



Petfield and the crew were busy aerating fairways in mid-April.

on TV, everyone will say what the freak is going on?" he laughs. "Everyone is so fastidious with trying to get it perfect. I'm positive this will not be a perfect Open."

### Equal opportunity

There are quite a few turf degrees circulating the 36 holes at Merion Golf Club. All that turf knowledge in one place, things could get a little too competitive.

To keep a team atmosphere present, Shaffer has implemented a system where jobs rotate. One week an assistant is the boss, the next week he's holding the shovel.

Information and project coordinator Dave McDonald explains: "The system here is, one week you're in the hot seat, scheduling, getting everyone to their positions and getting their tasks done. The next week you're part of the team out there, getting directed. It switches back and forth. So there's a tremendous amount of respect for who the quarterback is that day," he says. "With that comes no egos. It's all teamwork, because one day you're the quarterback, the next you're waterboy."

Because the crew, from the first-year in-

*Continued on page 32*

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# An American Dream

Continued from page 32

terms to McCurdy and Shaffer, all have a passion for turf, it's important that everyone gets a chance to see and learn about what is happening on the course, in the dirt, and even back in the maintenance facility's turf diagnostics lab.

Agronomist Dave Petfield, a superintendent for 18 years before coming to Merion, describes his youthful colleagues as "sponges." About a dozen times a year he'll look through the microscope to try to see what is going on with the turf. Word spreads quickly, and before long everyone is asking to take a peek.

"They want to know what's going on.



## Live Updates

For more on the U.S. Open, visit the Golfdom Daily ([golfdom.blogspot.com](http://golfdom.blogspot.com)) during the tourney.



Shaffer with general manager Christine Pooler and superintendent Arron McCurdy. "We have a great team here," Shaffer says.

They get ticked off if you don't include them. 'Hey, I heard you guys looked at this, is it still available to see?' If you say no, they're disappointed," he says. "I love it. I try to coach them along and give them the benefit of my experience."

With so much talent at the club, it's important to keep everyone engaged.

"(Shaffer) delegates. He's not afraid to delegate, and he does not micro-manage. He trusts you to your potential," says Fabian McLaughlin, administrative assistant. "And that's very highly appreciated because everyone here feels free to work. He delegates and then waits for the results."

"He's a teacher," McDonald says of Shaffer. "He calls himself a dirt farmer. He may have his boots in the soil, but his head is in the clouds when it comes to innovation."

The first tee shot of the 2013 U.S. Open will be taken on Thursday, June 13th. This may be the Open where superintendents around the nation can point to a shot on TV and tell their golfers that this course isn't just their land, but it's also our land.

It's the U.S. Open. Isn't America great?

PHOTO BY: SETH JONES



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# Super Science

## // ANNUAL BLUEGRASS

### PHOSPHORUS FERTILIZATION EFFECTS ON *POA ANNUA*

By Beth Guertal, Ph.D., and Scott McElroy, Ph.D.

**A**n annual bluegrass (*Poa annua* L.) is a common and persistent winter annual weed in southern landscapes. Previous research has indicated that phosphorus (P) may affect populations of annual bluegrass. Thus, the objective of this work was to evaluate the effect of P rate on *Poa annua*, seeking management methods for reduction of *Poa annua*.

Conducted twice in the greenhouse, this study evaluated rates of P (0, 50, 100, 200 and 400 lbs. P<sub>2</sub>O<sub>5</sub> per acre) applied to three soil types (sandy clay, loamy sand and a sand/peat mix), with five replications of each. *Poa annua* was seeded into each pot, and collected data included number of germinated seedlings, plant height, days to first seedhead, panicles per seedhead and variability in weight of seed produced.

In general, plant size and seed production increased as P rate increased, while days to maturity decreased. The addition of P decreased the number of days to maturity. *Poa annua* grown in the sand-peat mix was slower to produce a first seedhead, produced fewer seed with a lighter weight, and had fewer seedheads when compared to the two native soils. Overall, the addition of any P produced larger and more productive *Poa annua*.

Contact Beth Guertal, Ph.D., at [guertea@auburn.edu](mailto:guertea@auburn.edu) or Scott McElroy, Ph.D., at [jsm0010@auburn.edu](mailto:jsm0010@auburn.edu) at Auburn University for more information.



