Questions From the Floor

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

1) I've treated my golf course for Japanese beetle grubs for five consecutive seasons; last year there was very little evidence of adults, grubs, or damage. Should I make an insecticide application this year? – Dane County, Wisconsin

Response: Historically speaking, Japanese beetles tend to establish in respective geographic areas for about 5-10 or so years. Various factors influence the length of time which they sustain damaging populations. Such factors include host plant availability (food sources), environmental conditions including soil moisture, natural enemies including insect predators and parasitoids as well as bacterial, fungal, and viral pathogens, and insecticide management practices. Only through a sound Integrated Pest Management (IPM) plan that utilizes routine sampling and monitoring can one effectively make an informed decision as to the need to make an insecticide application. If the data generated from an annual Japanese beetle sampling and monitoring program suggests that populations have been continuing to dramatically decrease, it may be advantageous to forgo making a preventative Japanese beetle insecticide application. Keep in mind, this approach is not fool proof. But, with the development of effective curative (corrective) white grub control products such as chlothianidin (Arena), prophylactic applications of insecticides to putting green surrounds, tee boxes and surrounds, fairways, and rough areas may not be necessary. Ultimately, this IPM approach will reduce the amount of pesticides applied, reduce the monetary cost of controlling Japanese beetles, and minimize potential environmental impact.

2) When do you think or predict the emerald ash borer (EAB) will become a problem in Wisconsin? – Waukesha County, Wisconsin

Response: If I could earnestly predict when and where EAB will be found in Wisconsin, I would likely be considered for some type of distinguished award. Realistically, EAB poses an eminent and serious threat to Wisconsin, especially since Wisconsin borders Michigan (including the Upper Peninsula) and is in relatively close proximity to Indiana where EAB is currently established. EAB was most recently discovered in the eastern Upper Peninsula of Michigan at Brimley State Park. Folks in Wisconsin and Minnesota are particularly concerned about EAB since both states have significantly more ash resources than Michigan or Indiana, thus stand to lose much more. EAB is thought to spread by four primary means: 1) movement via firewood; 2) transportation via ash (*Fraxinus* spp.) nursery stock; 3) pallets and solid-wood packing material; and 4) adult flight (< 1/2 mile per year). Of these four, the movement of infested firewood from EAB infested areas appears to be the most likely means of introduction into un-infested areas. Thus, it is critical to educate as many people as possible about the threat that EAB poses as well as how its introduction can be minimized. So, to predict where EAB will be discovered first in Wisconsin is anyone's guess; however, the hypothesized geographic areas where EAB is most likely to be discovered are the gateway areas in Wisconsin including but not limited to SE and NE Wisconsin. Other high-risk areas for EAB include commercial properties where ash nursery stock may have been obtained from

Michigan, Indiana, or Ohio and planted before EAB was a know pest as well as industrial park areas where pallets and solid-wood packing materials from Asia are common. For additional information regarding EAB, visit the University of Wisconsin, Department of Entomology, Emerald Ash Borer website at www.entomology.wisc.edu/emeraldashborer

3) What advise would you give golf course superintendents experiencing problems with ants on putting greens? - Winnebago County, Wisconsin

Response: The predominate ant species found on golf course putting greens is *Lasius neoniger,* commonly referred to as the turfgrass ant. Although quite beneficial biologically speaking, this ant species is particularly problematic from the standpoint that it creates unsightly soil mounds that disrupt the playability and uniformity of the putting green surface as well as on tee boxes, and it can cause physical damage to the precision mowing units (bed knifes and reels). Recently published research regarding ants associated with golf course turf, especially putting greens, suggests that ant mounds found on putting greens are constructed by worker ants from nearby colonies located in the peripheral area (collar and rough) surrounding putting greens; > 90% of ant mounds on putting greens are typically located within seven feet of the perimeter. Superintendents often find that spraying putting greens provides only temporary suppression of mound-building ants. Surface-applied, contact insecticides only kill workers foraging on the surface, and often fail to eliminate the queen located underground in her nest chamber. Should you desire to take this approach to managing ants, the key to success is to get started treating ants as soon as mounds appear, at the time new colonies are just getting started. The newer classes of insecticides such as the neo-nicitinoids including thiamethoxam (Meridian, **not currently registered**) and chlothianidin (Arena) have been shown to provide up to 12 weeks of suppression. Keep in mind, this management strategy will not likely eliminate the ants. Another, possibly more effective ant management strategy that provides season-long suppression of mound activity is the use of fipronil, the active ingredient in Chipco Choice and Chipco TopChoice granular insecticides. Lastly, the use of granular ant baits is another effective ant management strategy. Ant baits such as MaxForce Fine Granule Insect Bait (Clorox Co.) contain a slow-acting insecticide. They are most effective when they are sprinkled around ant mounds; worker ants take the bait back to the nest and feed it to the queen and her young (brood). Typically, the nest dies out in a few days. It is important to remember that ants **do not** take wet bait, so do not apply the bait when dew is present or rainfall is anticipated, and withhold irrigation for at least 12 hours after application.


