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How to get a sports field ready in 70 days

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The 70-day summer window is ideal for sports fields to actively grow and repair themselves. Typically there is less activity on sports fields, and the summer months are usually ideal growing conditions for recuperation of traffic areas. However, any cultural practices during this time get increasingly complicated when school and park crews leave for vacation or inclement weather occurs during summer. The need for strategies that are less expensive and time-consuming is evident.

A 2002 Michigan Rotational Survey reported that the two practices sports turf managers performed most consistently, regardless of maintenance level, were mowing and fertilization.

Mowing is a common and essential practice for any turfgrass professional. When mowing height decreases, there is an increase in shoot density, plants per unit area, and a decrease in rooting. Fertilization is paramount for proper turfgrass health and is relatively inexpensive compared to other cultural practices. Extensive research has been conducted on fertilizers and their effects on turfgrass. Although usually more expensive, slow-release fertilizers can provide potential benefits for the sports field manager, including, longer turfgrass response, less nitrogen leaching, less surface run-off, less volatilization, and fewer applications for healthy turfgrass response compared to quick release fertilizers.

Typically with urea, multiple applications are needed to attain responses observed by using a single slow-release fertilizer over a long period of time. Sports field managers tend to use fertilizer products that are less expensive due to restrictive budgets, usually urea or sulfur-coated urea (SCU). Little research has evaluated these products or others in neither a short re-establishment window nor the agronomic effects on the playing surface. Studies have been conducted in evaluating a combination of mowing and fertility practices. As expected, these studies found more shoots were produced with a lower mowing height in conjunction with a higher rate of nitrogen; however, research did not focus on sports field management situations when time for preparation was a factor nor did the studies evaluate playing surface characteristics (traction and surface hardness).

Canaway and Krick compared perennial ryegrass *Lolium perenne* L.) established from seed and Kentucky bluegrass (*Poa pratensis*L.) sod for soccer fields before the playing season on sand-based rootzones. Sod produced a superior playing quality surface compared to seed when evaluating playing surface characteristics. Cook et al. evaluated turfgrass establishment using hydroseeding (a mixture of primarily water, seed, fertilizer and mulch sprayed on the intended target area) and compared the results to seed and sod on a sand-based rootzone. However simulated traffic on these studies was not initiated until 125, 365 and 140 days after treatment (DAT), respectively. Furthermore, these studies implement practices (sodding and hydroseeding) that can be expensive and labor intensive from year to year.

The objectives in our study were to clarify the impact of best management practices in regards to mowing height and fertilization on re-establishment of sports field turf during a 70-day window, and quantify these effects during and after a 25-day simulated traffic period.

This study was conducted in 2002 and 2003 at the Hancock Turfgrass Research Center (HTRC) on the campus of Michigan State. Three mowing heights and six fertilizer treatments were evaluated (Table 1) and re-randomized in 2003, to avoid any edge effects from the first year. Plot size was 6 x 9 feet. In 2002, sod cutters were used to strip out the existing sod, and in 2003, a Koro Field Topmaker was used to strip the turf from the 2002 experiment. The soil was a sand-based profile and sterilized each year with Basamid G at 8 lbs/1000 ft^2. Seeding and fertilizer treatments began June 1 both years. A 30:70 sports grass mixture (by weight) of perennial ryegrass and Kentucky bluegrass was seeded at 4 lbs/1000 ft^2. Lebanon Country Club 13-25-12 from Lebanon Turf Products was applied at 1 lb N/1000 ft^2 and subsequent fertilizer treatments were applied (Table 1). Fertilizer treatments applied were: Andersons urea (46-0-0) at 1 lb N/1000 ft^2 July 1 (Urea) and 0.33 lb N/1000 ft^2 every 2 weeks starting June 16, July 1, and July 18 (Urea 2w); Lesco Poly-Plus sulfur-coated urea (39-0-0, 12% sulfur coating) at 3 lbs N/1000 ft^2 (SCU); and Polyon resin-coated urea (RCU) [43-0-0, 6% Reactive Layer Coating (RLC)] at 2 lbs N/1000 ft^2 (RCU2), and 3 lbs N/1000 ft^2 (RCU3) and (44-0-0, 4% RLC) at 4 lbs N/1000 ft^2 (RCUThin).

