4 shoot and root growth response to an array of imposed sand root zone pH levels (5.0 to 7.5) was evaluated under conditions of frequent and ample macronutrient and chelated micronutrient (EDTA) fertilization in the greenhouse.

The resulting observations strictly adhered to reference literature. In sands maintained at pH levels from 5.5 to 6.5, Penn A-4 showed 100 percent to 150 percent greater shoot and root growth (3- to 9-inch depth) relative to growth rates observed at the 5.0, 7.0 or 7.5 soil pH levels. Field experiments evaluating acidifying treatments of alkaline Penn A-4 sand putting greens are currently under way in University Park.

Derek T. Pruyne and Maxim J. Schlossberg, Ph.D., Penn State University. Pruyne can be reached at dtp5025@gmail.com.

PHOTO BY: DEREK PRUYNE

NEWS UPDATES

UC TURFGRASS EXPERT HARIVANDI RETIRES AT 60

After 33 years at University of California Cooperative Extension in the San Francisco Bay area, Ali Harivandi, Ph.D., retired on June 27.

Throughout his career, the turfgrass expert advised homeowners and turf professionals throughout northern California.

Harivandi is best known for his research in water conservation and recycled water use, having promoted sustainability long before it was the buzz word that it is today.

"Drought has become part of our life," Harivandi said when he spoke at Rain Bird's Intelligent Use of Water Summit earlier this year. "For that very reason we have to look into other sources of water if we want to survive as an industry."

Harivandi also had expertise in soils, salinity and general irrigation issues. He eventually expanded his research to weeds, diseases, erosion control and insect management, and is known for introducing to the region tall and fineleaf fescues that use less water than other turf species, a UC release stated.

"NEW EXPERIMENTAL RESOURCES AND PERSONNEL HAVE LED RESEARCHERS TO ADD IMPROVED DROUGHT RESISTANCE, LOW IRRIGATION ADAPTATION AND SHADE RESISTANCE TO THEIR MENU OF IMPORTANT TRAITS FOR NEW BERMUDAGRASSES."

Gregory E. Bell, Ph.D.
(see full story on page 44)

//SHADE PERFORMANCE

Improving shade resistance in bermudagrass

By Gregory E. Bell, Ph.D., Yanqi Wu, Ph.D., Dennis L. Martin, Ph.D., Justin Q. Moss, Ph.D., and Kyungjoon Koh, M.S.

Superintendents know that bermudagrass is an important turfgrass on most golf courses in the South. It has excellent fine-turf characteristics that make it a popular grass for use on fairways, tees, roughs and putting greens. Bermudagrass has relatively good pest resistance, excellent recuperative potential and an aggressive growth habit.

Oklahoma State University (OSU) in cooperation with the USGA and multiple industry partners has successfully released and commercialized cold-tolerant fine-turf bermudagrasses such as Yukon, Riviera and Patriot (Martin et al. 2007; Taliaferro et al., 2004), and most recently, Latitude 36' and Northbridge. The breeding of improved cold-tolerant bermudagrass cultivars continues at OSU. However, new experimental resources and personnel have led researchers to add improved drought resistance, low irrigation adaptation and shade resistance to their menu of important traits for new bermudagrasses.

In 2009, OSU researchers embarked on a project to screen bermudagrass germplasm for shade resistance. We planted 45 experimental common bermudagrass selections gathered mostly from China, Africa and Australia and four commercially available cultivars — Celebration, Patriot, TifGrand and Tifton 10. The experimental selections were already known to be cold tolerant and good seed producers (Wu et al., 2006). We planted on two sites, one site providing a combination of vegetative and artificial shade, the other providing full sun. The turf was mowed at 2.0 inches to represent golf course rough, irrigated sufficiently to keep all selections green through the growing season, and fertilized at a rate of 1 lb. N per 1,000 sq. ft. per month.

On the shaded site, a combination of mature pines to the west, vines to the east and one (2009) or two (2010 and 2011) 10-ft. wide strips of 75-percent shade cloth overhead provided shade for an average of up to 67 percent of each day, depending on season and year (Fig. 1).

FIGURE 1

The bermudagrass shade study at the Oklahoma State University Turfgrass Research Center, Stillwater, Okla., on September 29, 2009.

