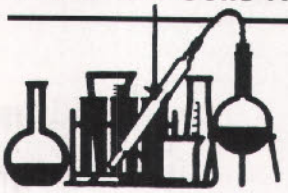

QUESTIONS FROM THE FLOOR

By Dr. Wayne R. Kussow

1. I've just received results from the State Soils Testing Lab of samples sent in last fall. I tested all my fairways. In every case, the phosphorus test read 400 lbs/A and the reading was nearly off the scale in the "excessive" range. Should I be worried? What can I do?

DANE COUNTY

ANSWER: Worry is too strong a term. Vigilant and concerned are more appropriate. Be vigilant because there is the possibility of high phosphate levels triggering one or more micronutrient deficiencies. This possibility is, however, quite remote. I'm not aware of any confirmed micronutrient deficiencies on turfgrass in Wisconsin and certainly none induced by overfertilization with phosphate.

Concern should arise over how soil phosphate became "excessive". This cannot happen overnight. Rather, soil phosphate levels such as these represent years of phosphate applications that were not needed.

What to do? Examine your fertilization program. Applying more than 0.25 to 0.50 lb/(1000ft²(M))of phosphate annually is more than what is removed in clippings and will slowly buildup soil phosphate levels. In your case, where soil test phosphate is excessive, the recommendation is to not apply any phosphate until soil test levels drop to something in the range of 75 to 100 lb/A. Then institute a maintenance program of 0.25 lb/M (10 lb/A) phosphate annually. If soil tests continue to decline, increase the rate to 0.5 lb/M/season.

2. I've been receiving some literature on a product called N-Sure. Using a new fertilizer formula known as triazine, it sounds like it is too good to be true (controlled release, low burn, high stability). Does this product have a place in the management of good golf turf?

MARATHON COUNTY

ANSWER: N-Sure granules consist of powdered triazine (also known as nitrazine and melamine) embedded in urea. Pure triazine has a guaranteed minimum N content of 66%. Its water solubility at room temperature is 0.5%, which is five times that of IBDU but still far too low to cause salt injury. Release of N to turfgrass from triazine is by way of microbially mediated hydrolysis. Initially, the rate of hydrolysis is very slow. In fact, it is so slow that for all practical purposes there is no N release to turfgrass during the first four to six weeks after application. This is why triazine is blended with urea. Once hydrolysis begins to release significant amounts of plant available N, triazine appears capable of satisfying turfgrass N needs for a period of 12 to 14 weeks providing a high enough rate is applied. By relying on urea to meet turfgrass N requirements during the first several weeks after application, N-Sure begins to look like a fertilizer that needs to be applied only once each season.

Field testing of N-Sure has not been extensive, but the product has been shown to be capable of maintaining satisfactory color in Kentucky bluegrass until fall when applied at the rate of 100 1b. N/A in early spring. Turfgrass color tends to drop off rapidly in mid-to-late fall, just as it does with any slow release N source that depends on microbial action for N release.

As with any new product, I would not advise anyone to get too excited about N-Sure until you've experimented with it on a limited basis. If you do decide to try the product, do so in such a way that you have side-by-side strips of turf treated with N-Sure and your normal N applications. If you're naturally skeptical of new products, come to the WTA Field Day next August. Triazine is one of the entries in a fertilizer demonstration installed last fall on a golf tee at the Yahara Hills Golf Course.

3. I've been on a sand topdressing program for over a decade now and for a lot of different reasons I'd like to switch back to using an amended sand material. From what I've read and all I've heard, it seems I shouldn't even consider this. What do you think?

OUTAGAMIE COUNTY

*ANSWER: I think the blanket statement that "once on a sand topdressing program, always on a sand topdressing program" is long overdue for some qualifications. The basic qualifier is that one must never create abrupt soil layers that differ substantially in their moisture characteristics. **If** you are thinking of switching from pure sand to something like an 80/20 sand-peat mix using basically the same sand as before and **if** you continue to core aerify on a regular basis, then you will not create the type of layering such as that often associated with black layer formation. This, of course, assumes that your present sand layer and the original soil beneath do not already present sharp contrasts in water infiltration rates. Assuming here that they do not, then I see no reason why you should not change to an amended sand material **providing the two "ifs" noted above are satisfied.***

4. I'm wondering if I should climb on the "high K bandwagon" so many of my colleagues are riding these days. Many are using 1:2 and 1:3 N/K ratios. What do you recommend for N/K ratios for Wisconsin golf green turf? Do you have a recommended SSTL level for K in golf green rootzones based on this increased interest in potassium?