A *Poa annua* plant fertilized with 200 lbs. P<sub>2</sub>O<sub>5</sub> per acre.

## ON THE MOVE

### HOYLE JOINS KSU FACULTY

Jared Hoyle, Ph.D., has joined Kansas State University's Department of Horticulture,



Forestry and Recreation Resources as an assistant professor and statewide turfgrass extension specialist. Hoyle earned his bachelor of science degree in horticulture science in 2006 and his master of science degree in crop science in 2009, both

from North Carolina State University.

While in North Carolina, Hoyle focused his research on the impact of turfgrass mowing height and other cultural practices on crabgrass and brown patch incidence. He also evaluated rating methods commonly used in turfgrass weed science.

In 2012, Hoyle received his doctorate in agronomy and soils from Auburn University, where he explored factors that influenced thermal weed control. For the past year he has continued conducting turfgrass research projects as a post-doctoral research associate at the University of Georgia.

Hoyle enjoys cultivating relationships with turfgrass managers, who help him focus his research efforts on developing an applied research and extension program.

“THE EFFICACY OF A FOLIAR SYSTEMIC HERBICIDE APPLICATION DEPENDS ON MANY FACTORS, INCLUDING ITS ABILITY TO REACH THE PLANT’S LEAVES, RETAIN HERBICIDE ON THE LEAF SURFACE AND PENETRATE INTO THE LEAVES.”

Deying Li, Ph.D.

(see full story on page 34)

## //IMPROVING TENACITY

# Improve the efficacy of Tenacity for creeping bentgrass control

By Deying Li, Ph.D.

Since the launching of Tenacity (mesotrione) as a turfgrass herbicide by Syngenta in 2009, many studies have been conducted by researchers to take advantage of this unique product. One of its uses is selective control of creeping bentgrass from other cool-season grasses, such as Kentucky bluegrass and perennial ryegrass.

Creeping bentgrass on putting greens, tees or fairways often escapes to surrounding areas of a different cool-season species. The results are undesirable visual quality, poor playing conditions and scalping.

The efficacy of a foliar systemic herbicide application depends on many factors, including reaching the plant leaves, retaining herbicide on the leaf surface, penetration into the leaves, movement to the site of action, length of activity in the plants, absorption by roots, persistence in soil, and soil characteristics. Therefore, any attempts to improve the efficacy of a foliar systemic herbicide should address one or more of these basic factors (Calhoun et al., 2005).

Tenacity is a systemic pre-emergent and post-emergent herbicide for the selective contact and residual control of weeds in turfgrass. It works by inhibiting p-hydroxyphenyl pyruvate dioxygenase (HPPD), an enzyme essential for the biosynthesis of carotenoids. Without carotenoids, excessive light energy destroys chlorophyll and causes new growth to appear white before necrosis and death (Giese et al., 2005).

A careful study of the Tenacity label reveals that besides uniform application, the label addresses factors of



A view of the experimental area following treatment with Tenacity. Leaf tissue of Tenacity treated creeping bentgrass has turned brown.

## “Temperature and sunlight intensity both impact the efficacy of Tenacity.”

soil moisture; leaf surface retention and penetration (addition of a non-ionic surfactant); and persistence in the plants (repeated application requirement).

### HYPOTHESIS AND RESEARCH OBJECTIVES

This led to the hypothesis of our current study. Since the herbicide prevents the synthesis of carotenoids that protect plants from intense sunlight, if the sunlight is not intense, the herbicide would not be as effective. Dead leaves of creeping bentgrass caused by an initial Tenacity application may block

light penetration to the lower canopy. Could the removal of dead creeping bentgrass leaves by raking before subsequent application of Tenacity improve the herbicide efficacy? In addition to non-ionic surfactant (NIS), could other adjuvants, such as urea ammonium nitrate (UAN), improve the herbicide absorption (Dodds et al., 2007)?

### EXPERIMENT AND METHODS

To test the hypothesis, an experiment was conducted in field plots that had an established stand of BrightStar perennial ryegrass overseeded with Penncross creeping bentgrass at the Agricultural Experiment Station, Fargo, N.D., in 2007 and repeated in 2008. The soil was a silty clay with 4.6 percent organic matter, 2 percent sand, 46 percent silt, and 52 percent clay.