USGA Turfgrass and Environmental Research

Visual ratings (ratings = 1–9; 9 = best) for turf quality were made for each plot biweekly during 2008, 2009, 2010 and 2011. Turf quality also was rated using a sensor that measured Normalized Difference Vegetation Index (NDVI), an objective measure of turf color and density (Bell et al., 2002; Bell and Xiong, 2008). Visual ratings were used in a comparative fashion to determine the best performing entries in shade and in full sun. Visual ratings and NDVI were used to measure shade resistance by comparing an entry's mean visual rating or NDVI in shade expressed as a percentage of its mean visual rating or NDVI in full sun [100 x (entry NDVI in full sun minus entry NDVI in shade) divided by entry NDVI in full sun; larger = better].

SHADE RESULTS

Surprisingly, according to visual ratings, Patriot (mean ratings = 7.1, 7.8, 6.0, and 5.7 in 2008, 2009, 2010 and 2011, respectively) was the top-performing grass in shade for the first three seasons (Fig. 2). Patriot's strong performance in shade was not expected, since it did not perform exceptionally well in other shade studies (Trappe et al., 2011).

Patriot may have superior visual quality in shade, but it also may have been the top performer in this study because it is uniquely adapted to the climate in Stillwater, Okla., where it was developed.

Tifton 10 (mean rating = 6.5) and Celebration (mean rating = 6.5) performed well in shade in 2008; Celebration (7.1), TifGrand (7.0) and Tifton 10 (6.6) in 2009; and Celebration (5.6) and TifGrand (5.6) in 2010. Celebration (6.4) was the top performing cultivar in shade in 2011, with Patriot (5.7) and TifGrand (5.7) close behind. Tifton 10 (5.2) was in the fourth statistical group in 2011. Many of the experimental selections also performed well in shade in at least two of four seasons.

FIGURE 2

Patriot bermudagrass (upper left corner of photo) outperformed these three seeded experimental entries in shade. However, there were a few seeded experimental entries whose performance was equal to the commercially available cultivars.

FULL SUN RESULTS

According to visual quality ratings, Patriot was the best performing cultivar in full sun for all four seasons (7.7, 8.7, 7.6, and 7.4 in 2008, 2009, 2010, and 2011, respectively). TifGrand also performed well in all four seasons (7.4, 7.8, 7.3, and 6.7). Celebration (7.5, 7.0, and 7.0) and a few of the experimental entries demonstrated excellent performance in the final three seasons.

SHADE RESISTANCE

By comparing each bermudagrass in full sun with its counterpart in shade, we were able to estimate the shade resistance of each entry. The commercially available cultivars and experimental entries with exceptional fine-turf characteristics ranked high in shade resistance, but rankings differed between visual quality rating and NDVI. According to visual quality, Celebration (-11.3 percent) was the most shade resistant of the commercially available cultivars in the last three years of the study (2009–2010), followed by Tifton 10 (-15.4 percent) and TifGrand (16.0 percent). According to NDVI, TifGrand (-7.9 percent) was the most shade resistant, followed by Celebration (-8.1 percent) and Patriot (-8.4 percent). According to visual quality Patriot (-18.3 percent) had the poorest shade resistance of the commercially available cultivars, and according to NDVI, Tifton 10 (-10.2 percent) was the least shade resistant.

According to NDVI, the shade resistance of five of the experimental entries (-0.2 percent to -14.3 percent, depending on entry and year) was equal to or exceeded the shade resistance of the commercially available cultivars. Of these five experimental entries three also ranked high in shade resistance measured by visual rating. A few of the experimental entries demonstrated good shade resistance but had less than acceptable fine-turf qualities.

In 2012, we selected the best of the experimental entries for fine-turf qualities and shade resistance, followed by more crossing, which resulted in promising experimental seed-propagated lines that are undergoing additional investigation for shade tolerance and specific trait evaluation over the next several years.

We expect that the resultant progeny will demonstrate superior turf performance in internal as well as external testing, such as in the National Turfgrass Evaluation Program (NTEP). Excellent fine-turf characteristics, coupled with good seed yields, should allow the eventual release and commercialization of seeded bermudagrasses with improved shade resistance in the next few years.

Acknowledgments

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//THE FIGHT AGAINST POA

Annual bluegrass control in golf turf

By Bruce Branham, Ph.D.