Germination blankets were placed over the top of the plot and removed 15 days after seeding in both years. Based on visual quality throughout the experiment, potassium, phosphorous, and micronutrients were supplemented. Andersons 0-26-26 fertilizer and

Andersons Trace Element Package were applied at 1 lb/1000 ft² and "normal rate," respectively, June 27 and July 25 both years. Lebanon Country Club 18-3-18 was broadcasted to all treatments at 0.5 lb N/1000 ft² August 6 and August 19 to supplement nutrients during traffic phases in 2002 and 2003. Irrigation was applied daily during re-establishment and as necessary throughout the experiment to prevent moisture stress.

Mowing began June 25, 2002 and July 3, 2003, and treatments were mowed twice per week throughout the experiment (Table 1). During the re-establishment phase, the 1.5-inch-continuous strategy was mowed with a 17-inch wide McLane mower and the 3 inch-grad-1.5-inch (mowing height lowered weekly) and 3.0 inch-chop-1.5-inch (Table 1) treatments were mowed with a Honda rotary mower (Harmony HRB216 Quadracut).

Table 1. Individual treatments for mowing and fertilizer study, 2002 and 2003.

Mowing Treatments

1) **1.5" Continuous** - mowed at 1.5" throughout the study.
2) **3.0"-Gradual-1.5"**† - maintained and mowed at 3.0" for 33 DAS and slowly dropped height to 1.5".
- 3 July - 15 July - 4 mowings at 3.0"
- 16 July - 24 July - 2 mowings at 2.5"
- 25 July - 30 July - 2 mowings at 2.0"
- 31 July - 3 Sept - 9 mowings at 1.5"

3) **3"-Chop-1.5"** - mowed at 3" and scalped to 1.5" 68 DAS.

Fertilizer Treatments	Total N used ‡
1) **Urea** – 1 lb. N/1000ft² only on 1 July	2 lb. N/1000ft²
2) **Urea 2w** – 0.33 lb. N/1000ft² starting on 15 June every 15 days equaling 1 lb. N/1000ft²	2 lb. N/1000ft²
3) **SCU** - 3 lb. N/1000ft²	4 lb. N/1000ft²
4) **RCU2** - 2 lb. N/1000ft²	3 lb. N/1000ft²
5) **RCU3** - 3 lb. N/1000ft²	4 lb. N/1000ft²
6) **RCUThin** – 4 lb. N/1000ft²	5 lb. N/1000ft²

† In 2002, mowing started on 25 June and was mowed at 3.0" until 15 July. Six mowings occurred until 15 July.
‡ Total N used includes starter fertilizer application (13-25-12) at 1 lb. N/1000ft² plus treatments on 1 June.
Analysis of fertilizers - Urea 46-0-0, SCU 39-0-0, RCU2 and RCU3 43-0-0 and RCUThin 44-0-0.
Seed and starter fertilizer (13-25-12) was applied on 1 June to all treatments.
Fertilizer treatments 3 - 6 were only applied on 1 June.

The 3.0-chop-1.5-inch treatment was scalped down with an Exmark Lazer Z HP, to a height of 1.5-inch 68 DAS. From this point on, all mowing treatments were mowed at 1.5-inch height with the Exmark mower for the duration of the experiment. Clippings were returned at all times.

Traffic was applied by the Cady Traffic Simulator (CTS) uniformly to all plots. The CTS was a modified Jacobsen Aero King 30 self-propelled core cultivation machine with "rubber feet" weighing 1,496 pounds.

Data were collected during re-establishment and traffic phases. Extensive research parameters were measured in this experiment, including, turfgrass cover percent ratings, shear resistance, divoting resistance, peak deceleration, chlorophyll index, root pulls, and plant count. (Due space limitations, we will only discuss turfgrass cover percent ratings and traction. You may see the full article at Applied Turfgrass Science, doi:10.1094/ATS-2008-0218-01-RS). Turfgrass cover percent ratings were estimated qualitatively. Traction values were measured by both the Eijkelkamp shear vane Type 1B for shearing resistance and Clegg Turf Shear Tester for divoting resistance with a plate depth of approximately 1.6 inch.