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Lawn P: Where'd It Come From?

By W.C. Kreuser and Dr. W.R. Kussow, *Department of Soil Science, University of Wisconsin-Madison*

Surveys indicate that 65 to 90% of home lawns contain levels of soil test P that are above what research has shown to be optimum levels for the grass. The assumption among environmentalists is that this "excessive" P is the result of over fertilization of lawns and this is why P application on lawns must be regulated. Ignoring the fact that there is no relationship between soil test levels of P in home lawns and the amounts of P in runoff water, we decided to test the assumption that home owner fertilization of their lawns is what has led to these high soil test levels of P.

Theoretical considerations led us to hypothesize that in most instances fertilizer *is not* the primary source of soil test P in home lawns. To arrive at this hypothesis, we first looked at the relationship between the annual rate of P_2O_5 application and soil P that was developed over several years of research at the O.J. Noer Turfgrass Research and Education Facility. This relationship, shown in Figure 1, says that unless more than 0.98 lb P_2O_5 /1,000 ft² is annually applied when clippings are being removed or more than 0.38 lb P_2O_5 when clippings are not removed, fertilizer is not increasing soil test P. We then selected 29-3-4 as a typical grade of lawn fertilizer and calculated how much P would be applied when the annual N input is 4.0 lb/1,000 ft².

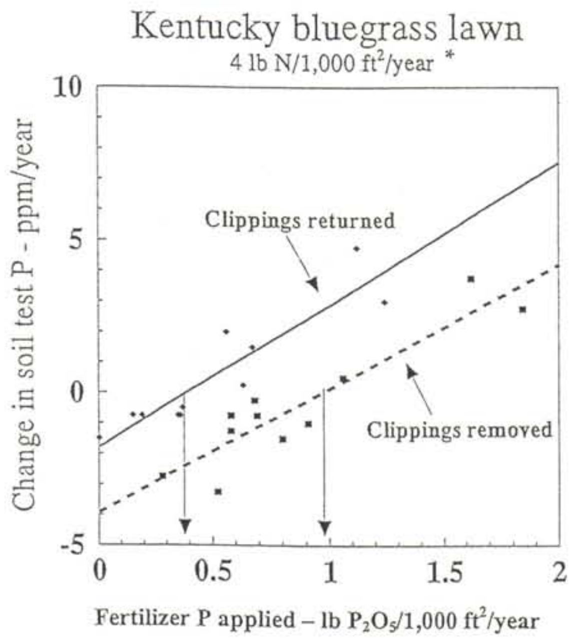

Figure 1. Influence of annual fertilizer P rate on soil test levels of P in a Kentucky bluegrass lawn with clippings returned or removed.

What we're assuming here is that this translates into 4.0 lb actual fertilizer N when clippings are removed and 3.0 lb fertilizer N plus recycling of what research has shown to be an additional 1.0 lb N when clippings are not removed. Under these circumstances, the annual rates of P_2O_5 applied/ 1,000 ft² are 0.41 lb when clippings are removed and 0.31 lb when the lawn is mulch mowed. According to Figure 1, neither rate of P_2O_5 is sufficient to replace what the grass is removing. Rather, there should be a gradual depletion of soil test P.

