SIMPLE ATHLETIC FIELD FERTILITY

BY **W. DAN STRUNK, JOHN SOROCHAN, AND TOM SAMPLES**

Maintaining competitive and safe playing surfaces has long been the goal for all sports turf managers. Many cultural practices are used to promote proper growth and health of the turf, which is important to prevent injury to players. Often, fertility can be a puzzling matter. Considerations must be made to the location, amount of traffic, and disease and pest incidence in order to apply correct amounts of nutrients. Over-applications of nutrients are wasteful and potentially harmful to the environment, not to mention the extra labor and money needed. But where does a turf manager begin when creating a fertility program suitable for his or her field?

The first step to creating a fertility program is to determine the actual amount of nutrients currently available in the soil. To do this, soil samples need to be sent to a soil testing lab or a university extension lab for analysis. Soil sampling is a simple procedure. Randomly select 10-12 locations on the field for sampling. At each location, remove the sod and take a sample at least 6 inches in depth. All samples should then be mixed well in a bucket. From the mixture of the ten samples, fill a soil sampling box or a 4 x 7-inch bubble mailer and mail.

The lab will send back a report that tells the amount of available phosphorus, potassium, calcium, magnesium, and zinc. Phosphorus should be maintained at levels ranging from 30-120 pounds per acre. Potassium should be maintained at much higher levels ranging from 300-500 pounds per acre. Generally, potassium should be applied depending upon nitrogen levels. Low levels of nitrogen decreases the amounts of potassium used by the plant.

Typically, soil test reports also make recommendations for fertilizer applications based upon nutrient requirements. Soil testing is a cheap and effective way to prevent over and under applications of nutrients, which saves time and money. However, soil analysis does not measure the levels of nitrogen, which is likely the most limiting factor in turfgrass growth and vigor.

Determining actual levels of nitrogen in the soil is pointless due to the volatile and mobile nature of the nutrient. A soil sample sent off to a soil testing lab would likely have a different amount of nitrogen when it arrives to the lab than it did before it was taken. Instead, nitrogen applications must be determined individually based upon geographic location, rootzone mix, deficiency symptoms, turfgrass species selection, and the expected quality of the turf. Applications should be made only during months of active turfgrass growth. However, tissue analysis does determine actual amounts of nitrogen and other nutrients in the plant. Leaves for tissue analysis should be taken at random and sent to a lab for testing. Optimum levels for nitrogen in plant tissue should be three to five percent of the total dry weight.

Table 1.

Bermudagrass Fields in the South (lbs of N per 1000 sq ft)

Month	*Sand Based Fields* Slow Release	*Sand Based Fields* Fast Release	*Native Soil Fields* Slow Release	*Native Soil Fields* Fast Release
Jan		0.5		
Feb	1	0.5	1	0.5
March	1	0.5-1		0.5
April	1	1	1	1
May	2	1	2	0.5-1
June		1-1.5		1
July	2	1-1.5	2	1
Aug		1-1.5		1
Sept	2	1	2	1
Oct		1		1
Nov	1	1	1	0.5
Dec		0.5		1
Total N/year without overseeding	6	6-7.5	6	5.5-6
Total N/year with overseeding	10	9.5-12	9	8-9.5

Denotes Nitrogen applications for actively growing turf.
Denotes Nitrogen applications for overseeding.

Geographic location determines to the number of months for active growth, and aids in the selection of a suitable turfgrass species. Growing months for turf can differ by several months between various locations. Therefore, the total amounts of nitrogen to be applied per year must be adjusted for location. For instance, a Bermudagrass sports field in Tennessee may only need 6-9 pounds of nitrogen (per 1000 sq.ft.) per year compared to the exact same field in Florida that needs more than nine pounds per year, with the difference being the length of the growing season.

The make up of the rootzone also affects the amounts of nitrogen to be applied. Fields consisting of high silt and clay contents require different application procedures versus a sand-based field. Rootzones consisting predominantly of silt and clay have lower percolation rates, helping to prevent the loss of nitrogen through leaching. Therefore, applications of nitrogen can be limited to a monthly basis using a fertilizer consisting of both fast and slow release nitrogen sources.

However, sand-based root zones require applications to be applied more often with less total nitrogen per application. Sand-based rootzones promote drainage, which reduces the holding capacity for nutrients like nitrogen. To insure the availability of nitrogen for the plant, it should be applied every 10-14 days at half the normal rate depending on irrigation and precipitation levels.

Sand-based fields have other nutrient retention problems as well. The lack of cation exchange capacity of sand allows other nutrients such as potassium, which normally are found at acceptable levels in native soils, to potentially leach out. Therefore, sand-based fields should receive applications of potassium and phosphorus, as well as other micronutrients, more frequently than native soil fields. However, soil testing will also help determine these nutrient requirements.