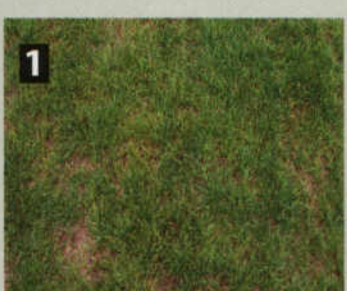
Turfgrass cover percent

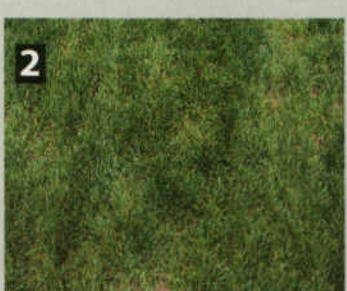
Mowing height only detected differences at the end of the 70-day trial, August 5, 2002 and August 4, 2003 for turfgrass cover percent (Table 2). These dates represented the last turfgrass cover percent ratings observed before simulated traffic was initiated. There were differences among fertilizers for every date regardless of traffic

Take-home message

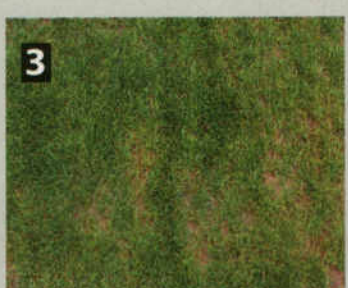
The fertilizer strategy was more important than the mowing strategy for a 70-day window in the summer. First, there may not have been a wide enough difference among mowing strategies. Second, the fertilizer strategy was implemented for the full 70-day window while the mowing strategy was not implemented until halfway into the experiment because young seedlings were too immature to mow. An effective fertilizer strategy (product and rate) is paramount in a re-establishment growing window.

Implementing a mowing and fertilizer strategy, a sports field manager could reduce labor costs, and/or redirect labor to other projects, while also producing a better quality and safer surface for the upcoming playing season.





Photos 1 and 2: On July 28, 2003, SCU (1) and RCU3 (2) both mowed at the 7.6 – Grad. – 3.8 cm mowing height before traffic.



Photos 3 and 4: On July 28, 2003, SCU (3) and RCU3 (4) both mowed at the 7.6 – Chop – 3.8 cm mowing height before traffic.

Table 2. Effects of mowing height and fertilization treatments on turfgrass cover percent (%) on a non-trafficked and trafficked perennial ryegrass/Kentucky bluegrass stand at the Hancock Turfgrass Research Center, East Lansing, MI., 2003.

Treatments	2002		2003				
	Non-traffic				Traffic		
	2-Jul	5-Aug	7-Jul	4-Aug	12-Aug	19-Aug	3-Sep
	%						
Mowing							
1.5" Continuous	77	84	52	77	66	49	40
3.0"-Gradual-1.5"†	72	85	57	81	69	51	41
3"-Chop-1.5"	73	80	54	73	67	46	37
LSD (0.05)	NS	4	NS	6	NS	NS	NS
Fertilizers†							
Urea	62	82	42	76	66	39	27
Urea 2w	72	82	43	74	60	42	34
SCU	69	78	47	68	61	43	32
RCU2	83	86	69	81	74	62	49
RCU3	88	92	76	92	84	68	66
RCUThin	70	79	49	69	61	38	28
LSD (0.05)	6	5	9	8	9	11	11
No. of passes	0	0	0	0	8	16	34

NS - non-significance at the 0.05 level.

† All fertilizer strategies received 1 lb. N/1000ft^2 of 13-25-12 on 1 June.

Urea, urea applied at 1 lb. N/1000ft^2 on 1 July; Urea 2w, 0.33 lb. N/1000ft^{2}urea applied every two weeks; SCU, 3 lb. N/1000ft^2 sulfur-coated urea; RCU2, 2 lb. N/1000ft^2 polymer-coated urea applied on 1 June; RCU3, 3 lb. N/1000ft^2 polymer-coated urea applied on 1 June; RCUThin, has a thinner coating compared to other polymer coated-ureas and 4 lb. N/1000ft^2 polymer-coated urea applied on 1 June.

and non-traffic areas in both years. RCU3 was in the highest statistical category for every measuring date.

