TURFGRASS SOIL MANAGEMENT RESEARCH REPORT - 1995

P. E. Rieke, T. A. Nikolai, M. A. Smucker, P. Grow, and D. M. Roth
Crop and Soil Sciences Department, M.S.U.

The research reported herein was conducted at the Hancock Turfgrass Research Center. Financial support was provided by the Michigan Turfgrass Foundation and it is gratefully acknowledged.

GREENS ROLLING STUDY

A new greens rolling study was initiated in 1995 at the Hancock Turfgrass Research Center. The study was conducted on three greens soil mixes on plots that were established in 1993. The three soils are: 1) an 85% sand, 15% peat green built to U.S.G.A. specifications; 2) an 80% sand, 10% peat, 10% soil green with a perched water table; and 3) a native soil push-up green (sandy loam-sandy clay loam) with no perched water table. There are three replications of each soil type. Each soil type section measures 60 feet by 60 feet. Furthermore, each section was split to accommodate two greens giving us a total of 18 greens. One of the two greens in each section was rolled three times/week with an Olathe roller and the other green was utilized as a check(i.e. not rolled). The grass is Penncross creeping bentgrass mowed at 5/32 inch.

Ball roll was determined on 12 dates in 1995 on the day of rolling treatment. The greens were rolled in the morning with Stimpmeter readings taken late morning to early afternoon. Given statistical significance a difference of six inches is acknowledged as the smallest difference that can be noticed by most golfers. That is, while differences of less than six inches might have statistical significance it is not regarded as having any detectable significance for the golfers. Data for the effect of rolling are given in Tables 1-5. Table 1 gives the Stimpmeter data for the day of rolling. On all dates the rolled plots had statistically greater distances than the unrolled plots. The season average for the greens rolling saw an increase in green speed of 1 foot. This data corroborates past studies that have been done with greens rolling.

Stimpmeter readings were also taken on Days 1 and 2 after rolling treatment for five dates during the season with data shown in Tables 2 and 3, respectively. Day 1 after rolling the seasonal average distances were 8.70 feet for the rolled greens and 8.24 feet for the unrolled greens, thus one day after rolling the difference was just under 6 inches. However, in Table 2 notice on three of the five dates(July 25, 27, and August 24) there were significant statistical differences. On two of those three dates a detectable increase in green speed existed on the rolled plots. In other greens rolling studies conducted around the country it was concluded that a detectable increase in green speed only existed on the day the greens were rolled. In the previous studies that have been published an Olathe roller had not been used. Unpublished data from a 1993 green speed study conducted at MSU found that a day after rolling an increase in green speed of 6 " or greater occurred on some dates with the Olathe roller that did not exist with the triplex type rollers.

By Day 2 there were only two dates for which there were significant differences, both in August. All dates indicated an increased ball roll of less than 6 ". The seasonal averages showed a difference of about 3 inches thus the effect of rolling did not last up to 48 hours after treatment.

The effect of soil type on seasonal green speed was negligible (Table 4) on the day of rolling. On Day 1 after rolling there was a slightly higher distance on the U.S.G.A. greens (Table 5), followed by no difference on Day 2 after rolling (Table 6). The effect of soil on turf color and quality ratings (Table 7) was small, although the soil green tended to have lower quality at certain times. There appears to be no consistent pattern.

During the season there was disease activity on the plots. Only limited amounts of fungicides were applied to determine if there was any effect of treatment on incidence of diseases. Table 8 gives disease ratings. There were no significant differences in the amount of dollar spot, brown patch, or yellow tuft, although the number of dollar spots counted

on August 15 and September 1 were considerably higher for the unrolled plots. In a traffic study done several years ago, the use of a heavy vibrating roller (with golf shoe soles and spikes attached) caused significant increases in dollar spot. The interpretation was that the roller was spreading the dollar spot organism from one plot to another. Perhaps there was injury caused by the roller, making the grass more susceptible to infection. But in this study there was no significant effect of rolling on dollar spot.

