"Our previous units were 8 years old, and it was getting to the point where it was almost impossible to achieve a good quality cut," Chojnacky says. "We were expending more effort maintaining the older fairway units than it was worth to continue using them. The board wants to see numbers and research. In my case, I did a cost/benefit analysis and was able to show the ratio of repairs compared to the cost of new equipment."

The second most important consideration to research is dealer support. Often the value of a new equipment purchase is proven in the relationship with the dealer, and the before-, during- and after-sale support that should be provided. During the research phase, partnering with the dealer to schedule equipment overviews and demos, as well as negotiating purchase options, can give you a perspective on the best choice for your needs.

"Our dealer, Reynolds Farm Equipment, was pretty involved in the process, as far as showing me the actual equipment and providing demo units for us to try out to see how they performed on the golf course," Weitz says. "It also left the equipment for an extended time so my crew and mechanics could get a better feel for it."

PHASE 2:

MAKE THE ASK THE RIGHT WAY

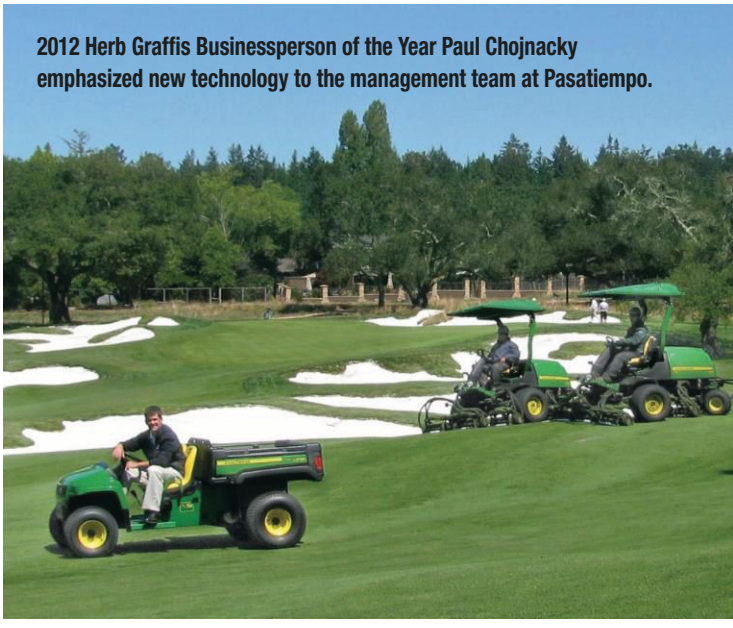
Once you've analyzed all considerations and worked with your dealer to test equipment, you should be prepared to build your case and present it to your management team. That means:

- showing management you've done your homework
- putting yourself in management's shoes
- selling the technology

By discussing the budget numbers and the reasons new equipment is needed, you're able to show the management team you've taken a thoughtful approach to developing your recommendation. Remember, the management team is considering how your recommendation will affect the whole facility, not just the golf course. Thinking from this wider perspective will help to define additional reasons why the equipment purchase is necessary.

Touting new technology's benefits is another effective way to strengthen your case for new equipment. Often new and improved equipment provides increased efficiency and productivity from your crew, which will speak volumes to the management team.

Chojnacky worked with his local dealer to develop a package plan for the purchase of the 7500 E-Cut fairway mowers and presented it to his management team with a simple but strong argument: "If the fairways are cut properly, they will be healthier, and the aftercut appearance will be cleaner. The available technology has changed a lot during the past few years, so for us, the big advantage was the electric reels because we were able to almost eliminate hydraulic leaks, which is a huge priority."



2012 Herb Graffis Businessperson of the Year Paul Chojnacky emphasized new technology to the management team at Pasatiempo.

PHASE 3:

CLOSE THE DEAL

The research and purchase process can be long — six months or more — but it's imperative to take as much time as needed to address the many factors that go into such an important decision. Start early in your research.