SCU and RCU3 had the second highest amount of nitrogen, but these two products responded differently. SCU releases nitrogen once water comes in contact with the urea prill via cracks and imperfections in the sulfur coating. RCUs combine irrigation/rainfall and high temperature (> 80 degrees F) to slowly release nitrogen. The process is initiated when the RCU prill uptakes water, expands with heat and then slowly releases nitrogen via expanded pores in the coating at a steady rate. Consequently, due to a more controlled release from RCU3, it rated higher in turfgrass cover percent (and others).

Mowing treatments (started June 25, 2002 and July 3, 2003, respectively) had approximately a 35-day window compared to fertilizer treatments applied at the beginning of the 70-day re-establishment window. Even though more than one-third of the plant was being removed from the 3.0-chop-1.5-inch treatment 68 DAS, differences were not observed among mowing treatments for turfgrass cover percent.

There were no significant differences among Urea, Urea 2w, SCU, and RCUThin for five of seven measurement dates for both years combined. RCU3 was 14% and 18% higher compared to SCU August 5, 2002 and August 4, 2003, respectively, before traffic commenced. Turfgrass cover percent loss after traffic revealed a 53% loss with SCU, but only a 28% loss with RCU3 between August 4 and September 3, 2003.

Soil temperatures in the month of June, for 2002, averaged from 77 to 82 degrees F from 1200 to 1800 h. In June 2003, average soil temperatures ranged from 67 to 77 degrees F from 1200 to 1800 h. This might explain why turfgrass percent cover was higher in 2002 compared to 2003.

Shear resistance and Turf Shear Tester (TST)

Shear resistance and TST values are quantitative measures that clearly ascertained differences in strength of the surface after the 70-day reestablishment window, and during and at the end of the 25-day traffic regime (see Table 3).

At the end of the 25-day traffic regime in 2003, only RCU2 and RCU3 had shear vane values above 10 Nm. It should also be noted that RCU2 values were significantly higher than SCU and RCUThin for all dates except September 3 TST non-traffic values. RCU2 nitrogen amount was less than SCU and RCUThin. Type of coating and coating thickness were possible factors in releasing of nitrogen from the RCU2 fertilizer compared to SCU and RCUThin.

Results presented may be due to a more accelerated wear compared to other data in the literature using different traffic simulators. The CTS is a more aggressive machine compared to traditional wear machines to date. ■

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Table 3. Effects of mowing height and fertilization treatments on shear resistance and turf shear tester (TST) on a non-trafficked and trafficked perennial ryegrass/Kentucky bluegrass stand at the Hancock Turfgrass Research Center, East Lansing, MI., 2003.

Treatments	2002		2003						
			Shear resistance					TST	
	Non-traffic	Traffic	Non-traffic	Traffic				Traffic	Non - traffic
	15-Aug	4-Sep	7-Aug	13-Aug	21-Aug	28-Aug	3-Sep	3-Sep	3-Sep
	Nm								
Mowing									
1.5" Continuous	16	11	14	15	12	10	8	49	113
3.0"-Gradual-1.5"	16	11	15	15	12	11	8	53	108
3"-Chop-1.5"	15	11	14	14	12	9	7	51	106
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Fertility†									
Urea	16	11	13	13	11	9	5	39	97
Urea 2w	16	10	15	14	11	10	7	47	109
SCU	15	10	13	14	11	7	7	48	112
RCU2	18	12	16	17	14	13	11	61	112
RCU3	17	12	18	17	15	13	12	70	118
RCUThin	14	11	12	12	11	8	4	39	106
LSD (0.05)	2	1	2	2	2	3	3	11	NS
No. of passes	8	30	0	6	18	26	34	34	0

NS - non-significance at the 0.05 level.

† All fertilizer strategies received 1 lb. N/1000ft^2 of 13-25-12 on 1 June.

Urea, urea applied at 1 lb. N/1000ft^2 on 1 July; Urea 2w, 0.33 lb. N/1000ft^2 urea applied every two weeks; SCU, 3 lb. N/1000ft^2 sulfur-coated urea; RCU2, 2 lb. N/1000ft^2 polymer-coated urea applied on 1 June; RCU3, 3 lb. N/1000ft^2 polymer-coated urea applied on 1 June; RCUThin, has a thinner coating compared to other polymer coated-ureas and 4 lb. N/1000ft^2 polymer-coated urea applied on 1 June.