Spring is a wonderful time of year for superintendents. Grass growing conditions are often excellent, temperatures are moderate, heat and drought stress are usually absent, and golfers are just happy to be playing. However, there is one problem that annually disrupts a superintendent's spring: *Poa annua*. Whether dying from ice damage or producing copious quantities of seedheads, *Poa annua* remains a grass (or weed) that most superintendents wish they didn't have to see.

I've been working on *Poa annua* control for nearly 30 years and clearly haven't had much success. Controlling *Poa annua* isn't really the problem. Rather, control must occur slowly so that turf quality is not reduced—and that's not how most herbicides work. Also, there must be enough safety so the desired turf species shows no injury. Many superintendents have experimented with low rates of Roundup (glyphosate), high rates of iron, microbial products, etc. Yet, we still have lots of *Poa annua* on our golf courses.

There always is a new herbicide that will solve the *Poa annua* problem once and for all, right? Well, don't bet on it. My 30 years of experience have taught me that *Poa annua* is a wily and tenacious competitor and no single herbicide will defeat it. It will take multiple chemistries, an equally tenacious superintendent and some luck to have a golf course with little to no *Poa annua*. It can be done, and I've seen it done, but it takes consistent and persistent effort.

FIGURE 1

When Velocity is applied frequently, selective control is achieved, but creeping bentgrass can be severely injured and significant voids can occur as the *Poa annua* dies.

POA ANNUA BIOLOGY

What makes *Poa annua* such a difficult weed to control? To paraphrase President Clinton, "it's the seed, stupid." *Poa annua* is so competitive because it produces tremendous amounts of viable seed at any mowing height. Further, its ecological niche is extremely well suited to the golf course environment. Frequent irrigation is perhaps the biggest contributor to *Poa annua* establishment.

When you do find an herbicide that combats it, *Poa annua* seed most likely will repopulate the voids left by the dying *Poa annua*. In the scenario where an herbicide actually kills *Poa annua*, the turf manager is so anxious to get grass back on the golf course that further thoughts of controlling *Poa annua* are quickly forgotten. The *Poa annua* comes back from seed along with other desired grasses, such as creeping bentgrass.

"*Poa annua* is so competitive because it produces tremendous amounts of viable seed at any mowing height."

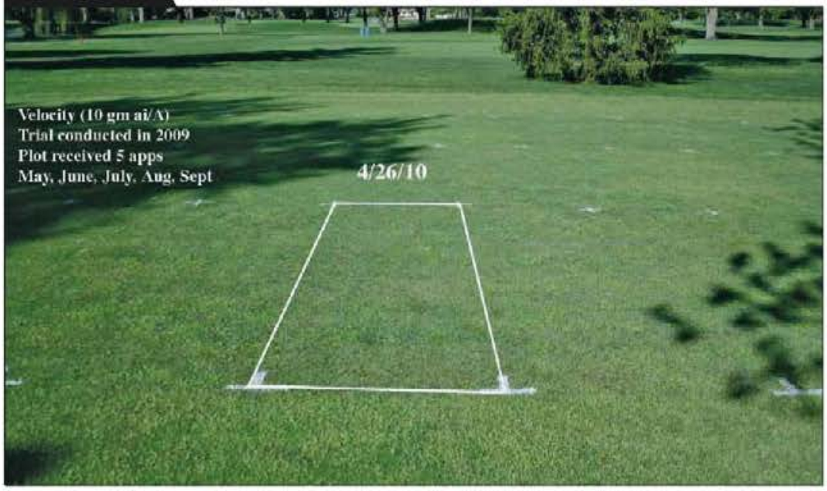
While data are a little hard to come by, Calhoun (2010) suggested that *Poa annua* seed can be viable up to 6 years in the soil. Several authors have determined that the large percentage of *Poa annua* seed shed by *Poa annua* plants will germinate in the first year following production. To net this out, if you can eliminate *Poa annua* from your turf and continue to eliminate it before more seed is produced, then after +/- six years, the *Poa annua* seed bank will be much reduced and the *Poa annua* problem will be much easier to manage.

As any superintendent who has tried to renovate fairways can attest, killing the existing *Poa annua* with Roundup is easy, but keeping the seed bank from reinfesting the golf course is very difficult. In fact, without a viable herbicide program following seeding (see Branham and Sharp, 2011 for recommendations on *Poa annua* control in creeping bentgrass seedlings), many renovations end up with as much or more *Poa annua* than existed prior to the renovation program.

