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Conclusion

Based on the research, it appears that for cool-season grasses potassium may increase drought or heat tolerance, has very little to do with wear tolerance or cold tolerance, and excessive applications can increase gray snow mold. So given that, it seems potassium applications should be targeted in the summer – not in the fall as a "winterizer". In part two, I'll articulate my preferred application and soil testing strategy in a bit more detail.

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Cold and Wet: What Does This Mean For Insects This Year?

By Dr. R Chris Williamson, Department of Entomology, University of Wisconsin -Madison

Oh how different this spring is compared to last year! Comparatively, from a growing degree-day perspective (heat units), as of May 1 we are an estimated 2-3 weeks behind this year. To this end, insects are cold-blooded animals that are dependent on temperature for biological activity, most insects are inactive at temperatures below 50 F. So what impact will this have on insects this year?

The answer to this question is not so easy, thus only a speculative guess would be in order. Nature often tends or finds ways to make-up or catch-up to get things back to some degree of normalcy. However, in theory, if weather conditions continue to remain cool and wet, we can anticipate a delay in the development of insect pests and subsequent damage. For example, Japanese beetle adults typically begin to emerge in mid- to late-June with peak adult emergence in early July. If our current weather pattern continues and we do not develop typically heat-unit accumulation, the emergence of Japanese beetle adults will likely be delayed several weeks. Consequently, the occurrence of white grubs and subsequent turfgrass damage will also be delayed by several weeks.

So, what does this mean for your management approach or strategy for managing insect pests such as the Japanese beetle? The ideal IPM strategy would be to closely monitor adult emergence by either using pheromone traps or merely observing preferred hosts of Japanese beetle adults such as linden, birch, maple, etc. Once Japanese beetles adults are captured in traps or observed on plants, respective preventative grub insecticide treatments can be applied. Make certain to appropriately water grub insecticide treatments into the turf with an adequate amount of water (about 0.10-0.20 inches) immediately following insecticide application.

Should you choose to make a curative or corrective grub control application over the preventative approach, understand that smaller grubs (younger) are much easier to control than larger (older). Since most curative or rescue grub insecticides are relatively short-residual products (< 15 days) and the grub are delayed as a result of the cool conditions, be sure to closely inspect the turf for the presence of young larvae to ensure maximum control.

The bottom line regarding the impact of a cool and wet spring is that is can be quite difficult to predict how it will ultimately affect insect pest populations and subsequent damage. Again, be sure to regularly monitor and sample for respective insect pests to accurately determine the appropriate management or strategy timing to ensure the greatest likelihood of success.

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Costs, Benefits and Structure of the UW-Madison Turfgrass Program

By Dr. John Stier, Department of Horticulture, University of Wisconsin -Madison

Budgets seem to have been on everyone's minds the past few years. Superintendents have had to figure out how to make do with less, and in many cases that means fewer personnel and reduced hours. The UW turf program faces the same pressures. It's been marvelous to see, how despite constraints on their own budgets, superintendents have recommitted their efforts to helping support turfgrass research and extension in Wisconsin through general funding support and the Par4 Research program.

Part of the efforts seem due to the acknowledgement that the University of Wisconsin provides a full complement of turfgrass faculty, greater than at any time in history. We have four full-time faculty members working in turf: Dr. Doug Soldat, Soil Science Department, who focuses on soils, nutritional, and water issues; Dr. Jim Kerns, Plant Pathology Department, is the resident turfgrass disease specialist; Dr. Chris Williamson, Entomology Department, addresses insect issues for turf and trees, and Dr. John Stier, Horticulture Department, hired to provide expertise in environmental issues, grass selection and weed management. All four are knowledgeable about turfgrass management in general and can fill in for each other on providing general turf information for extension or educational programs.

Funding for our positions comes from a combination of UW-Madison and UW-Extension. Jim and Chris have appointments as 70% Extension and 30% Research. Doug's appointment is 60% Extension, 25% Research, and 15% Instruction. The research and instruction portions of the appointments are paid for by UW-Madison. John's appointment is 70% Extension and 30% Instruction.

