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NYSTA Funded Projects

There is a lack of current soil test calibration studies with newer varieties and contemporary fertilization practices. The purpose of this project is to improve the Cornell University fertilizer recommendations by conducting soil test-turf response studies with newer varieties managed under various management practices.

Improving Turfgrass Soil Test Recommendations

Soil testing can be one of the most useful ways to determine the amount of nutrient (phosphorus (P), potassium (K), calcium, and magnesium) and pH modification that is needed to produce healthy turfgrass. Soil testing may also be a best management practice used to reduce the risk of phosphorus runoff. Fertilizer recommendations based on soil testing are developed from years of turf performance and soil test calibration research. There is a lack of current soil test calibration studies with newer varieties and contemporary fertilization practices. The purpose of this project is to improve the Cornell University fertilizer recommendations by conducting soil test-turf response studies with newer varieties managed under various management practices.

Locations of Project

Three sites, including the Cornell Turfgrass Research and Education Center in Ithaca and several locations around New York (Bethpage, Long Island, and Lake Placid in the Adirondacks) in cooperation with extension field staff and other cooperators.

Methodology

Selected sites initially had low levels of P and K. Sites had different soil textures (sandy to silt loams) but the same turfgrass species or varieties. On each site, 3 levels (1/2 X, 1X and 2X the soil test recommendation) of P and K were used, coupled with 3 different nitrogen levels, an unfertilized control, and a high rate of N, P, and K. Turf performance was evaluated by standard measurements of turf quality, density, yield, pest infestation when evident, and other special methods based on turf use. Soil nutrient levels and tissue levels were determined twice during the year. Turf performance vs. soil and tissue nutrient values were correlated to determine the optimum performance based on soil test levels.

The treatment list for the Ithaca site for 2002 is shown in Table 1. The site was seeded in the fall of 2001 with a mixture of 70% Kentucky bluegrass, 20% perennial ryegrass and 10% fine fescue, seeded at a rate of 4 lbs/1000 sq.ft. Urea was applied at 1 lb N/1000 sq. ft and lime at 40 lbs/1000 sq.ft. prior to seeding. Soil samples and clippings (at a height of 2.25”, from an area of 52.5 sq.ft.) were collected on July 26 and October 25, 2002. Soils and clippings were analyzed at the Cornell ICP and Nutrient Analysis Laboratories. Visual quality (1-9 scale where 6 is acceptable) ratings were taken monthly from June through October in 2002 (see Table 2).

Results

The first year of data collection gave us limited information. As seen in the figures on page 9, turf quality was not affected by the soil test level for either phosphorus (P) or potassium (K). Increasing the soil level of either P or K did not increase the percentage of P or K in the clippings. The clipping yields were higher as soil K levels increased for 200 lbs/a to 300 lbs/a. As clipping content (percentage) of P and K in-

Table 1: Treatment list for Ithaca site, 2002

	Treatment made on, as lbs/1000 sq.ft			
	28 Jun	26 Jul	22 Aug	1 Oct
Treatments				
1. Check				
2. Nitrogen* 1/2 x rate	1		1	
3. Nitrogen 1x rate	1	1	1	1
4. Nitrogen 2x rate	2	2	2	2
5. Phosphorus at 1/2x rate	No P needed			
6. Phosphorus at 1x rate	No P needed			
7. Phosphorus at 2x rate	No P needed			
8. Potassium^ 1/2x rate	0.23		0.23	
9. Potassium 1x rate	0.23	0.23	0.23	0.23
10. Potassium 2x rate	0.45	0.45	0.45	0.45
11. N-P-K at 2x rate	2 N + 0.45 K	2 N + 0.45 K	2 N + 0.45 K	2 N+0.45 K
12. Nature Safe (1x N rate)	1	1	1	1

* Polyon SCU (35-0-0), ^ Potassium sulfate (0-0-50), + 8-3-5

creased the clippings yields and quality increased, indicating that tissue levels of P and K may be a better indicator of turf growth and quality than soil test levels. The treatments that contained nitrogen increased the uptake of P and K in the turf and resulted in more clipping growth and higher quality.