Although the budget is often a prime factor when it comes to making the final purchase decision, the most important thing you can do is communicate the value of dealer support and service as an almost-equally-important factor.

Weitz talks about the equipment purchase process he executed in 2009:

"I worked all of the top industry brands against each other aggressively and wound up doing an entire lease package," he says. "The second the deal was done, the dealers disappeared. My team can deliver great results with almost any piece of equipment, but what it comes down to is the service support."

Another factor that can strongly influence the final decision is forecasting a long-term calendar for your ongoing equipment purchasing priorities and needs.

Keeping these essential factors in mind and having an open dialogue with your management team will help you reach the best conclusion.

When it comes to asking to purchase new equipment, map these three phases, and you'll find you've developed a complete story that demonstrates your course's need. Most importantly, you'll demonstrate to the management team you understand the magnitude of budget decisions. ■

Steve Vincent is the national sales manager for John Deere Golf.

PHOTO (LEFT) BY: SETH JONES; PHOTO COURTESY: JOHN DEERE

Clark Talks Turf

TIMELY TURF ADVICE

Organic matter management

Roch Gaussion, Ph.D., is a professor of turfgrass science and department head at the University of Nebraska-Lincoln. He has devoted much of his time to addressing organic matter accumulation in cool-season grass putting greens. Gaussion can be reached at rgaussion1@unl.edu.

Q Before we discuss the conclusions of your research, briefly describe the research you conducted that allowed you to reach the conclusions. We have conducted several field studies under controlled conditions. We undertook a two-year survey of over 130 golf courses in the northern U.S., from coast to coast. We asked the superintendents numerous questions about their greens and how they managed those greens. Superintendents submitted more than 1,600 samples from poor-, moderate- and high-performing greens from their courses for organic matter determination.

Q What did you learn about organic matter management from the survey? Greens with the lowest organic matter were topdressed with 100 percent sand at a rate of 18 cubic feet or greater per 1,000 sq. ft. per year. A more complete discussion of organic matter management can be found at http://tinyurl.com/9fy8s4o.

Q Did frequency of topdressing matter? No. By default, if a superintendent is going to apply 18 cubic feet of sand topdressing per 1,000 sq. ft. per year to greens, the only way greens will remain playable throughout the growing season is to make numerous light, frequent applications of sand topdressing. Topdressing weekly or every two weeks during the season was common to greens with lower organic matter.

Q Did cultivation make a difference in managing organic matter accumulation? Yes, from the sense that any and all cultivation techniques that helped incorporate sand into the profile were important in managing organic matter accumulation. The specific cultivation technique was less important than regular, light cultivation to help move sand into the rootzone.

> "It just doesn't make sense to try to establish a single threshold for organic matter accumulation."

Q What do you think of the concept of establishing a numerical threshold for organic matter content? So any number above that specific threshold would mean superintendents need to take action to control organic matter accumulation? I don't think there is a single magic number or threshold for organic matter accumulation in greens. Our research showed that greens performed well over a range of organic matter content in the rootzone.

There are too many variables to try to account for, with geographic location topping the list. A green in Utah will be different from a green in coastal Washington. Considering the variability between locations, along with all the other conditions such as cultivar, length of growing season, rootzone composition, etc., it just doesn't make sense to try to establish a single threshold for organic matter accumulation.

There are also challenges in which method to use to determine organic matter content in a putting green rootzone and using a consistent technique when collecting samples for organic matter determination.

Q What did you learn from your field research studies? The major conclusion was that on greens that have been topdressed lightly and frequently on a routine basis for several years, pulling a core when aerifying was not necessary. Light cultivation when topdressing is important to get the sand into the profile, but plots that were aerified with either a hollow or solid aerification tine showed no differences in performance or organic matter accumulation.

Q Is there anything else you would like to add? Get the topdressing sand into the profile. It does you no good in the mower baskets.