This conclusion that under many circumstances fertilization of lawns has not increased soil test P led to the question posed in the title of this article: Where'd It Come From? After some discussion, we decided to test the idea that perhaps the P was primarily coming from that "magical" 3 inches of topsoil spread prior to lawn establishment. This made sense given that the topsoil is that being scraped off new areas of housing developments and these developments are taking place on agricultural lands where soil test P levels can be very high. We then set about collecting samples from topsoil stock piles around the fringes of Madison and nearby communities. Bill consulted Madison bus routes and on weekends loaded his bike on busses, went to outlying housing developments, and then rode his bike around collecting topsoil samples. I drove to Fitchburg, Verona, and Oregon and likewise collected samples. After three weekends, we had samples from 18 stockpiles of topsoil. Bill then analyzed the samples in my lab for Bray #1 extractable P.

The results of the analyses of the topsoil samples are shown in Table 1. As you can see, the levels of P ranged all the way from 27 to 173 ppm and averaged 67 ppm for the 18 samples. To put these numbers in perspective, 40 ppm P are considered to be optimum for lawn establishment and 20 ppm are optimum once the grass is established. Therefore, in the eyes of environmentalists, 78% of the samples have "excessive" P for turf establishment and all have excessive P for established lawns. Interestingly, the lowest yet excessive P level of 27 ppm came from the topsoil stockpiled in a housing development taking place in a forested area. While the area may have been farmed many years ago, it certainly has not been fertilized to any notable extent.

The recommended depth of soil sampling for a home lawn is 6 inches and would therefore include some subsoil as well as the topsoil. Assuming equal amounts of each, the P contributed by the topsoil would be one-half the levels shown in Table 1. If we make the ridiculous assumption that there was no P in the subsoil, soil test P levels to a soil depth of 6 inches would be above 20 ppm for 72% of the soils included in this study. Factor in the application of starter fertilizer and some P in the subsoil and this per-

Table 1. Topsoil stockpile soil test P.

Stockpile	Soil P	Stockpile	Soil P
	ppm		ppm
1	173	10	44
2	41	11	91
3	31	12	65
4	73	13	97
5	64	14	45
6	93	15	54
7	38	16	38
8	50	17	130
9	51	18	27

Table 2. Characteristics of lawns sampled.

Number	Age	How established	Cultural practices
	years		
1	2	Seed	No fertilizer or irrigation; mulch mowed at 3 inches
2	2	Sod	Starter fertilizer only first year; irrigated daily; mulch mowed at 2.5 inches
3	13	Sod	Starter fertilizer only; irrigated to overcome moisture stress; mulch mowed at 3 inches
4	14	Sod	Fertilized four to five times per year; irrigated weekly to prevent moisture stress; mulch mowed at 2.0 to 2.5 inches
5	37	Sod	Fertilized three to four times per year with high-N lawn fertilizer for first 30 years, only N since then; clippings removed first 25 years; generally mulch mowed since then; mowing height of 2.5 or 3 inches; irrigated at onset of moisture stress
6	35	Sod	Fertilized following a four-step program; irrigated to prevent stress; mowed at 2.5 to 3.0 inches; clippings generally removed

centage could easily increase to 90 or more, which is the percentage of Madison lawns that reportedly have excessive P and can only be fertilized with "zero" P fertilizer.

All of this information clearly suggested that topsoil, not lawn fertilizer, is the primary source of the soil test P in at least the more recently established Madison area lawns. But we decided to take our study one step further. We located some lawns of different ages and management and took soil samples at 1-inch increments down to and including the subsoil. The rationale we applied here was that, given the textures of the topsoils we examined, these soils would have such high P sorption capacities that the chances of fertilizer P migrating much below the top inch would be slight to none at the soil test P levels observed. Therefore, the P levels at the 2- or 3-inch soil depths should represent the amounts of P originally present in the topsoil. Subtracting this amount of topsoil P from the amount in the top 1 inch of soil then provides an indication of how much P has been added through fertilization.

The general features of the 6 lawns sampled are listed in Table 2. Analyses of the soil samples collected appear in Table 3. Note that the P in the top inch of soil from the 4 lawns ranging in age from 2 to 14 years was well above the optimum of 20 ppm but in the much older lawns the P was at or below this optimum level. This observation immediately casts doubt on the assumption that fertilization is the cause of high P levels in home lawns.