There was some tendency for more dollar spot on the U.S.G.A. soil than on the other soils (Table 9), with significant differences on June 7 and September 1. Although the data were not statistically different on July 27 and August 15, there were much higher numbers on both dates for the sand:peat green. The 80:10:10 soil had a few more dollar spots that the native soil, but differences were not significant. The greater number of dollar spots on the sandier soil most likely reflects a lower amount of nitrogen available to the turf. There was no yellow tuft on the sand:peat green, while a few spots were present on the other soils.

GOLF SPIKE STUDY

On August 1 a demonstration was initiated for visitors of the August 17th Field Day to observe the impact that three different golf shoe spikes had on the greens described above. Soft Spikes and Green Spikes were donated by the prospective companies and the MTF donated money for the purchase of three identical pairs of golf shoes. Soft Spikes were screwed into one pair of shoes, Green Spikes in another, and metal spikes remained in the third pair. For 17 straight days an individual made the same amount of passes(20 to 40 passes daily) on each 1' x 15' plot with the appropriate shoe. We never anticipated collecting data from these plots as they were initiated for demonstration purposes. However, Field Day was literally awash in 1995 when flooding was caused by the 1.4 inches of rain that fell that morning. So on August 18 ball roll data was taken on all 54 plots using a Stimpmeter so the time and effort put into the study was not a complete waste of time.

Data are given in Table 10. Numbers reflect the averages for the golf spike data the soil types data and the rolling data. The data cannot be analyzed statistically by traditional methods because complexity of the design. As has been determined in other studies around the country the metal spikes gave lower ball roll distances than the Soft Spikes and Green Spikes. Visually, the steel spikes resulted in more surface disruption of the green with spike marks and lifting of bentgrass stolons. It was interesting to note that on August 18 the USGA green was approximately a foot faster than the other two soil type greens. This differed from the greens rolling study for which no differences existed in green speed among soil types. However, no traffic was applied to that study in 1995. It was determined to run the demonstration again to see if we could duplicate the results. The Stimpmeter readings taken in September fluctuated more with inconclusive results although the USGA green gave the highest readings.

PHOSPHORUS SOIL TEST CORRELATION ON A SAND:PEAT GREEN

This study was established in 1993 on the 85% sand, 15% peat green built to U.S.G.A. specifications described above. The grass is Penncross creeping bentgrass mowed at 3/16 inch. When the study began there was serious phosphorus deficiency evident and Bray P_1 phosphorus tests of about 4 lbs per acre. Treatment 1 receives no phosphorus; treatment 2 receives 1 lb. P_2O_5 per 1000 sq. ft. annually; treatment 3, 2 lbs. annually; treatment 4, 4 lbs. annually; treatment 5, 4 lbs. P O_2 $_5$ in 1993 only with no further applications; treatment 6 is treated annually at the rate recommended by the Bray P_1 phosphorus soil test; treatment 7 is treated annually at the rate recommended by the Olsen phosphorus test. Plot size is 4 ft. by 12 ft. with 3 replications.

Table 11 gives the treatments, the Bray soil tests at the end of each season, the amount of phosphate applied each year, the Olsen soil tests for 1995, and the phosphate recommended for 1996. The check plot has shown no change in phosphorus test over the three years (4 to 5 lbs P per acre). Applying 1 lb. P_2O_5 annually increased the test from 4 to about 9. With 2 lbs. applied annually, the test increased to about 28 lbs. P. When 4 lbs. are applied annually, the test increased to 12 lbs. after one year, 32 lbs. after two years, and 62 lbs. at the end of 1995. The recommendation for next year is only 0.5 for 1996. When the Bray and Olsen tests are used for recommendations the soil tests have increased gradually, with both having recommended the same amount of phosphate for a total of 10 lbs. over the three years. Comparing this to the 4 lbs. P_2O_5 annual treatment which received a total of 12 lbs. over the three years, the soil tests are at 62 for this treatment and 47 for the two soil test treatments. These data are remarkably consistent and give us confidence that the soil test recommendations based on these two tests are giving dependable results. Although the Bray and Olsen tests have not increased the P soil tests as fast as might be preferred.