Also, I greatly appreciate the support of the USGA, the Environmental Institute for Golf, the Nebraska GCSA, the Peaks and Prairies GCSA and the GCSA of South Dakota for helping fund our organic matter management research.

Clark Throssell, Ph.D., loves to talk turf. He can be reached at clarkthrossell@bresnan.net.

TURFGRASS TRENDS

Tenacity: A New Weapon in the *Poa Annua* Battle

By Bruce Branham, Ph.D.

Controlling annual bluegrass (*Poa annua*) has been a challenge for turfgrass managers since we began managing it. Finding herbicides that control annual bluegrass selectively has been difficult, and only in the past decade have we been able to use products that can provide postemergent control of annual bluegrass reliably. Velocity (bispyribac-sodium, manufactured by Valent) is one of the first herbicides to control annual bluegrass with postemergent applications safely and effectively. Other herbicides have been used, but the results were inconsistent or caused excessive injury or death to the desirable turf.

It's difficult to find selective herbicides to control annual bluegrass in Kentucky bluegrass. Both species are from the same botanical genus and are presumed to be similar in growth and physiology. Currently, there are no herbicides labeled for the postemergent control of annual bluegrass in Kentucky bluegrass.

Tenacity (mesotrione) is a relatively new herbicide introduced in the market in 2008 by Syngenta. Mesotrione has been used on corn for several years under the trade name Calisto. This reduced-risk herbicide is an analog of a natural product, leptospermone, which is produced by the bottlebrush plant (*Callistemon citrinus*). Mesotrione, which represents a new class of herbicides known as HPPD inhibitors, works by inhibiting the enzyme 4-hydroxyphenylpyruvate dioxygenase (HPPD), which blocks the pathway that produces plastoquinone and tocopherols — antioxidants that reduce damaging oxygen radicals. Without plastoquinone, carotenoids, which are critical for harvesting light and quenching the high-energy states of chlorophyll, can't be synthesized. Without carotenoids, radicals and reactive oxygen species damage the photosynthetic enzymes and membranes so that eventually all leaf pigments can't be produced (Beaudegnies et al. 2009). This causes the characteristic bleached-tissue look in plants treated with HPPD herbicides, and it's common to all HPPD inhibitors.

Mesotrione selectivity derives from differential rates of metabolism in plants. Tolerant plants degrade mesotrione rapidly; susceptible plants have a slower rate of mesotrione metabolism. We noticed that in the cooler temperatures of spring and fall, mesotrione would cause bleaching of annual bluegrass. During the sum-

Continued on page 34

TABLE 1: CONTROL OF ANNUAL BLUEGRASS FROM VARIOUS RATES & APPLICATION TIMINGS OF MESOTRIONE

Rate (lbs. a.i./A) or [oz. prod/A]	Application schedule	Total applications	Treatment duration in days	Percent annual bluegrass control					
				05/09	07/09	05/10	06/10	07/10	10/10
0.05 [1.6]	M W F	10	21	85a*z	93a	40b	96a	88a	68a
0.05 [1.6]	M Th	10	31	84ab	77b	75a	68ab	86a	100a
0.17 [5.3]	M (every 2 weeks)	3	28	**y	**y	3c	0d	27b	100a
0.17 [5.3]	M	3	14	**y	**y	3c	58abc	79a	82a
0.17 [5.3]	M Th	3	7	**y	**y	3c	20cd	70a	23b
0.17 [5.3]	M W F	3	5	0c	51c	3c	0d	31b	0b
0.1 [3.2]	M W F	5	9	38bc	95a	3c	38bc	87a	33b
0.1 [3.2]	M Th	5	14	80ab	97a	5c	76ab	90a	37b
0.1 [3.2]	M	5	28	57b	41c	15c	43bc	92a	53a
0.2 followed by 0.1 [6.4 fb 3.2]	M Th	4	10	**y	**y	3c	85a	65a	5b
0.075 [2.4]	M Th	7	21	**y	95a	**y	**y	62a	86a
Average temperature in the 21 days after treatments begin				61.9	69.7	62.0	76.0	78.1	***