Another way to determine nitrogen needs is through the overall quality of the turf. Turfgrass growing under low nitrogen levels will exhibit chlorosis. Chlorotic plants appear yellowish-green to yellow. However, yellowing turf does not necessarily mean that levels of nitrogen are inadequate, but proper nitrogen fertility will correct any deficiencies. Other environmental stresses can produce the same effects. Density is another quality of turfgrass that can be used as an indicator for nitrogen deficiencies.

Often, turfgrass areas infested with weeds can indicate a lack of nitrogen available to the plant. Weeds are not the cause of bad turf. Rather, weeds are caused by bad turf. Low nitrogen fertility reduces the competitive nature of the turf, which allows invasive weeds to take over.

Table 2.

Kentucky Bluegrass/Perennial Ryegrass Athletic Field (lbs/1000 sq. ft.)

	Sand Based		*Native Soil*	
Month	**Slow Release**	**Fast Release**	**Slow Release**	**Fast Release**
Jan		0.5		
Feb	1-2	0.5	1-2	1
March		0.5-1		0.5
April	0.5	1	1	1
May	0.5	0.5		0.5
June	0.5	0.5	0.5	0.5
July	0.5	0.5	0.5	0.5
Aug	0.5	0.5		0.5-1
Sept	1	1	1-1.5	1
Oct		0.5		0.5
Nov	2	0.5	2	1
Dec		0.5		
Total N per year	5-6	6-6.5	5-6.5	6-6.5

Optional. Slow release fertilizer recommended.

Turfgrass species selection affects the amounts of nitrogen needed. Bermudagrass, Kentucky bluegrass, and perennial ryegrass generally require more input of nitrogen per year than any other turfgrasses being used on athletic fields. These grasses are vigorous and aggressively growing plants that require high nitrogen fertility. Increased rates of nitrogen must be applied to keep the plant healthy and able to recuperate from wear. Bermudagrass can receive rates of nitrogen per 1000 square feet of 6-15 pounds per year depending on geographic location and field usage. Kentucky bluegrass can receive rates ranging from 3-6 pounds per year.

Quality requirements for sport fields differ between little league parks and professional stadiums. City-operated fields often times will not be mowed as many times or as low as in the professional stadiums. This difference changes the needs for nitrogen. Lower mowing frequency and higher mowing heights requires less nitrogen input. Fields that collect clippings will need to apply more nitrogen than fields that mulch clippings.

There are, however, some generalized rules for producing a fertility program right for you. First, nitrogen should be applied at least one time per active growing month. Amounts of nitrogen will differ, but applications should be made every growing month to insure sufficient amounts. Figures 1 and 2 describe application timing of fast and slow release fertilizers on Kentucky bluegrass, perennial ryegrass, and Bermudagrass. Highly used fields should receive one pound of nitrogen per month of active growth while low use fields will only need as little as a half of a pound of nitrogen. The more applications made per month the better. Try splitting applications in half every 14 days. Applying fertilizers more frequently aids in keeping nitrogen available to the plant at all times. Use fertilizers with both fast-release and slow-release nitrogen forms. One type of fertilizer is not sufficient for an entire season.

Fertilizers with different nitrogen forms and percentages should be used to maximize growth. Recommendations of applying phosphorous and potassium by a soil analysis report should be followed. However, some turfgrass managers apply potassium at a one to one rate with nitrogen. This is significant to managers with sand-based rootzones. Potassium aids in stress tolerance of the plant, but is readily leached from sand rootzones. Finally, applications of nitrogen and potassium should be given at the end of each growing season when shoot growth slows. During this time, the plant is storing carbohydrates, rebuilding damaged roots, and preparing for harsh environmental conditions.

For some sports field managers, nitrogen applications do not end with the induction of dormancy at the end of the growing season, but continues with the overseeding of ryegrass for play in the winter season. Fields overseeded with ryegrass need to continually be fertilized throughout the cool season growing months.

Tables 1 and 2 describe examples of fertility programs for sports fields. These examples are meant to be modified and adapted to fit the needs of individual fields. Table 1 describes nitrogen applications for Bermudagrass fields in the South. Amounts of nitrogen in pounds per 1000 square feet are given in terms of slow release and fast release fertilizers in either native soil or sand based athletic fields. In addition, table 1 describes a continuance of the fertility program for overseeded turf.

Table 2 describes applications for fields with Kentucky bluegrass and perennial ryegrass. Nitrogen amounts are also given in pounds per 1000 square feet. Application amounts are given for both fast and slow release, as well as native soil versus sand-based fields.

Guidelines for creating a fertility program are useful, yet they are only guidelines. Each individual field requires its own specific fertility program based upon its particular needs. Finding what works for you is not an easy task, so be patient and do not be afraid to try new things. ST

Dan Strunk is a graduate student at the University of Tennessee in the Department of Plant Sciences working for his Master's Degree in Turfgrass Science. John Sorochan is an extension, research, and teaching professor at the University of Tennessee. Tom Samples is a Turfgrass Science extension professor at the University of Tennessee.