Soil chemical analysis showed 68 ppm P, 320 ppm K, and pH 7.8. The



grass was mowed weekly at 2.0 inches. Nitrogen was applied at 2.0 lbs. per 1,000 sq. ft. per year from polymer coated sulfur-coated urea (43N-0P-0K) in two equal applications in May and September of both years. Potassium was applied at 3.5 lbs. per 1,000 sq. ft. per year from potassium sulfate (0N-0P-41.5K) in two equal applications in May and September of both years. Irrigation was provided to prevent drought stress.

The experiment was arranged in a split-plot design. Raking was the whole plot treatment and herbicide was the subplot treatment. Herbicide treatments included Tenacity at 0.8 and 1.0 oz. a.i. per acre applied singly and three times sequentially on a two-week interval with 0.25 percent (v/v) non-ionic surfactant (R-11) or 0.25 percent (v/v) non-ionic surfactant plus 2.5 percent (v/v) UAN solution that contained 28 percent N (Table 1).

The first treatment in 2007 was applied on August 17, and the first treatment in 2008 was applied on July 24. The single treatment was applied at the same time as the first application of the sequential treatments. The herbicide was applied with a backpack sprayer

**TABLE 1**

**Treatment list for creeping bentgrass control with Tenacity at different rates, timing, and adjuvant.**

Tenacity (oz. a.i./ acre)	Non-ionic surfactant (NIS) (%)	Urea ammonium nitrate (UAN) (%)	Applications (no.)
0	0.25	0	3
0	0.25	2.5	3
0.8	0.25	0	3
0.8	0.25	2.5	3
1	0.25	0	3
1	0.25	2.5	3
2.4	0.25	0	1
2.4	0.25	2.5	1
3	0.25	0	1
3	0.25	2.5	1

pressurized with carbon dioxide at 36 psi and equipped with flat-fan nozzles at 19 inches spacing held about 18 inches above the soil surface to deliver a spray volume of 10 gal. per acre.

The raking treatment was applied using a power rake set at 1.2 inches height prior to the first herbicide treatment and weekly thereafter. The clippings were manually collected and removed using a spring rake. Creeping

bentgrass control was visually evaluated weekly after the first treatment based on a 0 to 100 scale (Camper, 1986), where 0 equals no effect, 1 to 30 equals slight, 31 to 60 equals moderate (rating above 30 considered unacceptable injury), 61 to 99 equals severe injury and 100 equals complete death. Evaluation of creeping bentgrass survival also was conducted on May 29, 2008 and May 14, 2009.

Continued on page 36

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**TABLE 2**

**Effects of dead tissue removal by raking on creeping bentgrass control at different weeks after treatment with Tenacity (values averaged across different rates, timing, and adjuvant).**

Treatment	Creeping bentgrass control (%)													
	1 WAT		2 WAT		3 WAT		4 WAT		5 WAT		6 WAT		Spring	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2008	2009
Rake	32a	36a	54a	56a	70a	70a	76a	78a	72a	73a	56a	60a	74a	72a
Non-rake	33a	39a	52a	52b	52b	61b	56b	70b	60b	71a	41b	57a	60b	61b

Values followed by a same letter within a column are not significantly different at 0.05 probability level separated by Fisher's protected least significant difference (LSD).

Continued from page 35

The data for creeping bentgrass control were subjected to statistical analysis. Fisher's protected least significant difference (LSD) was used to compare treatment means.

## RESULTS

Removing clippings and dead leaf tissue by raking prior to herbicide application resulted in better creeping

bentgrass control three to six weeks after treatment in 2007, but only at three and four weeks after treatment in 2008 (Table 2). The raking effects on creeping bentgrass control also appeared the following spring of both years (Table 3).

The differences between the two years might be attributed to the lower average temperature in 2008 than in 2007, despite the solar radiation of 16.1

MJ m<sup>-2</sup> in 2007 vs. 22.5 MJ m<sup>-2</sup> in 2008 during the months of study. It indicates that temperature and sunlight intensity both impact the efficacy of Tenacity. Our observation in another study also showed low efficacy of Tenacity in creeping bentgrass control under low temperature conditions.

