NUTRIENT MANAGEMENT ON ATHLETIC FIELDS

Wayne R. Kussow
Department of Soil Science
University of Wisconsin-Madison

Introduction

The primary objective of athletic field management is to present to players the safest surface possible. To meet this objective, one has to create a resilient turf with uniformly dense cover that provides sure footing. The surface needs to be free from irregularities, and good drainage is a must.

Nutrient management cannot overcome soil physical problems nor compensate for inherent weaknesses in the grass or grasses being grown. These are issues that are beyond the scope of this presentation. The purpose of this presentation is to provide you with the simplest and yet effective means for eliminating turfgrass nutrition as a limiting factor in quality of your athletic fields. I am presenting this task as a series of three steps.

Step #1 — Taking Inventory

The first step is to bring yourself out of the dark regarding where you are and where you need to be with respect to soil nutrient supplies and pH. Soil testing is the only means by which this can be accomplished.

The most crucial part in soil testing is in the taking of samples. The sample you send to the soil testing laboratory must accurately reflect all of the variability that naturally exists in soils on the areas of concern. It is a good idea at this point to already have selected the laboratory to which the soil sample will be sent and to have solicited from the laboratory their recommendations for taking soil samples. The reason for this is very straightforward: How the laboratory personnel interpret the results of the soil analyses is somewhat dependent on how you took the sample.

The key issues in soil sampling area number of cores taken, depth of sampling, and whether or not the thatch layer is included in the sample. To do the job right, you need to take about 20 cores total while walking the field in either an "X" or "W" pattern. Unless the laboratory specifies otherwise, the depth of sampling on athletic fields should be 6 inches. While research has shown that thatch can be a significant source of nutrients, it can also contain granules from the previous fertilization. Even a single fertilizer particle can give you very erroneous soil test results. For this reason, the thatch layer should be removed from the cores.

The final step in soil sampling is to break up the cores and mix them thoroughly before sending them off for testing. Twenty cores comprise a large sample. Chances are the laboratory will not include all of the same in the portion they dry, grind, and analyze. It is your responsibility to make sure that the portion analyzed contains soil from all 20 cores.

Step #2 — Responding to Soil Test Recommendations

You have received your soil test report from the laboratory. Now what? First, you need to recognize that not all soil tests are equal. They vary substantially in their ability to accurately measure the amount of plant available nutrients in soil. Tests for plant available P, K, Ca, and Mg are very reliable. In contrast, tests for micronutrients are very suspect. Do not apply micronutrients based simply on a soil test. Anytime a soil test indicates the need for micronutrients, this should be substantiated through analysis of grass clippings.

Let's assume the soil test report indicates a need to increase soil phosphorus and/or potassium. What's the simplest way to do this? The answer lies in the fact that grass takes up N, P, and K in a remarkably constant ratio. In fertilizer terms of N, P_2O_5, and K_2O, that ratio is 3:1:2. But on athletic fields the clippings are not removed and some of the N, P, and K is recycled. When we allow for recycling of nutrients via the clippings, the N:P_2O_5:K_2O ratio becomes 2.5:1:1.

What this N:P_2O_5:K_2O ratio of 2.5:1:1 tells us is that if we apply a fertilizer whose N:P_2O_5 is not 2.5:1 but 2.5:2, more phosphate is being applied than the grass can utilize and the soil test level of P will increase. The same line of reasoning applies to K. If you have access to a professional line of fertilizer, it should be easy to find a fertilizer whose grade provides the desired ratio of N:P_2O_5, N:K_2O, or N:P_2O_5:K_2O. On the

other hand, you can purchase from your local lawn and garden center and apply turf starter fertilizer, where the N:P_2O_5 ratio is in the range of 1:1.5 to 1:2.

Finding in lawn and garden centers a fertilizer whose use will increase soil K is a bit more problematic. Here, you have to turn to the "late season" or "winterizer" types of fertilizer. You need to select the one with the highest K_2O content and, if you do, will come up with a product whose N:K_2O ratio is 2:2 or even something like 2:3 or 2:4. This is the same group of fertilizers that include products that will allow you to simultaneously increase soil levels of P and K.