The UW Turf program offers more turf-related courses than any time in history: Introductory Turf Management, Introductory Turf Management Laboratory, Turfgrass Nutrient and Water Management, Advanced Turfgrass Physiology and Management, and Lawns, Society and the Environment. Chris and Jim also teach sections of introductory entomology and introductory plant pathology specifically for turf students.

Besides faculty, the UW Turf team includes several staff, graduate students, and hourly workers. Tom Schwab is the manager of the O.J. Noer Turfgrass Research and Educational Facility. Outside of the four faculty and Tom, most of the staffing of the turf program is paid for by grants, gifts, and revenue generated from special activities such as the Turfgrass Diagnostic Laboratory and educational events (Table 1). Audra Anderson, the receptionist, works part-time for the O.J. Noer facility and part-time for the Wisconsin Turfgrass Association, plus a small appointment paid for by Jim Kerns for clerical assistance with the Turfgrass Diagnostic Laboratory. Paul Koch, Ben Pease, and PJ Liesch are staff members employed by faculty to assist with turfgrass research and outreach: they run the day-to-day activities associated with the 100 or so individual research projects, particularly trials evaluating new products such as pesticides, cultivars, and fertilizers. About 12 hourly workers are employed during the summer to maintain the OJ Noer grounds and assist with research projects, with state support for only two of the workers, who deal with management of the grounds and building while gift and grant dollars support the other ten workers. Several UW-Madison students are also employed during the school year to help with various research projects. The annual total employee cost is about $275,000, with slightly over half provided by the turf faculty.

Research is fundamental to acquiring information the UW Turf Program uses to provide assistance to the industry and education to students. Graduate students are hired on grants and non-state funds to conduct much of the in-depth, novel and groundbreaking research. The UW turf program has one of the largest graduate student bodies in the country. A graduate student costs a professor approximately $34,500 per year, including stipend ($21,000), fringe benefits ($6,018), and tuition ($8,000). This year's cost of graduate student salaries, fringe benefits and tuition is $413,016. Costs for supplies, travel, analyses, and other expenses associated with each project are extra, and can be enormous. The information on the effectiveness of late fall fertilization, for example, generated by Dr. Doug Soldat's graduate student Dan Lloyd, took twoyears and over $160,000 in direct costs to gather (Table 2). The information is already gaining national and international recognition, and is being used to revise long-standing extension recommendations (Lloyd et al., 2009; 2010).

Table 1.Funding sources for support staff of the UW-Madison turfgrass program.

	Funding Source	
Position	**State (University)**	**Grants, Gifts, Program Revenue, other**
Superintendent (Tom Schwab)	100%	---
Clerical (Audra Anderson)	20%	60%
Technical (Paul Koch) *	100%*	---
Technical (Ben Pease)	40%**	40%
Technical (PJ Liesch	---	100%
Hourly Labor	~ 25%	~ 75%
Gradutate Students	---	100%

* This position will lose all state funding support by 2014-15.

**This position could lose all or part of state funding support beginning in 2012.

Table 2. Costs associated with Dan Lloyd's Master degree project on cold weather nitrogen uptake. 2007-2009

Item	Amount
Stipend/benefits/tuition (2 yrs)	$69,000
Plant & soil analyses	$70,000
Cold room rental	$7,500
Nitrogen enzyme assay chamber	$10,000
Student labor	$3,000
Miscellaneous supplies	$1,000
Travel	$1,000
Publication (estimated)	$1,500
TOTAL	**$163,000**

In addition to staffing, capital and maintenance expenditures at the O.J. Noer are borne by a combination of funds from the state and professors' programs (Table 3). Since its development in the early 1990s by the Wisconsin Turfgrass Association, the O.J. Noer facility has doubled its research land area while state funding has been largely flat. In 1992, the station received approximately $15,000 for an operating budget which included hourly labor, fuel, and supplies; in 2011, the station will receive $16,000. Irrigation improvements, and capital items such as sprayers, trap rakes, and mowers are increasingly paid for by professors' program revenue and gift accounts.