BROWN COUNTY

ANSWER: The high K bandwagon exists for two reasons: (1) experimental evidence that high levels of K in turfgrass are associated with greater stress tolerance; and (2) recognition that USGA greens mixes have low K storage capacity and, for this reason, are notable for high K leaching rates. What constitutes an appropriate N:K ratio, therefore, depends on whether we're talking about USGA greens mixes or natural soil and/or older mixes that contain substantial amounts of soil. Silt loam

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soil easily stores 500 or more lbs/A of plant available potassium and allows for little or no leaching loss. Under this circumstance, once soil test K is built to 300+ lbs/A, annual application of 0.8 lbs K_2O/M for every pound of N applied will put your turfgrass on a high K diet. Assuming the K goes on only once a year (preferably in early fall), the annual N rate is 3 lbs and the K is going on with 0.5 lbN, then we are, in fact, talking about a fertilizer whose N:K_2O ratio is nearly 1:5 in order to have 0.8 lbK_2O per pound of annual N.

Because of K leaching loss from USGA greens mixes and a K storage capacity of only about 250 lbs/A, the fertilizer N:K_2O ratio required is generally in the range of 1:1.0 to 1.2. In this case, it is impractical to even think of getting by with only one or two K applications per season. If all the N is going on as a dry material, the appropriate N:K_2O fertilizer ratio is 1:1 to 1:1.2. However, the most common situation is one in which N is being applied at frequent low rates for much of the season, often as a urea solution. Then there is no alternative but to apply K alone (preferably as K_2SO_4) three or four times each year. The appropriate rate for each application is the annual N rate multiplied by 1 to 1.2 and divided by the number of applications.

Owing to the fact that we can't expect to build K levels much above 250 lb/A in USGA greens without getting excessive leaching, this is a reasonable soil test to shoot for. However, we need to realize that this is not enough K to keep turfgrass on a high K diet for an entire season.

5. My soil test results are starting to scare me. Soil pH values have slowly been rising in green, tees and fairway results. Many are now in the 7.6-7.8 range. Am I risking real problems of nutrient availability yet? Should I be on an elemental sulfur program? How many lbs/A can I safely use? When's the best time to apply?

ROCK COUNTY

ANSWER: Your pH values have risen to 7.6 to 7.8 because you, like many others in the state, are irrigating with hard water. Every time you irrigate you're applying calcium and magnesium that act as liming material. Your pH values should not increase much above where they are at the present time.

We normally think of high soil pH as a common cause of micronutrient deficiencies in Wisconsin turf. The most likely candidate is iron, but we haven't seen any Fe deficiency.

The pH rise you've experienced is common, cannot be avoided and, at least so far, has not seemed to create nutrient deficiencies. For this reason alone, I'm not a proponent of elemental sulfur programs. Even if widespread micronutrient deficiencies did begin to show up in turfgrass growing on high pH soils, elemental sulfur would not be the total answer to the problem. There are several reasons for this. Sulfur neutralizes soil alkalinity only as a result of microbial oxidation to sulfuric acid. Theoretically, (i.e., when 100 percent of the sulfur is oxidized), slightly more than the equivalent of three pounds of calcium carbonate is neutralized per pound of sulfur applied. Even then, the amount of sulfur required is impressive. For example, decreasing the pH of a sandy soil

from 7.5 to 6.5 requires approximately 500 lb/A or 12 lbs/M of sulfur. Contrast this with the fact that turfgrass injury is likely if more than 2 lbs/M of sulfur are applied at any one time and if more than four lbs. are applied in a single season. Clearly, soil pH control with sulfur has to be approached as an annual affair extending over several seasons.

Another problem with pH control through sulfur application is incomplete sulfur oxidation and, therefore, less than 100% effectiveness. How much sulfur will be oxidized varies greatly from one soil to another and is unpredictable. In the years to come we're going to hear a lot of heated discussion about the effectiveness of sulfur applications, simply because oxidation rates vary widely from one location to another.

Finally, in turf, sulfur must be surface applied. Soil pH at the surface will eventually drop very low, perhaps as low as 3.0. It is only over time that the acidifying action of the sulfur will work its way downward in soil. I am not aware of any studies that show how surface applications of sulfur affect soil pH in both the short and long run.

6. We're rebuilding some putting greens on our golf course next summer. The question I'm confronted with is one that has received a lot of discussion lately. Opinions seem to vary. Do you recommend the very coarse sand layer in the USGA specifications?

