Testing Turfgrass Soils

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Best management practices for turfgrass fertilizer ensure a vigorous soil cover while minimizing risk of nutrient and sediment losses that harm water quality. While soil testing of home lawns is seldom practiced, a recent survey indicates that two-thirds of turfgrass soils in New York may be limited by P, K, or pH. About 20% require P fertilizer.

Fertilizers, applied with the right management, can green lawns without greening lakes. Phosphorus—a nutrient that can stimulate algal blooms—can also be an essential component of such fertilizers. Soil testing provides information critical to deciding whether or not to include it.

Turfgrasses are well known for their ability to protect against soil erosion. They break the impact of raindrops, reduce runoff by increasing the amount of water that filters into the soil, and hold the soil from moving. Since erosion puts both sediment and nutrients in streams, turfgrasses play a key role in protecting water quality.

All plants, including turfgrasses, require nutrients to grow. Their vigor depends on the level of soil nutrients. Maintaining a vigorous lawn has been shown to reduce erosion and runoff compared to poorly maintained lawns. So while it may seem contradictory, you may need to apply P to turf in order to reduce P loss in runoff.

How can you tell if your lawn needs P? Few people test the soil for their lawns, and soil testing is not commonly a part of a commercial lawn care programs. The cost of a soil test is not high—US$10 to 30—but it seems that many people feel the size of their lawn doesn't justify the cost and the time involved.

The Cornell University Nutrient Analysis laboratory analyzes over 800 turfgrass soil samples each year, but a recent survey of New York state reported a total of 3.7 million residential lawns, comprising 2.8 million acres. Other labs also test turfgrass soils, but at the current rate of soil testing, it is likely that the average lawn is sampled just once in a thousand years.

Most residential lawns do not require sampling as frequently as agricultural fields. If clippings are returned, most of the P and K taken up by the grass is returned to the soil, and soil test levels will not change much over time. However, if a lawn is never sampled, it can be hard to judge whether a lawn's performance is limited by those nutrients.

A recent summary of New York turfgrass soil tests, based on samples submitted to the Cornell laboratory between 2001 and 2005, included 3,303 home lawns and 500 athletic fields. Since it was not designed as a random sample of these soils, limitations apply to its interpretation, but it can be assumed to represent some of the better-managed turfgrass soils of the state.

The summary indicated that soil fertility levels were often high, and distributions for home lawns and athletic fields were similar. Around 60% of soils tested high or very high for P (Table 1). Likewise, 64% of soils tested high or very high for K (Table 2). However, a substantial number of soils tested in the low range, a level where applying the nutrient usually improves turfgrass vigor, or in the medium range, a level where it could.

Maintaining a vigorous and healthy lawn has been shown to reduce erosion and runoff compared to poorly maintained lawns.

Another soil attribute that may limit turfgrass vigor is soil pH. The distribution of pH levels in from the same survey is shown in Table 3. Turfgrass species differ in their pH preferences. Kentucky bluegrass

Table 1. Soil test P levels in New York state turfgrass soils, 2001-2005.

Soil test category	Soil test P[1], ppm	%
Low	0 – 2	20
Medium	2 – 4	19
High	4 – 20	41
Very high	> 20	19

[1]Morgan soil test, sodium acetate extractant.

Table 2. Soil test K levels in New York state turfgrass soils, 2001-2005.

Soil test category	Soil test K[2], ppm	%
Low	0 – 50	18
Medium	50 – 75	18
High	75 – 120	31
Very high	> 120	33

[2]Soil test K categories depend on Soil Management Group. Ranges in ppm shown are for Group 4 soils (sands and coarse loams). Percentages were calculated from the appropriate ranges for each soil group.

Table 3. Soil pH distribution in New York state turfgrass soils, 2001-2005.

Soil pH range	% of soils
<5.5	14
5.5-6.0	18
6.0-6.5	16
6.5-7.5	39
>7.5	13

Abbreviations and notes for this article: P = phosphorus; K = potassium; ppm = parts per million.

grows best when soil pH is between 6.0 and 7.0, while fine fescues grow best in the more acidic range of 5.5 to 6.0.

Putting the three attributes together—P, K, and pH—two-thirds of the soils tested showed a possible limitation arising from one or more of the three. Soil testing would benefit the performance of the majority of lawns. It also identifies lawns where further P inputs are not required, helping to protect the environment.

Since P and K are nutrients that accumulate in the soil, fertilizing usually builds up the soil test level, as long as the amount applied exceeds removal. If all clippings are removed from a vigorous lawn, the nutrient removal amounts to about 0.5 to 2 lb of P_2O_5 and 1 to 5 lb of K_2O per thousand square feet. If the clippings are left on the sod, most of the P and K is recycled. Where soil tests are low, continued fertilization will eventually increase them. It is unnecessary to continue building up soil test P once it is in the high range.

Does a buildup of P in a turf soil increase the risk of runoff polluting water? This question was investigated in research at Cornell University. In the fall of 2003, 68 plots were monitored for runoff water. Half of the plots were bare soil, and the other half had turf. The Morgan soil test P levels in these plots ranged from 4 to 20 ppm in the top 6 in., and from 8 to 40 ppm in the top inch.

The presence of turfgrass reduced the P load in runoff from these plots by 36%. For bare soils, the P load in runoff increased six-fold with increasing soil test. Where the soils were protected by turf, there was no significant increase in runoff P load as soil tests increased.

These data suggest that buildup to a soil test P level sufficient for turfgrass nutrition would not constitute a risk to water quality in terms of runoff P load. Of course, it would be important to ensure that P fertilizer is applied using best management practices:

- At recommended rates
- Avoiding spillage onto paved surfaces
- Keeping away from water flow paths
- In balance with other nutrients
- With appropriate timing BC

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2007 InfoAg Conference Schedule

Dates for two regional Information Agriculture Conferences and the biennial international InfoAg Conference were announced earlier by Foundation for Agronomic Research (FAR) President Dr. Harold F. Reetz and IPNI President Dr. Terry L. Roberts.

InfoAg Mid-South is set for February 7-8 at the Bost Extension Center, Mississippi State University, Starkville. This regional event will focus on the application of precision technology and information management for cotton, rice, soybeans, and other crops of interest in the Mid-South.

InfoAg Northwest is scheduled for February 20-21, at the Three Rivers Convention Center in Kennewick, Washington. This is a first-time conference in the Northwest agricultural region. InfoAg Northwest will highlight precision equipment, practices, and the people who have successfully incorporated them into their grain crop, fruit, vegetable, and potato production systems.

InfoAg 2007, the popular national/international edition of the Information Agriculture Conference, is set for July 10-12. The location is the Crowne Plaza in Springfield, Illinois, the same as for InfoAg 2005. Since the first conference in 1995, InfoAg has been a leading event in precision agriculture. InfoAg 2007 will present a wide range of educational and networking opportunities for manufacturers, practitioners, producers, and anyone interested in site-specific techniques and information management.

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