*z *Means within a column followed by the same letter are not significantly different according to the LSD at α=0.05*

y *Indicates that all treatments were not used in all trials* * *The author intended for this box to be blank*

When presenting treatment mean data in a table such as this, scientists often present the mean for each treatment followed by a lowercase letter or letters. In this table, each treatment mean followed by the letter a is statistically equivalent to all other treatment means followed by the letter a. A treatment mean followed by the letters a,b is statistically equivalent to all other treatments followed by either the letter a or b or a,b. A treatment mean followed by the letter a is statistically different from a treatment mean followed by the letter b. And a treatment mean followed by the letter b is statistically different from a treatment mean followed by the letter c.

Continued from page 33

mer, one application of mesotrione on annual bluegrass would, at most, cause a minor loss of green color but no bleaching. Thus, we didn't see enough activity to think mesotrione could control annual bluegrass. In fact, the label for Tenacity states annual bluegrass is suppressed by a preemergent application but doesn't control or suppress annual bluegrass by a postemergent application.

There are numerous preemergence herbicides that will control annual bluegrass, but the real test is finding a postemergence herbicide that can control established annual bluegrass safely.

The observation that mesotrione bleaches annual bluegrass during the cooler months but hardly at all during the warmer months led us to think the metabolism of mesotrione in annual bluegrass was rapid enough during the summer to reduce the herbicidal activity to essentially nothing. In other words, temperature controls the rate of metabolic activity in plants. Under high temperatures, plants have a higher metabolic rate; under cooler temperatures, the metabolic rate is slowed.

The question became: How do you keep enough mesotrione in annual bluegrass long enough for it to cause toxicity? We tried frequent applications at low rates.

Experiments and results

Beginning in 2009, we conducted six trials examining different rates and timings of mesotrione in a mixed stand of annual and Kentucky bluegrasses maintained at a height

of 7/8" (See Table 1). The results showed that several factors affected the level of annual bluegrass control from mesotrione. The good news was several treatment regimes provided consistently high levels of annual bluegrass control. The bad news was these treatment regimes required a significant number of frequent, low-rate applications.

Upon closer examination of the data, we saw temperature during the treatments had a large effect on the results. For most treatment regimes, the higher the temperature, the better the results. Note that the trial with the highest average daily air temperature was the trial conducted in July 2010. In this trial, five treatment regimes gave more than 80 percent annual bluegrass control. Some regimes that provided poor control in other trials provided respectable annual bluegrass control in this trial. For example, applying 0.1 lbs. active ingredient per acre weekly for a total of five applications resulted in control ranging from 15 to 57 percent in the other five trials; but in the July trial, annual bluegrass control was 92 percent. Similarly, 0.17 lbs. a.i./acre applied three times on a Monday-Thursday-Monday schedule showed control levels of 3, 20 and 23 percent in the other trials conducted in 2010 but 70 percent in the July trial. The higher temperatures increase the activity of Tenacity dramatically, probably because higher temperatures result in greater production of oxygen radicals, and without the carotenoids to quench them, the oxygen radicals wreak havoc on the plants.

So when temperatures are hot, control is excellent, and good control can be achieved with less frequent applications. Excellent control was achieved from 0.1 lbs. a.i./acre applied once a week for five applications or twice a week for five applications. Conversely, when temperatures are cool but not cold, activity is reduced. In the May 2010 trial, only two treatments provided control above 40 percent. The May 2009 trial saw several treatments provide greater than 80 percent control even though the average temperature of the trial was comparable to the 2010 trial.