MANITOWOC COUNTY

ANSWER: The very coarse sand layer was originally incorporated into USGA greens solely to provide a barrier to prevent fine soil particles from migrating into the pea gravel bed, clogging pores and impeding drainage. The idea that the very coarse sand layer may not be necessary arose from studies conducted by researchers at Texas A&M University and reported in the November/December 1980 issue of the USGA Green Section Record. They concluded from studies with eight-year-old greens and simulated greens subjected to prolonged saturated water flow in the laboratory that "no significant effect of the two-inch sand layer was evident when proper size gravel was used." In other words, they found no evidence for downward migration of fine soil particles into the pea gravel when the very coarse sand layer was left out.

The USGA Green Section does not refute this conclusion, but emphatically points out that the Texas A&M observations apply only when the 12-inch sand-peat mix adheres rigorously to USGA specifications and the pea gravel falls almost exclusively in the 1/4 to 3/8 inch size range. It is out of concern that these specifications are often not strictly adhered to that the Green Section staff continues to recommend installation of the 1½ inch coarse sand layer over the pea gravel bed.

My recommendation is to continue to install the very coarse sand layer unless your construction materials have been subjected to rigorous laboratory testing, have been shown to meet USGA specs, and mixing of the sand and peat will be as prescribed by the USGA. Most people that I've talked to point out that the cost of installing the very coarse sand layer is not a major component of total green construction cost and is worth the insurance it provides against drainage system failure.

7. We did some remodeling last year and built a new green. I was under a lot of pressure from the course architect to use straight sand in the rootzone mix. I resisted but still wonder if it would have been okay to use sand alone. He lobbied heavily with my committee and I would like some assurance it was worth the battle. What do you think?

PORTAGE COUNTY

ANSWER: Consider yourself lucky that you won the battle. Unfortunately, your club membership will probably never fully appreciate what you've done for them. Peat is mixed with sand to provide a lower soil bulk density that facilitates root penetration, to increase pore space by 30 to 40 percent so as to ensure adequate aeration and to increase water holding capacity by 60 percent or more. Without this added water holding capacity, it is very difficult to get completely through a single sunny, summer day without turfgrass wilting. Peat also contributes a substantial amount of cation exchange and pH buffering capacity. These mean better nutrient retention against leaching and a more stable soil pH. I know of a pure sand green in Wisconsin that requires 20 lbs N/M/season just to maintain satisfactory bentgrass color!

In summary, mixing peat with sand provides a more favorable physical environment for turfgrass and a chemical environment that makes soil fertility easier to control. The net results in the long run are

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better quality greens that are easier and less costly to manage.

8. I've religiously aerified my greens twice a year for the past 20 years. Each time I've removed the cores and backfilled the holes with my own rootzone mix. It's gotten to the point now where the cores are of the same texture as the topdressing I'm hauling back on. Can I stop aerifying now or is there still value to the procedure? Would one time a year be enough? (I'm under a lot of pressure from our members to give it up altogether.)

KENOSHA COUNTY

ANSWER: The answers to your questions lie in the reasons for core aerification and whether or not one or more of these reasons still applies to your greens. Core aerification alleviates soil compaction, minimizes soil layering, crusting and localized dry spots and retards thatch accumulation. You indicate that there is no longer any evidence of soil layering, so we can strike this from the list. If you rely on wetting agents to handle localized dry spots, the list becomes even shorter. I'm of the opinion that core aerification can be replaced by slicing plus topdressing to control thatch. Assuming you're willing to go this less disruptive route for thatch control, then all that remains to worry about is soil compaction.

It would be foolhardy for me to sit here and decide whether or not compaction is or could become a problem for you should you cease core aerification. All I can do is try to provide information that will help you make this decision.

Research has shown that soil compactability is minimal and essentially constant once the sand content of soil exceeds 60%. Thus, with greens that contain more than 60 percent sand, traffic rather than soil composition controls how much compaction will occur. The minimum traffic is, of course, that arising from maintenance equipment. To this you have to add the number of rounds of golf being played each year. The heavier the play, the greater the potential for compaction and its associated problems.

I find it difficult to believe that there are any golf greens whose bulk densities do not slowly increase over time due to compaction. The difficulty is deciding at what point compaction requires remedial action. What compaction does is collapse the larger pores in soil. The responses are reductions in water infiltration rates and increases in water holding capacity that eventually provide a nearly continuously moist soil surface on which algae and moss can become established. These, then, are the initial indicators of soil compaction and the need to begin or intensify a core aerification program.

Can one core aerification per year prevent compaction from becoming a problem? Very frankly, I don't have any basis on which to answer this question. Perhaps this is feasible on relatively lightly trafficked USGA type greens. I'd sure like to hear a panel of golf course superintendents discuss this issue sometime!