As an aside, soil fumigants are also effective, but the cost and environmental concerns when redoing fairways make fumigants a less attractive option. Remember too, that fumigants do not eliminate the *Poa annua* seed bank; they reduce the number of seeds significantly and tend to give a "*Poa annua*-free" window for germinating the new grasses. However, that window closes fairly quickly, and *Poa annua* begins competing with whatever species was planted.

I have one final point about *Poa annua* that is particularly challenging for any golf course that is considering a *Poa annua* control program. As mentioned above, the seed bank needs to be managed to achieve long-term control. That means the seed bank on the whole golf course—greens, tees, fairways, surrounds and roughs. Eliminating *Poa annua* on the putting green, a goal of many superintendents, will be more difficult if no effort is made to control *Poa annua* on the rest of the golf course. *Poa annua* seed will inevitably be deposited in the green by mower traffic, foot traffic, birds and more, requiring constant removal programs.

FIGURE 2



When Velocity is applied regularly but infrequently, in this case five monthly applications at 2 ounces product per acre in 2009, gradual but significant reductions in *Poa annua* can be obtained. The image was taken on April 26, 2010. Note the *Poa annua* in the foreground that was untreated.

Also, since *Poa annua* is well adapted to shade conditions, removing *Poa annua* from shaded areas may result in reduced turf quality as less-adapted species struggle to grow. Before beginning a *Poa annua* control program, you must make the environment better suited to the species you want to manage. That means reducing shade, improving drainage and managing traffic—all factors that tend to favor *Poa annua*.

CONTROL OPTIONS

Golf turf managers have always had the option of controlling *Poa annua* from seed with a pre-emergence herbicide, but that strategy is ineffective without a means to control established *Poa annua*, such as a postemergence herbicide. In the past five to eight years, we've had several new products come to market that control *Poa annua* postemergence. Turf managers have been slow to adopt these herbicides because of the risks involved in trying to remove a grass that may constitute 10 percent to 50 percent of the turf present. There's also the fact that these are all herbicides. That is, they kill plants. An inadequate margin of safety or unexpected environmental or chemical interactions can lead to unexpected turf injury, even with relatively safe products. Turfgrass professionals should never underestimate this.

With those warnings and caveats, I'll update the status of new chemistries for *Poa annua* control in cool-season turfgrasses. Separate articles will focus on *Poa annua* control products for warm-season turfgrasses and cultural/mechanical techniques to help manage *Poa annua*.

PROGRASS

The oldest of what I consider effective postemergence herbicides for *Poa annua* control is Prograss (ethofumesate). Prograss has been labeled for turf use since the late 1980s and can give good postemergence control of *Poa annua* in certain cool-season grasses. It is very safe on perennial ryegrass but only marginally safe on creeping bentgrass and Kentucky bluegrass. Prograss can provide effective control at most times of the growing season, but the best control is normally obtained with applications

Continued on page 48

FIGURE 3

A significant benefit of Velocity is its ability to suppress dollar spot. The area within the white plot marks received spring and early summer Velocity applications. The area outside did not receive fungicide and was riddled by dollar spot.

Continued from page 47

made four to six weeks before grass growth ceases for the winter. These applications don't seem to kill the *Poa annua* immediately. Rather, the *Poa annua* is weakened and dies either over the winter or as grasses resume growth early the next spring. The problem is that these applications give wildly different results depending on factors we don't understand. Literally, control can range from 0 to 100 percent and anywhere in-between. My own theory is that Prograss prevents *Poa annua* from reaching maximum winter hardiness, so depending on a number of factors—snow cover, winter temperatures, etc.—control is determined by the severity of winter stress. But again, this is just speculation.

As mentioned above, perennial ryegrass is extremely tolerant of Prograss, and Prograss is still widely used where perennial ryegrass is grown for golf course fairways. Prograss can be applied in the late season, but with perennial ryegrass, excellent *Poa annua* control can also be obtained within the growing season. Higher rates are required, but perennial ryegrass responds beautifully to Prograss applications. The turf becomes quite dense and dark green in color, similar to a PGR response.

Creeping bentgrass and Kentucky bluegrass are much less tolerant of Prograss, so lower rates are used when applying to these two species. Because of the lower rates, in-season applications are generally not effective with these two species and best results are obtained with September and October applications as described above.