Looking more closely at the temperature data, we saw that, in 2010, temperatures dropped right after the first application, reaching a low, average daily air temperature of 46 F at four days after the initial treatment. Day 5 experienced a low of 34 F and an average of 48 F. Beginning at 17 days after the initial treatment, the air temperatures in 2010 exceeded the ones in 2009 and helped push the averages close together. But my guess is that drop in temperature after the initial application

Continued on page 36

Mesotrione selectivity derives from differential rates of metabolism in plants.

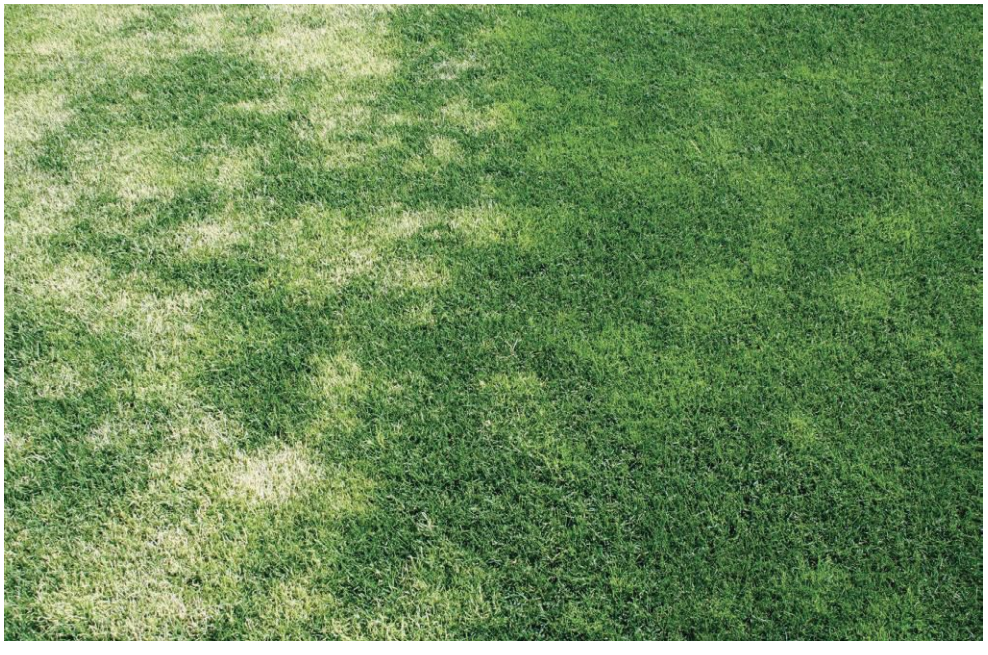


PHOTO COURTESY: BRUCE BRANHAM, PH.D.

The bleached annual bluegrass on the left half of the photo has been treated with Tenacity.

Overall plot view from the May 2010 trial of mesotrione treatments 16 days after the beginning of treatments.

Continued from page 35
halted the mesotrione activity.

The last trial we conducted in October 2010 gave completely different results. Treatments that had a long interval between successive applications provided the best control. For example, applying 0.17 lbs. a.i./acre every two weeks for three applications resulted in an average of 10 percent annual bluegrass control in the three trials conducted in the spring and summer of 2010 but 100 percent control in the October trial.

How can this be explained? My hypothesis is, as temperatures cool off in the late fall, the metabolism of mesotrione by annual bluegrass slows substantially, keeping a higher level of mesotrione in the plant for a longer period of time (i.e., the half-life of mesotrione in annual bluegrass increases from one to two days in the summer to seven to 10 days in the late fall). The increase in mesotrione half-life resulted in sound control from an application regime that would be completely ineffective during the spring or summer.

Treatment duration

Another observation from these trials is that annual bluegrass must be bleached for a substantial number of days before control is achieved. As can be seen in the photo above, almost every plot in the picture, from the May 2010 trial, is showing substantial bleaching at 16 days after the first application. Yet, all treatments in this trial provided poor control, with only two treatments providing significantly better control than the untreated plots (See Table 1). The two treatments that resulted in marginal control used light, frequent applications that, from the first treatment to the last, took 21 or 31 days.