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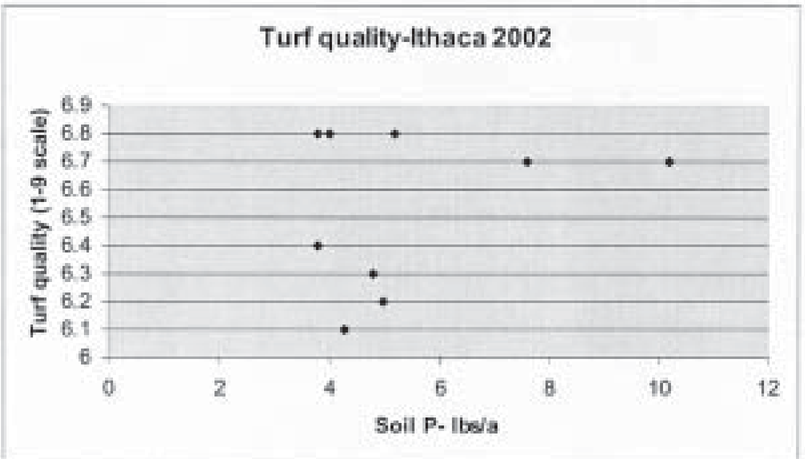

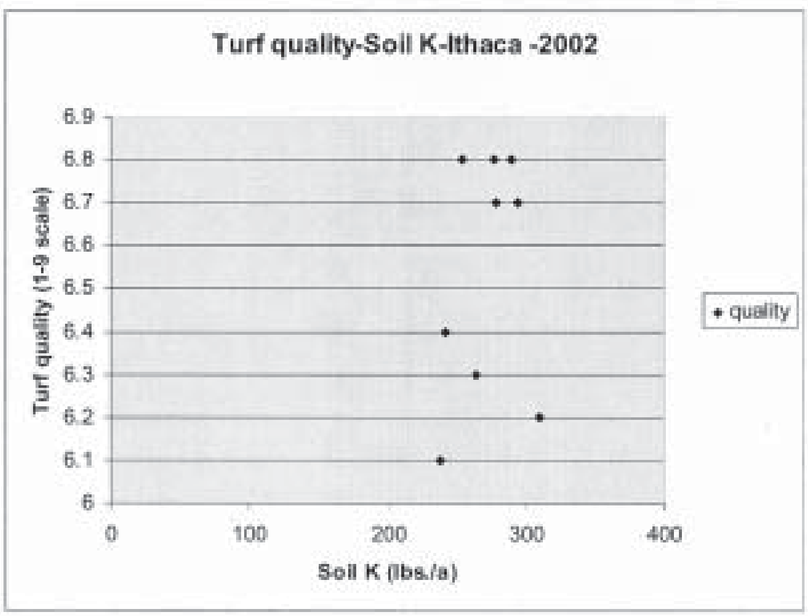

Turf quality was not affected by the soil test level for either phosphorus (P) or potassium (K). Increasing the soil level of either P or K did not increase the percentage of P or K in the clippings.

The treatments that contained nitrogen increased the uptake of P and K in the turf and resulted in more clipping growth and higher quality.

Table 2: Average visual turf quality for 2002, Ithaca Soil Test Calibration Study

Treatment	Visual Quality
Unfertilized control	6.1b*
Potassium 1/2x rate	6.4a
Potassium 1x rate	6.3b
Potassium 2x rate	6.2bc
Nitrogen 1/2x rate	6.8a
Nitrogen 1x rate	6.8a
Nitrogen 2x rate	6.7ac
Nitrogen 2x + K 2x rate	6.8a
Nature safe (1x N rate)	6.7ac

* Values not followed by the sample letter are significantly different (P=0.05).

Success With Overseeding for Sports Fields

NYSTA Funded Projects

Repetitive overseeding was conducted on two sports fields in the Capital District of New York. Research has demonstrated that dramatic increases in turfgrass density were possible when high rates of perennial ryegrass (Lolium perenne) *were overseeded* weekly *on a simulated sports field.*

Overseeding, or distributing seed over an existing turfgrass area to increase density, is a traditional practice followed by many turfgrass managers. Unfortunately, success in overseeding is not easily accomplished. To improve the chances that a high rate of seed germination and establishment will occur, it is often recommended that some sort of cultivation is done before seeding. Types of cultivation include removing cores of soil (core cultivation), spiking, and vertical mowing.