VELOCITY

Velocity was registered for turf use in 2003. It was originally tested as a plant growth regulator, and Dr. Ron Calhoun, a Michigan State University turfgrass scientist at that time, spotted its herbicidal activity. However, because it is metabolized fairly rapidly by all turfgrass species, several sequential applications are required to get a high level of *Poa annua* control. While Velocity works, its adoption by golf turf managers has been relatively low. When used, it can control *Poa annua* rapidly, often leading to unhappy turf managers who may have underestimated the amount of *Poa annua* in their turf (or simply failed to appreciate what the turf would look like without any *Poa annua*).

Further, it is a growth regulator herbicide, so turf growth can slow significantly (this applies to creeping bentgrass as well), resulting in reduced quality turf, especially where traffic is significant. Secondly, there is typically some phytotoxicity associated with its use. This often is observed as a loss of green color of the turf. Under conditions of very high soil moisture or very cool temperatures the turf injury can be quite pronounced.

Finally, Kentucky bluegrass is generally injured by Velocity. From a practical standpoint, it is very difficult to apply Velocity uniformly to a putting green or fairway without getting some spray into the rough, which is usually Kentucky bluegrass.

Our own research has found that light (10 gm a.i./A or 2 oz. product/A), frequent applications give the best control. I normally recommend 2 oz. product/A applied twice per week (Monday and Thursday) for a total of six applications. This program typically controls >90 percent of the *Poa annua* on fairway height turf. However, this program is too aggressive if *Poa annua* populations are greater than 10 percent to 20 percent. When *Poa annua* populations are above this threshold, I recommend a different strategy that can lead to a gradual loss of *Poa annua* that does not result in voids or dead patches of *Poa annua*. The gradual control strategy calls for Velocity applications monthly during the warmer months of the growing season. Our best program would consist of monthly applications of Velocity at 2 oz. product/A from May through September. This approach injures *Poa annua* but does not directly kill it. Over time, *Poa annua* is outcompeted by less regulated creeping bentgrass. This program will not give complete control, but we typically see a reduction of 60 to 90 percent of the *Poa annua*. The value of this program is that turf injury is minimized and *Poa annua* reduction is gradual.

XONERATE

Xonerate (amicarbazone) is a new product from Arysta Life Science that was registered for turf use in 2012. Xonerate is a photosynthesis inhibitor that controls *Poa annua* postemergence in creeping bentgrass, Kentucky bluegrass and perennial ryegrass. Xonerate is very sensitive to high temperatures, and the label does not recommend applications to turf when temperatures are above 80 degrees F. Best results have been observed with spring applications when temperatures are cool. Fall applications, even when temperatures are cool, have been problematic.

The launch of Xonerate in spring 2012 gave mixed results. Injury to creeping bentgrass was observed at a number of locations, and creeping bentgrass varieties responded differently to Xonerate. *Poa annua* control was somewhat variable. Better results were observed in the Southeast, with more variable results in the Midwest and West. Additional research is under way to determine what factors control the activity of Xonerate.

POACURE

There has been much buzz surrounding the evaluation of an experimental herbicide that is tentatively named PoaCure (methiozolin). I'm hesitant to spend too much space on an herbicide that is not yet labeled by the EPA. The literature is littered with examples of promising herbicides that never make it to market. What makes this product unique is its ability to slowly remove *Poa annua* from putting green turf. Most companies are afraid to label a product for use on greens because of concern over potential liability should any problems arise, while this product is being developed with greens as the intended target.

FIGURE 4

Prograss provides excellent control of *Poa annua* in perennial ryegrass. In the above photo, Prograss was applied 2-3 times in August and the photo was taken in early November. Note the dark green color from the Prograss-treated perennial ryegrass.

By controlling the number and rate of applications, a turf manager can control the rate at which *Poa annua* dies. Further, with this herbicide *Poa annua* doesn't so much as die as slowly wither away, therefore allowing time for creeping bentgrass to cover any empty space. The result is a slow, almost imperceptible, transition to pure creeping bentgrass.

Results have been impressive to date, but the potential for creeping bentgrass injury under normal use conditions needs to be determined. The company is sponsoring an experimental-use permit with 166 golf courses around the United States that will run from 2014 to 2016. Expect EPA registration in late 2015 or early 2016.