Only when the temperatures were hot — the July trials — did treatment durations of less than 14 days provide reasonable annual bluegrass control (See Table 1). For example, applying 0.1 lbs. a.i./acre five times on a Monday-Wednesday-Friday application schedule provided an average of 91 percent annual bluegrass control in the two trials conducted in July of 2009 and 2010. Average control from this treatment regime was only 28 percent in the other four trials conducted in cooler temperatures. This treatment regime took nine days from the first application to the last.

Summary and future work

We've shown Tenacity can be used to control annual bluegrass at almost any time of year when using the proper application strategy. During the warmer months (June through September), frequent, low-rate applications provide the best results. Applying 0.05 lbs. a.i./acre (1.6 fl. oz. product/acre) three times per week totaling 10 applications provided consis-

PHOTO COURTESY: BRUCE BRANHAM, PH.D.

tently sound results. However, few turf managers would want to chain themselves to their sprayers for this kind of application schedule. Similar results can be obtained by applying 0.1 lbs. a.i. /acre (3.2 fl. oz. product/acre) twice a week totaling five applications. If we exclude the October trial because of the cooler temperatures and different results, the five-application treatment regime resulted in 70 percent control when averaged over the other five trials while the 10-application treatment yielded an average of 80 percent control. So, for half of the labor, you'll give up an extra 10 percent, on average, of annual bluegrass control.

Treatments initiated in the cooler weather of late fall also look promising but would require a different strategy. Under these conditions, applications of 0.17 lbs. a.i. /acre (5.3 fl. oz. product/acre) applied three times on a 14-day interval appear to be most effective. These results support work done by Reicher and his colleagues (Reicher et al. 2010), who reported effective control from fall applications with similar rates and timings.

We continue to attempt to improve the efficacy of Tenacity for annual bluegrass control by examining the effects of different spray adjuvants, spray volume and nitrogen fertilizer applications. We're also looking at tank mixes of mesotrione and amicarbazone (Xonerate, Arysta). Research of other crops has shown that tank mixes of mesotrione and herbicides that inhibit photosynthesis, the mode of action for amicarbazone, are synergistic.

Bruce Branham, Ph.D., is a professor, Josh Skelton is a graduate student, and Bill Sharp is a researcher in the department of crop sciences, University of Illinois. Branham can be reached at bbranham@illinois.edu.

Results showed that several factors affected the level of annual bluegrass control from mesotrione.

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The Company Line

NEW PRODUCTS FOR SUPERINTENDENTS

Irrigation app

Ewing Irrigation's new app for both Apple's iPhone and Google Android-based smartphones allows professionals to quickly locate the nearest Ewing branch (by providing driving directions); find the square footage of an area; convert measurements quickly for length, volume, weight, area and temperature; and save time on calculations for precipitation rates, run times, voltage drop and more. *Ewing1.com*

Nitrate reduction

SN14 from Biodiversity Products cuts nitrates by 25 percent, states the company. It supplies the missing form of nitrogen that turf needs but doesn't have. According to the company, because SN14 is entirely soluble, it will not clog drip lines or create a biofilm. It immediately fixes deficient nitrogen levels through foliar application, yet it does not attract insects or animals. Compatible with fertilizers and micronutrients, it's the only form of available nitrogen that also builds soil tilth and humus. In fact, it contains 17 of 20 amino acids that provide other vital plant nutrients to soil microflora. *Gobiodiversity.com*

Fungicide

Amvac Chemical Corp.'s Turfcide 400 non-crop fungicide prevents soil-borne diseases in turf and labeled ornamentals. It also controls persistent turf diseases such as snow mold, brown patch, leaf spot and dollar spot.