Sequential applications of 1.0 oz. per acre with UAN plus non-ionic surfactant at a two-week interval provided the highest observed creeping bentgrass control of 93 percent in 2007 and 97 percent in 2008 (Table 3). In both years, adding UAN to non-ionic surfactant improved Tenacity efficacy when applied at either low or high rates. Although other reports showed that three sequential applications of Tenacity can achieve 97 percent to 99 percent control 8 weeks after initiation of treatment (Jones and Christians, 2007), this study showed that, without raking or adding UAN to the spray solution, only 78 percent to 82 percent control was achieved.

Compared to other treatments, only three sequential applications of 1.0 oz. per acre applied at two-week intervals with both UAN and non-ionic surfactant provided complete control of creeping bentgrass in the spring evaluation one year following the field study (Table 3).

## CONCLUSIONS

Tenacity at or below an annual total rate of 3 oz. per acre applied with non-ionic surfactant, whether in one application or in three sequential applications on



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**TABLE 3**

**Creeping bentgrass control at different weeks after treatment (WAT) with Tenacity at different rates, timing, and adjuvant with values averaged across rake treatments.**

		Creeping bentgrass control (%)													
		1 WAT		2 WAT		3 WAT		4 WAT		5 WAT		6 WAT		Spring	
Tenacity	Adjuvant	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2008	2009
L3	NIS	20d	25d	38d	34e	44c	42c	50d	55d	49d	54d	48cd	54d	42c	25d
L3	NIS + UAN	32bc	37bc	39cd	35e	44c	46c	58c	63c	67c	72c	59c	64c	62b	70b
H3	NIS	27cd	32c	40cd	47d	60b	65b	60c	65c	71bc	77bc	78b	82b	70b	78b
H3	NIS + UAN	32bc	37bc	44c	49dc	71a	76a	71b	76b	86a	91a	93a	97a	97a	98a
L1	NIS	35abc	35bc	52b	53c	53b	58b	60c	65c	45d	57d	20f	30e	15e	25d
L1	NIS + UAN	30c	42ab	70a	63b	61b	66b	65bc	71cb	53d	59d	18f	28e	17e	28d
H1	NIS	39ab	47a	72a	76a	75a	81a	81a	86a	72bc	77bc	34e	50d	30d	44c
H1	NIS + UAN	43a	48a	70a	75a	77a	83a	81a	86a	79ab	81b	35de	51d	32d	40c

L3 and H3 = Tenacity applied at 0.8 and 1.0 oz. per acre, respectively, three times in 2-week intervals. L1 and H1 = Tenacity applied once at 2.4 and 3.0 oz. per acre, respectively. Values followed by a same letter within a column are not significantly different at 0.05 probability level separated by Fisher's protected least significant difference (LSD).

two-week intervals, provided only moderate creeping bentgrass control under the climate and soil conditions at our experimental site. Removal of dead clippings and adding UAN to non-ionic surfactant plus Tenacity provided satisfactory creeping bentgrass control with three sequential treatments at rates of 1.0 oz. per acre. Since little dead leaf tissue will be removed by mowing following an application of Tenacity, superintendents may need to remove dead leaf tissue by raking prior to sequential Tenacity treatments in order to improve efficacy.

Based on the results of this study, Tenacity should be applied at 1.0 oz. per acre in each of three sequential applications on two-week intervals using a non-ionic surfactant plus UAN with power raking. Power raking will remove debris before each Tenacity application and allow for the greatest control of creeping bentgrass.

Deying Li, Ph.D., is an associate professor of turfgrass science in the Department of Plant Sciences at North Dakota State University. He can be reached at [deying.li@ndsu.edu](mailto:deying.li@ndsu.edu).

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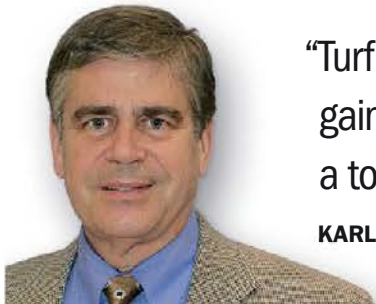
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“Turf ‘sunscreen’ products are gaining in popularity as part of a total plant health program.”

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

## Protecting turf from the sun’s rays

**S**olar radiation consists of a broad spectrum of wavelengths, from very short (cosmic rays) to very long (radio waves). Light that’s visible to the human eye makes up a narrow portion of the radiation spectrum, ranging from 380 to 775 nanometers (nm). For plants, that is the photosynthetic active range.