Professors get their money from a variety of sources. Federal and state grants supply an increasingly important part of the funding (Figure 1). Grants are desired by UW administration, because up to 50.1% of the grant dollars are taken by the campus as "indirect costs". These indirect costs are used by the campus for multiple purposes, including infrastructure maintenance, utilities, and supporting personnel to ensure we comply with increasingly complex federal rules. Grant proposals are reviewed by campus to make sure they meet legal and accounting requirements. Once received, each purchase has to be reviewed to make sure it meets grant rules established by federal and state governments (e.g., approved vendors). Three years ago a new software program was developed and is now used by each professor for recording the time spent on grant-funded activities at six-month intervals. Grants typically have many strings attached, and do not allow for unexpected expenses such as repairing a mower. Depending on the type of grant, a number of expense types are not allowed in any circumstance, such as purchases of paper, pens, computers, or various expenses associated with graduate students. Grants always have an end-date, and funds cannot be kept past the end date for other purposes. Program revenue has fewer strings attached, though approval is needed before anyone can be hired on the funds. Program revenue is generated from fee-for-service activities, such as samples diagnosed by the Turfgrass Diagnostic Laboratory or educational events such as Dr. Soldat's NR151 training sessions. Gifts are the most desirable type of money from a professor's viewpoint, because there are few restrictions on the types of ways they can be spent and there is no expiration date.We use this type of funding for items such as topdressing sand, irrigation parts, miscellaneous supplies, funding hourly workers, travel to conferences, extension travel to assist golf courses, computers, writing supplies, paper and photocopying. As funding sources change, so does the type of research we can do. In my early years at UW, a significant amount came as gifts from the WGCSA and the WTA. Loss of these funds make it difficult to conduct golf turf research, as federal and state grant programs rarely fund golf turf research.

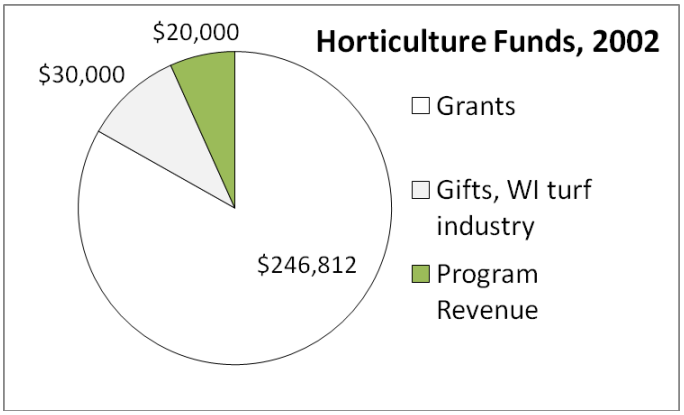
The impetus for this article came from a couple sources. First, the state's current budget deficit has resulted in many questions from the public about its tax dollars. Second, a suggestion from a long-term UW turf program supporter and superintendent at this year's Northern Great Lakes Golf Course Superintendents Association conference indicated that turf association funds should not be used by faculty for travel. I realized then that perhaps we had not sufficiently shared information with the Wisconsin turfgrass industry about where we get funds for our activities. As a colleague of mine put it, when a professor is hired, they get a desk and a license to search for money (and we sometimes have to buy our own desks). Outside of state support for our salaries, and a declining amount of funds for staff salaries, almost all the funding for the UW turfgrass program comes from money received as gifts, grants, and program revenue. Its these funds that underwrite the research and activities we provide for extension recommendations and support, such as the product and cultivar evaluations, answers to phone calls and emails, site visits, writing in The Grass Roots and newsletters, speaking engagements like the WTA Expo, Field Day, Reinders Conference and monthly WGCSA meetings, and information relayed to state and federal agencies like Department of Agriculture, Trade and Consumer Protection, the Wisconsin DNR, and the US EPA.

The recommitment from the WGCSA to help support turfgrass research and extension is vital to maintain college support for the program. As state resources decline, administrators seek to leverage funds where they will do the most good, and that includes looking at industries that will help support various programs such as potato, soybean production, nurseries, and turfgrass management. We look forward to enhancing our ability to serve the industry, and to seeing all of you at this year's field day.