An aggressive overseeding program for a sports field might be to overseed four or five times per year, hoping each time for some limited success. Home lawns and commercial properties, which are not usually overseeded, might be overseeded once or twice per year in a "best case" scenario. With limitations on the use of pesticides increasing, overseeding might seem to be a better option than ever. However, turfgrass managers often report disappointing results with overseeding. This is especially true on low-input fields, or fields where fertilizer, irrigation, weed management, and other cultural activities are limited or nonexistent. The cultivation requirement attached to overseeding can be disruptive to the use of the turf area in question, as well as adding costs. Clearly, easier and more effective ways to overseed turfgrass areas are needed.

The Research Project

In August of 2003 a research project examining heavy, repetitive overseeding was conducted on two sports fields in the Capital District of New York. This study was designed to put into practice the ideas of Dr. Frank Rossi, Extension Turfgrass Specialist at Cornell University. Dr. Rossi has demonstrated that dramatic increases in turfgrass density were possible when high rates of perennial ryegrass *(Lolium perenne)* were overseeded *weekly* on a simulated sports field.

The objective of this study was to demonstrate the practice of heavy, repetitive overseeding on two low-input Capital District sports fields using three seeding rates.

Procedures

Anyone who has visited practice soccer and football fields at high schools and parks would probably agree that many are examples of ugly, beat-up turf and weeds. Two fields were used in this study. The practice football field at Averill Park High School had compacted clay loam soil, a low pH (5.9), and was composed of bare spots, crabgrass, knotweed, plantain, dandelion, perennial ryegrass, and Kentucky bluegrass. The second field was a multipurpose soccer/football field in an inner city park, Prospect Park, in Troy. The soil was a loam with pH 7.5. The predominate species here were purslane, Kentucky bluegrass, perennial ryegrass, and goosegrass. See Table 1 for a description of the initial composition of each field.

Four treatments were made: no seed (check plots), and overseeding at rates of 2, 6 and 10 pounds of seed per 1,000 square feet (M), with three replications made of each treatment at each site. Overseeding started on August 14 and continued weekly (except for the week of 9/18) until October 16, for a total of 10 applications in 11 weeks. Seed was distributed evenly across the plots using a Gandy drop spreader. There was no cultivation done on the sites (other than that done by the football/soccer players or other field users); the seed was simply spread on the plots. No irrigation was supplied, as rainfall was abundant. Traffic and wear on the Averill Park field was concentrated in the center, and as a consequence one set of plots received light traffic, one medium, and one heavy. All of the plots at the Prospect Park field seemed to receive equal traffic.

Table 1: Initial composition (% of each component) on the two study fields

	Per. ryegrass/ Ken. bluegrass	Bare	Purslane	Goosegrass	Crabgrass	Plantain	Knotweed	Dandelion
Averill Park High School	4.4	1.3	0	0	57.8	2.1	32.3	0.8
Prospect Park	17.5	38	27.9	15.2	<1	<1	<1	0

Table 2: Average percent turfgrass for eight treatments over ten seedings at Averill Park High School

Treatment	Week 0	Week 5	Week 11	Net increase in turfgrass density
Check, light traffic	3.1	12.5	28.1	25.0
Check, heavy traffic	9.4	34.3	46.8	37.4
2 lbs./M, light traffic	12.5	71.9	96.9	84.4
2 lbs./M, heavy traffic	0	28.1	59.3	59.3
6 lbs./M, light traffic	0	62.5	100.0	100.0
6 lbs./M, heavy traffic	0	31.2	78.1	78.1
10 lbs./M, light traffic	15.6	81.3	96.9	81.3
10 lbs./M, heavy traffic	3.1	53.1	75.0	71.9

Results

Results for the Averill Park field are outlined in Table 2. Turfgrass density increased for all treatments, even for the check plots that did not receive overseeding. Small amounts of turfgrass already existed in these plots, and when competition from the weeds was removed after they died from frost and cooler temperatures, the density of the grasses increased. This same phenomenon is also partly responsible for the increase in density of the overseeded plots as well, except for the three treatments that started with no turfgrass, in which case the increase in density can be attributed to overseeding alone.