As explained in Table 3, the data can be used to calculate the percentage of P in the top inch of soil that is likely derived from the topsoil brought in for establishment. These numbers range from 49% for lawn #3 that is 13 years old to 100% in the 2-year-old lawn that was never fertilized. Averaging over all six lawns, the estimate is that 78% of the P in the top 1 inch of soil can be traced back to the topsoil. This leaves 22% that may attributed to fertilization. Research indicates that sod can also contribute significant amounts of P. We were unable to find any lawns where the sod contribution of P could be isolated from the influence of starter fertilizer application.

Table 3. Lawn soil test P. †

Lawn number	Topsoil depth 1 inch	2 inches	3 inches	Subsoil
	ppm of P			
1	79	83	80	31
2	45	36	34	31
3	89	69	44	37
4	85	79	—	43
5	13	10	9	15
6	19	20	16	12

† Bray #1 method.

The lawns 35+ years in age (#5 and #6) are of particular interest. For much of their lifetimes, they were fertilized with a fertilizer whose grade was 29-3-4 or something very similar to this and clippings were removed. Both were found to have less than the optimum 20 ppm P in the top inch of soil (Table 3). How can this be? This confirms the validity of the information given in Figure 1. When clippings are removed and 4 lb N/1,000 ft^2 are being applied, the phosphorus removal rate is about 0.98 lb P_2O_5 per year. With the 29-3-4 fertilizer, only 0.41 lb P_2O_5 is being applied. The resulting deficit of 0.47 lb P_2O_5 caused the soil test P to decrease by around 1.6 ppm per year. This suggests that both lawns started out with 72 to 75 ppm P, which are very reasonable numbers according to the amounts of P we found in the stockpiled topsoil (Table 1). Had regulations regarding P use on lawns been in effect when these lawns were established and zero P fertilizer applied, the rate of decline in soil test P would have been 3.9 ppm (Figure 1), and P deficiency would likely have occurred within 13 to 14 years after establishment.

Our main conclusions from this study are:

1. Topsoil accounts for the majority of the soil P in many Madison area lawns.

2. Applying a typical high-N lawn fertilizer such as 29-3-4 cannot increase soil test P when a lawn is mulch mowed and will decrease soil P by about 1.6 ppm per year if clippings are removed.

3. Unless Dane County home owners are diligent and have their lawn soils tested every few years, P deficiencies are inevitable when following regulations that prevent fertilizer P application. Research indicates that the result will be a decline in lawn quality, leading to increases in runoff loss of P.

William ("Bill") Kreuser has just completed his first year at the UW-Madison, majoring in Soil Science and specializing in Turf and Ground Management. He is interning this summer at the Whistling Straits Golf Course.

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The Great Microdochium Outbreak of 2006

By Paul Koch, Turfgrass Diagnostic Lab, University of Wisconsin-Madison

When managing turfgrass, seasons can be remembered for certain reasons long after they have come to pass. Spring is a delicate time of the year to grow turfgrass because so much depends on the weather. I'll remember the spring of 2004 for its heavy rains and destructive flooding, forcing me to pump water for hours on end at Blackwolf Run just so golf carts could pass the 18th hole (we ended up losing the battle that day). The spring of 2005 will be remembered by most as having some of the worst winterkill in recent memory and being an all around miserable spring for anyone managing turfgrass. Now I'm not sure what all of you will remember the spring of 2006 for, but I will remember it as the spring of "The Great *Microdochium nivale* (also known as pink snow mold) Outbreak."

Now that might not strike fear into the hearts of the average citizen, but it was quite a problem this spring for most people trying to manage turfgrass in Wisconsin. Despite its name, snow is not required for the development of pink snow mold. Under normal conditions, the fungus is most active at air temperatures ranging from 32-45°F. But under periods of prolonged leaf wetness, much like we saw this spring, severe infection can occur at air temperatures up to 65°F (Couch 1995). In fact, my predecessor Steve Abler reported seeing pink snow mold at a Wisconsin golf course in July of 2004.

Symptoms of pink snow mold differ depending on when you observe them. Pink snow mold symptoms seen as snow cover melts away are circular patches of dull white turfgrass matted together, sometimes with a pink ring surrounding the patch (Couch