For control of existing turf disease, Turfcide should be used at the first sign of symptoms. Applied as a soil treatment, Turfcide also protects against soil-borne diseases in greenhouse, shadehouse, nursery, landscape and field-grown ornamentals, as well as in interiorscapes. It's available in both granular and liquid formulations. *Amvac-Chemical.com*

Calcium-enhanced fertilizer

Solu-Cal's calcium-enhanced fertilizers give turf a double-dose of vital nutrients. Each formula delivers a precise amount of calcium and the right N-P-K ratio for fall applications. One spreader pass with Solu-Cal is the equivalent of two applications, the company states. *Solu-cal.com*

Nematode control

Nortica, from Bayer Environmental Science, contains the bacteria Bacillus firmus and is used to help manage nematodes by creating a living barrier of protection around the root. In trials, research showed that the new product consistently improved root growth, turf quality and turf density. When temperature-activated, the bacteria in Nortica colonize and grow around the root, coating it and preventing damage caused in the J2 larval stage of all major parasitic nematodes, including Sting, Lance, Root-knot and others.

With its natural composition, and through multiple modes of action, Nortica provides consistent, long-lasting nematode protection. Instead of killing nematodes, it acts as competition for access to plant roots and interrupts the signaling responses from plant exudates. It also has a negative effect on nematode eggs and J2 larvae. Available in 35-lb. bags as a 5 percent wettable powder, it can be applied to bermudagrass greens, tees, fairways and roughs. *BackedbyBayer.com*

Granular fertilizer

Contec DG dispersing granular fertilizer from The Andersons eliminates up to 40 percent nutrient loss from mower pickup compared to traditional granular products, the company states. Designed for application with conventional rotary spreading equipment, Contec DG shows results quickly after coming into contact with water and is well suited for close-cut, high-density greens and tees. According to the company, it improves nutrient delivery to roots as well as turf density, color and quality from green to green. *AndersonsTurf.com*

Transfer pumps

GoatThroat Pumps are small, versatile, hand-operated or pneumatic-operated transfer pumps that produce a constant flow with rates up to 4 gpm. With operating costs of $30 anually and a cost-effective life expectancy of 10 years, these thermoplastic pumps are designed to fit containers and drums from 2.5 to 55 gal., and provide for safe, spill-proof, transfer of all commonly used herbicides, wetting agents and fertilizers. Containers remain upright, so there is no extra handling required for drums and no chance of accidental spills. Made In America, the pumps meet RoHS and US FDA food safety requirements. *Goatthroat.com*