SUMMARY

While the number of herbicides available for *Poa annua* control has grown significantly, there still is a lot of *Poa annua* on golf courses. Herbicides like Xonerate and Prograss, when effective, result in a rapid kill off, often leaving the turf in poor condition with voids and thin turf. Products that can gradually remove *Poa annua* are obvious choices for golf courses that don't wish to close for a renovation. Velocity used as a slow-killing growth regulator is the only current choice that gives a gradual rate of control. Should PoaCure reach the market, it too offers gradual control and good turf safety.

Golf turf managers should consider that a major part of the battle against *Poa annua* is cultural. Keeping a dense, healthy turf is the best defense against *Poa annua* invasion. Ball marks, divots, surface disruption from aerification, and voids in general, give *Poa annua* a foothold. From there it's all downhill for such an invasive, competitive species.

Bruce Branham, Ph.D., is a professor of turfgrass science at the University of Illinois and can be reached at bbranham@illinois.edu.

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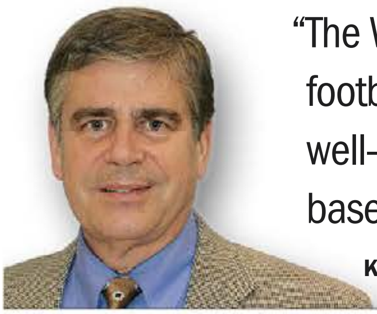

"The Wiffle ball, soccer and football games are bygone as well—it's hard to slide to second base with a tree in the way."

KARL DANNEBERGER, PH.D., *Science Editor*

Can't see the forest for the trees

I was heading to work and noticed the neighborhood kids waiting on the street corner for the school bus, as I had a thousand times before. Except this morning I was struck by the number of kids waiting. Where did they all come from?

When we moved into our newly constructed home some 25 years ago, the location was a recently developed subdivision. Like any subdivision developed from farmland, it was flat and baron. The obligatory six bushes and one tree required by FHA home loans were the extent of the ornamental landscaping. The majority of the landscape consisted of sod, which meant two of the first home improvement purchases were a lawn mower and a sprinkler.

As with many community zoning regulations, we were not allowed to enclose our properties with fences. Thus, we had expanses of turf running from property to property.

Neighborhood kids would create Wiffle ball, soccer or football "fields" across neighboring lawns. I forced my kids to also create chipping areas for golf. And with the expanse of turf came sidewalks. How can I forget waking up on Saturday morning to the sound of kids riding their Big Wheels up and down the sidewalk?

As time progressed, the city planted trees in the easement between the sidewalk and street, and we needed to place a tree in such a position to shade our newly constructed patio. Neighbors began planting a tree or two for aesthetic and shading purposes. And as the neighborhood kids got older, so did our trees.

The trees planted by the city were Bradford Pears. They were popular in the late 1980s and early '90s, but now they just cover the neighborhood cars with a sloppy mess of splattered berries from late fall through winter. The more sparrows that feed on the trees' berries, the worse the onslaught is.

Also, the sidewalks are no longer as smooth as airport runways; the shallow tree roots have caused their upheaval. No longer can the neighborhood kids ride their Big Wheels; hitting sections of the side walk will cause a crash. It's so bad that the city has now beveled the edges of the uprooted sidewalk squares to make them "safer."

The Wiffle ball, soccer and football games are bygone as well. After all, it's hard to slide to second base or run a stop-and-go pass pattern with a tree in the way. These days, outdoor games have been replaced by 12- to 15-foot enclosed trampolines that look more like an Ultimate Fighting Championship ring. They fit easily among the trees, but neighborhood kids who want to play sports now have to carpool to the nearest city sports complex.

It's ironic that when we first looked at places to live we decided not to go with the older, stately areas of town because we didn't see any kids. Now that I live in a stately and older area, it's not that the kids have grown and left, it's just that I can't see them for the trees.

I tell this story not so much to reminisce, which I have recently done in some of my columns, but to focus on benefits of removing trees from golf courses besides agronomics. Removing trees exposes the subtleness of course design that has been hidden, and opens the course up to more vista views. It brings a freshness and newness to a course that is old and claustrophobic. Now we can instill the excitement back into courses that have been hidden by trees for way too long.

Karl Danneberger, Ph.D., *Golfdom*'s science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.

ISTOCKPHOTO