Table 3. Example of typical annual maintenance and capital expenses for the O.J. Noer Turfgrass Research and Educaitonal Facility in Madison, WI

	State (University)	Professors
Captial Items	$8,000+*	$27,000*
Miscellaneous supplies	$2,000	$15,000
TOTAL	$10,000	$42,000

* Actual amounts can vary widely. For example, in 2011 a new pesticide building was funded from nearly 100% state funds. A rain-out shelter for research is currently being funded by professors' programs with a total esti mated cost of $100,000.



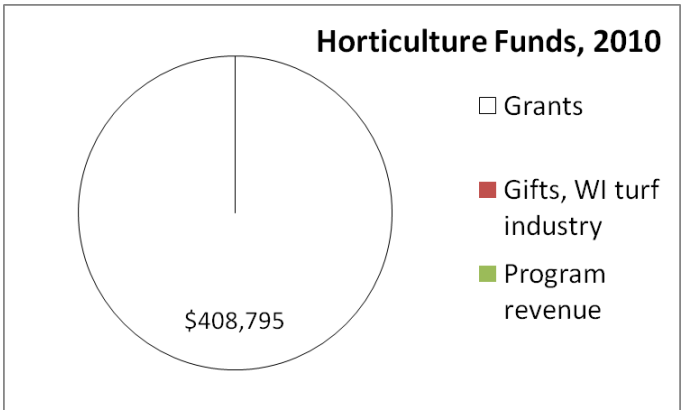


Figure1. Sources of funds for turfgrass programming in John Stier's program through the Department of Horticulture, UW-Madison. Program revenue operations were given over to other faculty in 2008.

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Patch Disease Refresher

By Dr. Jim Kerns, Department of Pathology, University of Wisconsin -Madison

The patch diseases in turf refer to a certain group of diseases (summer patch, take-all patch, necrotic ring spot, and spring dead spot) caused by ectotrophic root infecting fungi (ETRI). The fungi that incite these diseases are common soil inhabitants that can colonize root surfaces and can also infect turfgrass roots. Although this group of fungi is soilborne, they are not competitive saprophytes. In other words, they require a competitive advantage over other microbes and the turfgrass plant to initiate an infection. Hence, there are usually very specific conditions under which these fungi attack turfgrass roots.

Figure 1. Characteristic stand symptoms of take-all patch on a creeping bentgrass fairway, note that red fescue is colonizing the center of the patch. (Image Courtesy of B.B. Clarke).

This article will summarize the biology, epidemiology and management of two important patch diseases, summer patch and take-all patch, in creeping bentgrass and annual bluegrass stands.

Take-all patch

Take-all patch is caused by the fungus Gaeumannomyces graminis var. avenae (Gga). This fungus only infects bentgrasses to our knowledge and causes severe rotting of roots and crowns. Gga becomes active during periods of cool, wet weather, specifically when soil temperatures are between 55 and 65oF. The fungus has a high water potential requirement, which probably explains why we see more take-all in years with cool, wet springs. Becoming active during these cooler temperatures probably allows the fungus to outcompete other microbes for nutrients on the surface of the roots and in turn may eventually lead to infection. Although infection takes place when soil temperatures are cooler, take-all patch symptoms are not expressed until bentgrasses are subjected to heat or drought stress.

Once infection occurs then Gga colonizes primary and secondary roots near the crown and eventually the crown itself. I think the confusing thing about patch diseases is to separate the terms infection and colonization. Infection is the initiation of a feeding relationship between a pathogen and its host, whereas colonization is establishment and ramification of the pathogen throughout host tissue. Basically once Gga and other ETRI fungi have colonized turfgrass roots, there is little we can do to suppress disease. This is the reason why preventative chemical and cultural control strategies are so important for patch diseases.

After Gga has colonized the below ground tissue of turfgrass roots and a period of heat or drought stress occurs, symptoms of take-all patch become evident. Stand symptoms initially appear in late spring or early summer and are small, circular, light brown or reddish brown patches (Figure 1). Patches can increase in size throughout the summer months expanding 6 inches per year. Take-all patch can recur in following years and ultimately could reach 3 ft in diameter. As mentioned previously, Gga induces a severe rot of all below ground tissues (roots, crowns, stolons, and rhizomes), but seems to be most apparent on roots and crowns (Figure 2).