The visible light spectrum consists of violet, blue, green, yellow, orange and red wavelengths. Long wavelengths, greater than 775 nm, are not as powerful as shorter wavelengths. For the most part, long wavelengths contribute to the heat load of the plant.

Wavelengths shorter than 380 nm, such as ultraviolet (UV), X-rays, gamma rays and cosmic wavelengths, are powerful enough to cause chemical changes. Shorter wavelengths also are powerful enough to break bonds in organic molecules and cause mutation.

In humans, too much exposure to ultraviolet rays is the main cause of melanoma. The best way to prevent melanoma is to cover exposed skin, wear a hat and use sunscreen.

But humans aren’t the only ones who need protection from ultraviolet radiation; plants need it, too. And turf “sunscreen” products are gaining in popularity as part of a total plant health program. Pigment-based prod-

ucts are gathering the most attention, but dyes also are being used. Pigments are relatively insoluble and need to be applied as a suspension, while dyes are water soluble.

If you handle a pigment you will notice that the stains that occur on your hands, pants or shoes are much more difficult to remove than a dye that is easily washed off with water. That distinction has practical importance for superintendents on the job.

Pigments absorb, transmit and reflect specific wavelengths of light. The color we see when we look at turf is a specific pigment that’s reflecting light. The plant contains pigments, primarily anthocyanin and carotenoids, that provide protection to the plant under bright conditions and UV light. The expression of these pigments may be observed during spring, when high light intensities are present for photosynthesis but temperatures are below optimum, causing an overload of sun-

light (photoinhibition).

In response, anthocyanin and carotenoids may respond as a protective mechanism. Anthocyanin and carotenoids manifest themselves as turf leaves that are shades of blue, purple or red. Thus, the purple-colored turf patches that appear in spring are the result in many cases of these pigments.

Pigments also can be made synthetically by re-acting a dye with a metallic salt — typically copper. Synthetic pigments reflect green light, transmit red and blue light, and absorb red and blue light, along with UV.

There are a number of questions about how these synthetic pigments influence turf health. For example, they coat the leaf acting like an anti-transpirant, which can reduce water use, but do they also reduce photosynthesis? Do synthetic pigments increase, decrease or have no effect on canopy temperatures? And if the pigments have an effect, how much of an effect do they have?

Do they provide UV or plant protection? If they do provide UV protection, will adding them to a chemical compound such as an herbicide or fungicide reduce the breakdown of these and other chemicals to UV light?

These are just a few questions that we don’t have a lot of turf science to know. The good news is, research is being conducted across the country to answer these and several other questions.

We here at The Ohio State University are also continuing work on natural pigments with graduate student Dominic Petrella, who is following up work done by former student Edward Nangle. We’ll keep you up to date on our findings.

Karl Danneberger, Ph.D., *Golfdom’s* science editor and a professor at The Ohio State University, can be reached at [danneberger.1@osu.edu](mailto:danneberger.1@osu.edu).



# A multi-site contact fungicide for dollar spot control

Mike Agnew, Ph.D., is a senior field technical manager for Syngenta Turf and Landscape. Agnew is active in the development of many of Syngenta's plant protectants, especially fungicides. He can be reached at michael.agnew@syngenta.com.

## Q Secure is new to the turf market. What makes it unique?

Secure (fluazinam) is a multi-site contact fungicide that inhibits fungal respiration at several sites in the respiration pathway. It is the first multi-site contact fungicide registered for dollar spot control since Daconil. Secure will be a very effective tank-mix partner with single-site fungicides for dollar spot control.

## Q Which diseases is Secure most effective in controlling?

Secure is very effective in controlling dollar spot on greens, tees, fairways and roughs. It is most effective on fairways, because the higher mowing height means more turf canopy is present to intercept the fungicide. And a lower mowing frequency on fairways means less fungicide is removed when mowing. Secure also will control DMI- and benzimidazole-resistant strains of dollar spot and is excellent on brown patch and on leaf spot diseases of bermudagrass.

## Q What are situations where Secure is not a good fit in disease management programs?

Secure is effective on foliar diseases. As a contact fungicide, it is not effective on root diseases. Secure is excellent as a preventive fungicide and as a tank mix partner with a curative fungicide.