Last, let's assume that your soil tests indicate that the P and K are adequate or high, and you want to maintain them. All you have to do is, over the course of the season, apply fertilizes such that the total amounts of N, P_2O_5, and K_2O are in the ratio of 2.5:1:1.

Step #3 — Nitrogen Management

Nitrogen, more than any other nutrient, determines the quality of your athletic field. Yet, there is no soil test for N and most likely never will be. The N in turf is locked up in organic matter and its release through the action of microorganisms is too complicated to accurately predict via a simple soil test. Furthermore, at the rates and frequencies that we apply N to turf, there is very little carryover of fertilizer N from one season to the next.

Quality considerations drive our recommendations for N on athletic fields. The most important components of athletic turf quality are: (1) wear tolerance, (2) shear strength, and (3) wear recovery. Many studies have been conducted on turf wear tolerance and these have identified several contributing factors. But the overriding factor is the amount of aboveground biomass. This is determined primarily by the numbers of tillers per unit area. Research tells us that tiller numbers in Kentucky bluegrass, perennial ryegrass, and tall fescue attain a maximum at annual N rates of 6 to 8 lb/1000 ft^2.

Turf shear strength is dependent on root mass in the top inch or two of the soil. This is where we run into a bit of a dilemma regarding N management. There is no doubt but what root density of turf shows a general decline with increasing N rates. However, the amount of decline is also very much influenced by the frequency and time of N application. Two crucial times for N application are early spring and late in the season. Heavy N applications in April are very detrimental as far as root growth is concerned. Late season N, that which is applied after shoot growth ceases, is highly beneficial because it optimizes late and early season root and rhizome growth.

High turfgrass wear recovery equates to rapid growth rates. This becomes a problem as we move into fall because declining temperatures slow turfgrass growth. The key is to stimulate growth in early fall and preferably before intense use commences.

By putting all of these considerations together, we can come up with a general set of guidelines for N management on athletic fields. They are a starting point from which you can make adjustments that work best for you in your particular situation.

The recommended annual N rate is in the range of 6 to 8 lb/1000 ft^2. But, because you will be recycling N through the clippings, this annual fertilizer N rate is really in the range of 5 to 6 lb/1000 ft^2. The more intense the use of the athletic field, the more you want to operate at the upper end of this range.

Scheduling and rate of N per application are linked together. If you wish to avoid fertilizer spreader calibration, use the spreader setting shown on the fertilizer bag. Almost invariably these settings are for application of 1.0 lb N/1000 ft^2. Thus, to get down 5 lb N/season, you are faced with at least four and possibly five fertilizer applications per year. The key application times are early May (mid- to late-April for spring use), mid-June, mid-August, and late October. If the annual N rate is 5 lb, you can either put down a fifth application in mid-September or double apply in October, putting down 2.0 lb of N.

Finally, a brief comment about N carriers. In reality, this is a secondary consideration with respect to the time and rate of application. If you have budgetary constraints and are willing to make five applications per year, you can achieve excellent results with nothing but urea. But you must avoid application during hot, humid weather and water the fertilizer in immediately after application to avoid fertilizer burn. Moving up one step in cost is sulfur-coated urea. A good, general purpose turf fertilizer is one in which approximately one-half of the N is in the form of urea and the other half as sulfur-coated urea. At the top of the cost scale are the natural organic fertilizers, methylene urea, and polymer-coated or polymer+ sulfur-coated urea. What you get for this added cost is a more uniform N supply to the turfgrass for a longer period of time.

Summary

Nutrient management on athletic fields need not be complex nor require use of fertil-izers not readily available in your local lawn and garden center. By following the principles outlined here, you will be well on your way to providing an attractive and safe playing surface. You do, however, have to complement your fertility program with other vital cultural practices such as regular aerification and good watering practices.