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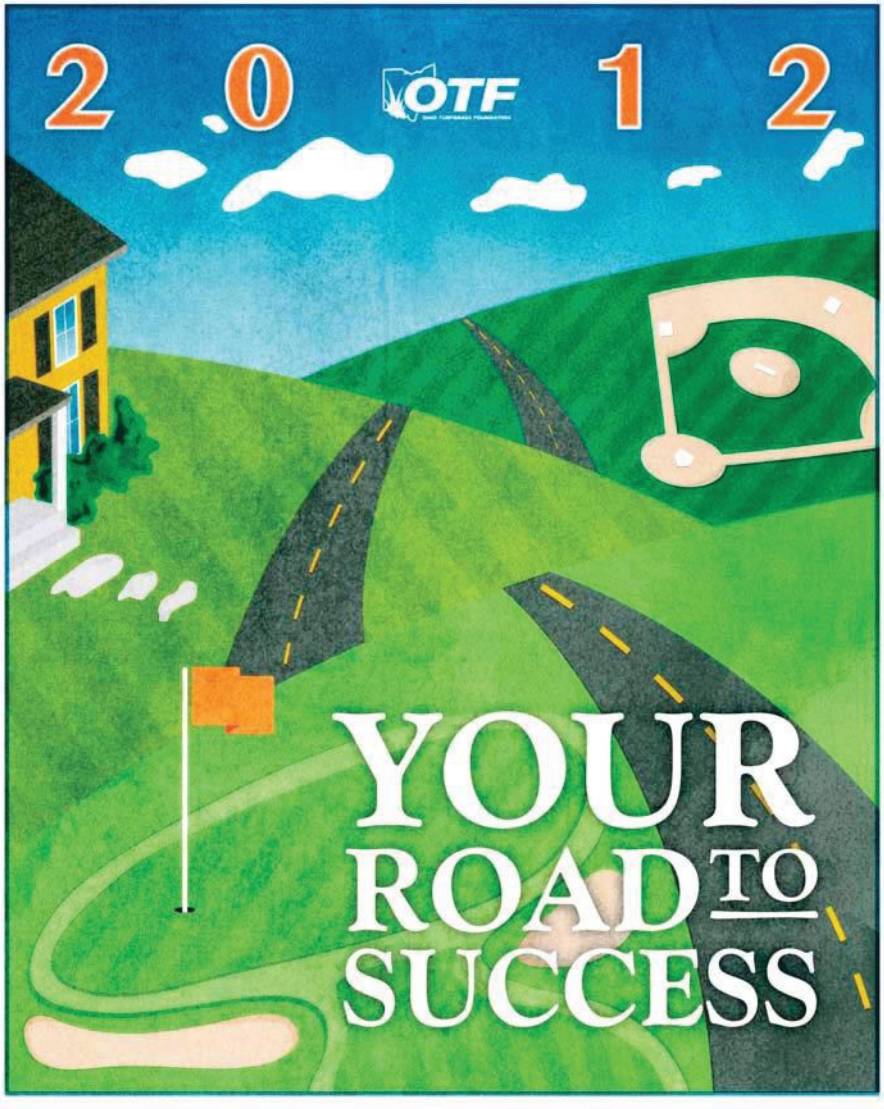

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The 19th Hole with...

Andrew Wilson

Director of Golf, Bethpage (N.Y.) State Park

We just got done playing 18, drinks are on me. What are you having? I'm partial to a pint of Guinness.

You have a degree in English, so I'm curious — what's your favorite book? I have a fondness for old Ernest Hemingway books and 20th Century American writers. Charles Bukowski is also a favorite. He was a down and dirty writer, a life you like reading about, but not one you'd want to live.

What's your girlfriend think of your job? Britainy's very understanding about the hours. Thank God she has patience. She looks forward to the fall and winter when we can spend more time together — and so do I!

What's your coolest celebrity encounter? I've been fortunate enough to travel to London twice. One of my favorite bands is the Clash. On two separate trips to London, I met Mick Jones, the lead singer, both times. We went to this little pub where they used to play gigs at when they were first starting out 25 or 30 years ago. He happened to be there the first time. We went back a year-and-a-half later, and he was there again.

So what's Mick Jones like? He was really cool. He's a long way from his punk rock days. He was wearing a blue blazer, and dressed like an English gentleman. He was affable, polite, gregarious, everything.

What's your favorite way to waste a day? While most of the planet wants to go to the golf course, I'd rather go to the city and see what it has to offer. I'm a downtown person, I like going to SoHo, Chinatown and East Village.

What's your favorite thing about your car? I have a little Honda. It starts every time, it's old reliable. I even have a Honda home lawn mower, and this spring, it started up on the first pull. So I'm sticking with Honda.

What's the best Steve Buscemi character? I have to go with Mr. Pink from "Reservoir Dogs." It put him on the map as the strange guy. He was good in "Fargo," but that one didn't end so well for him.

Of the 90 holes at Bethpage Park, what's your favorite? That's a tough one...No. 4 on the Black. When you get to the green on No. 3, it's hard to deny that the 4th hole on the Black is an awesome par 5 in front of you.

I also like just standing on the putting green. We have a lot of different languages being spoken out there… it's cool to see how the game has grown that way.

As interviewed by Seth Jones, September 25th, 2012

MAIN PHOTO BY: SETH JONES