## Q Do you recommend Secure and Daconil be tank mixed?

We are currently investigating this potential use of Secure and Daconil. We need to clearly define the benefits before making any recommendations.

## Q What application strategy do you recommend with Secure?

For dollar spot control in cool season grasses we recommend Secure be applied prior to the turfgrass showing symptoms of dollar spot infection. Superintendents should apply Secure at 0.5 oz. per 1,000 sq. ft., tank mixed with a single-site fungicide every 14 days throughout the dollar spot season. Uniform coverage of the turfgrass canopy is critical, and research has shown that 1 to 2 gallons per 1,000 sq. ft. of spray volume provides excellent dollar spot control. Following this program will result in excellent control of dollar spot in fall. A superintendent is limited to a total of 258 fl. oz. of Secure per acre per calendar year. Twelve applications at 0.5 fl. oz. per 1,000 sq. ft. are equal to 258 fl. oz. per acre.

An additional benefit of Secure is that while providing excellent dollar spot control, it also helps in dollar spot resistance management. Applications of Daconil that were formerly used for dollar spot control and resistance management can now be shifted to snow

mold control applications while staying below the yearly Daconil application cap.

## Q Are there any precautions that should be taken when applying Secure?

Before using Secure for the first time, superintendents should carefully read the label and pay close attention to the precautions listed on the label. Those who used it last year should reread the label this year so the information is fresh in their minds.



Clark Throssell, Ph.D., loves to talk turf. Contact him at [clarkthrossell@bresnan.net](mailto:clarkthrossell@bresnan.net).

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# The 19<sup>th</sup> Hole with..



## Mike Annaian

**SUPERINTENDENT** // Armed Forces Retirement Home GC, Washington, D.C.



### Mike, what can I get you to drink?

An ice cold beer. Preferably Busch Light, if they've got it.

**Tell me about your course?** It's a 9-hole course, located at the Armed Forces Retirement Home, about two miles north of the U.S. Capitol building in D.C. It's a really cool property. It's home to President Lincoln's cottage, where he spent his summer months during his presidency, and a lot of time during the Civil War. The property itself has been a national landmark since 1974. When President Clinton was in office, he spent a lot of time playing here.

### Before I mess it up, give me the phonetic pronunciation of 'Annaian.' I bet telemarketers trip all over themselves with it...

The proper pronunciation is *uh-NYE-en*. But throughout my life, I've heard all sorts of pronunciations. 'Uh-nanny-en?'... 'Anny-anney-en?' And it's never spelled properly. It's Armenian, and it's actually quite common.

**What do you like to do when you're not working?** I'm an avid musician. I'm a drummer, so I spend a lot of time playing music. Right now I'm not playing with a band, but I still like to get out



**"IF YOU HAVE A FULL-TIME MECHANIC, BE GRATEFUL FOR IT EVERYDAY."**

there and play. And I'm an avid outdoorsmen, so I like hiking in the mountains.

**I bet you remember the first record you ever bought with your own money.** I do remember, it was back in 1981, it was Grandmaster Flash and the Furious Five. Today I'm into everything, I'm a big Grateful Dead fan, Foo Fighters, jazz, blues, funk, reggae...

**Mother's Day is around the corner. Will you be buying flowers?** Every year I do buy flowers for my mother, but it's in tribute — she passed away almost 14 years ago. She loved her gardening. I do vegetable gardens each year. Every year when I'm doing my vegetable garden I add marigolds. They were her favorite flowers, and they also draw insects away from the veggies.

**What one thing, if your maintenance budget allowed for it, would make your life instantly better?** If I had

the budget, a full-time mechanic would make my life even that much better. I have a part-time guy now, and he's great, but if I had the room in the budget to be able to bring a full-time mechanic on? My efficiency would be even better.

**Best Saturday Night Live cast member ever?** By far and away Chris Farley. The Chippendales skit with Patrick Swayze? That's an all time great.

**What's one thing you love to do in D.C.?** If someone's visiting, there's so much history... so we go to the monuments. But if I'm on my own, every Sunday there's a drum circle that takes place in Meridian Hill Park. It's an open gathering of folks who bring random drums. You sit down, five or six people start a drum circle, within two or three hours later, you literally have hundreds of people drumming or just dancing and having a good time. As interviewed by Seth Jones, April 26th, 2013.

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