"Net increase in turfgrass density" was calculated as the density estimated at Week 11 minus the initial density. It is an attempt to measure the density increase caused by overseeding and to remove the influence of a plot having some turfgrass at the beginning of the study. The largest net increase in turfgrass density was seen in the 6 lbs/M light traffic plot, where density increased from 0% turfgrass at Week 0 to 100% at Week 11. The largest increase in net density for heavy traffic plots was also seen in the 6lbs/M plots, where density increased from 0 to 78.1%. Plots overseeded with 10 lbs/M had higher net increases in density at Week 5, but the 6 lbs/M plots had greater net increase in density by Week 11 of the study. A visual comparison is shown in photo 1.

Very different results were obtained at Prospect Park (see Table 3). In the first few weeks of the study, perennial ryegrass seedlings were observed to be germinating in many of the plots. After Week 5, all of the plots, except the untreated checks, had a net increase in turfgrass density. The largest increase of 50.9% was seen in the 10 lbs/M plots. After the week 5 observations, however, the 2 lbs/M plots continued to show an increase in turfgrass density, while the 6 lbs/M and 10 lbs/M showed decreases.

This was largely due to factors on the site. The middle of this field is very compacted and slightly depressed. Given the large amount of rainfall during the time period this study was conducted, this depressed area flooded repeatedly. Seed from treated plots was observed to have washed away and moved onto untreated strips between the plots. Seedlings may have also been uprooted or died from flooding. While a net increase in turfgrass density was still achieved for all seeded treatments, these confounding factors decreased the possible gains which could have been made. These results clearly indicate that the topography of the field will influence the success of overseeding.

Conclusions

These results indicate that heavy, repetitive overseeding using perennial ryegrass can improve turfgrass density on low-input sports fields. Greater increases were seen in plots receiving light traffic versus heavy traffic, yet even in plots with heavy traffic, significant increases were still seen. The least successful situation seen in this study was on the Prospect Park field, where the uneven topography combined with heavy rainfall caused seed to wash out of treated plots and seedlings to die. An even (or at least

continued on page 12

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While a net increase in turfgrass density was still achieved for all seeded treatments, these confounding factors decreased the possible gains which could have been made. These results clearly indicate that the topography of the field will influence the success of overseeding.

Table 3: Average percent turfgrass for four treatments over ten seedings at Prospect Park

Treatment	Week 0	Week 5	Week 11	Net increase in turfgrass density
Check	12.5	6.2	13.6	1.0
2 lbs./M	9.4	20.8	30.2	20.8
6 lbs./M	15.6	43.8	23.9	8.3
10 lbs./M	12.5	63.4	33.3	20.8

Overseeding

continued from page 11

Given a $1.00 to $2.80 price range, the cost for a 10 week overseeding program at a 6 lb/M rate would be $60.00 to $168.00 for 1000 square feet.

While this may not be an insignificant cost to financially-troubled school districts, it seems far less expensive than most pesticide treatments, or a lawsuit brought about from a student athlete's injuries suffered due to a poorly-maintained sports field.

not severely rutted) field surface is therefore important to overseeding success. Overseeding at the 6 lbs/M rate gave the greatest increase in net density and is also a less expensive alternative to the 10 lbs/M rate.

Is heavy, repetitive overseeding a cost-feasible proposition for sports fields? An internet search shows that perennial ryegrass seed prices range from $1.40 to $2.80 per pound; wholesale prices and bulk quantities can push the low end to less than $1.00 per pound. Given a $1.00 to $2.80 price range, the cost for a 10 week overseeding program at a 6 lb/M rate would be $60.00 to $168.00 for 1000 square feet.

If a school wanted to overseed the middle of a worn football field (approximately 18,000 square feet), the cost would be in the range of $1,080.00 to $3,024.00. While this may not be an insignificant cost to financially-troubled school districts, it seems far less expensive than most pesticide treatments, or a lawsuit brought about from a student athlete's injuries suffered due to a poorly-maintained sports field. Since cultivation is not necessary with heavy, repetitive overseeding, further expenses are avoided, and fields can remain in play as the overseeding is taking place. The effect of providing high-phosphorus fertilizer with overseeding should be studied, since such starter-fertilizer can increase seeding success and is fairly affordable.

Photo 1 (below): *From left to right: 2 lb/M, 6 lb/M and 10 lb/M seeding rates in a heavily trafficked portion of the practice field at Averill Park High School.*
Photo 2 (right): *The sports field at Prospect Park, with the worn, depressed area evident in the middle of the field.*

A project examining how this system performs in spring conditions on home lawns is planned for 2004.

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