Turf color and quality ratings are given in Table 12. The check plot has serious phosphorus deficiency throughout the season. The 1 lb. annual treatment has less serious deficiency symptoms than the check as would be expected, but turf quality is generally unacceptable. When 2 lbs. are applied annually, turf quality was acceptable although the soil tests were still moderately low. It may be that 28 lbs. P per acre is adequate for greens turfs based on turf quality ratings, but there could be stress or disease relationships which would require higher P rates. The plots that were treated with 4 lbs. phosphate at the beginning of the study in 1993 have continued to exhibit phosphorus deficiency symptoms quite often. As

Table 3.

Greens Rolling Study-Stimpmeter Readings, Feet-1995
Two Days After Rolling

Treatment	June 14	July 26	July 28	Aug. 25	Aug. 30	Season Average
Rolled	8.2	8.5	9.1	9.9 a	9.4 a	9.2 a
Not Rolled	8.1	8.1	8.8	9.6 b	9.0 b	8.9 b

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.*

Table 4.

Greens Rolling Study-Soil Effect-Stimpmeter Readings,Feet-1995
Day Rolled

Soil Type	June 5	June 12	June 14	July 7	July 10	July 12	July 19	July 24	July 26	July 31	Aug. 18	Aug. 23	Season Average
USGA	7.4	7.3	8.4	10.3	9.7	10.7	10.1 a	10.4 a	9.4 a	8.8	9.4	9.8	9.3 a
80:10:10	7.5	7.5	8.4	10.3	9.8	10.6	9.8 b	9.9 ab	9.0 b	8.2	9.0	9.6	9.1 b
Native Soil	7.5	7.0	8.7	10.6	9.7	10.6	10.1 a	9.7 b	9.1 ab	8.7	8.9	9.9	9.2 ab

Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*

Table 5.

Greens Rolling Study-Soil Effect-Stimpmeter Readings,Feet-1995
One Day After Rolling

Soil Type	June 13	July 25	July 27	Aug. 15	Aug. 24	Season Average
USGA	7.7	8.8 a	8.8 a	8.5 a	10.0 a	8.7 a
80:10:10	7.6	8.3 b	8.3 b	7.8 b	9.5 ab	8.3 b
Native Soil	7.7	8.0 c	8.5 b	8.1 ab	9.3 b	8.4 b

Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*

Table 6.

Greens Rolling Study-Soil Effect-Stimpmeter Readings,Feet-1995
Two Days After Rolling

Soil Type	June 14	July 26	July 28	Aug. 25	Aug. 30	Season Average
USGA	8.1	8.5	9.0	9.8	9.4	9.2
80:10:10	8.1	8.3	8.8	9.8	9.1	9.0
Native Soil	8.1	8.1	9.2	9.6	9.2	9.0

Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*

Table 7.

Greens Rolling Study-Color and Quality Ratings-1995								
	Color Ratings (9 = Best)				Quality Ratings (9 = Best)			
Soil Type	July 5	Aug.14	Aug.28	Sept.14	June 5	July 5	Aug.28	Sept.14
U.S.G.A	6.4	6.5	6.7	7.4	6.3 a	5.3	5.8 b	6.4 a
80:10:10	7.3	6.7	6.8	7.1	5.7 b	6.5	6.8 a	6.3 a
Native Soil	6.8	6.7	6.3	6.8	4.6 c	5.6	6.1 b	5.7 b
Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*								

Table 8.

Greens Rolling Study-Disease Counts-Rolling Effect 1995						
	Dollar Spot Counts				Brown Patch	Yellow Tuft
Treatment	June 7	July 27	Aug.15	Sept.1	Aug.16	Sept.14
Rolled	21.9	225.9	49.6	201.4	2.6	4.6
Not Rolled	22.8	253.8	83.0	363.3	8.3	4.9
Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*						

Table 9.

Greens Rolling Study-Disease Counts-Soil Effect 1995						
	Dollar Spot Counts				Brown Patch	Yellow Tuft
Soil Type	June 7	July 27	Aug.15	Sept.1	Aug.16	Sept.14
USGA	54 a	540	163	540 a	2	0 b
80:10:10	10 b	172	33	283 ab	9	5 a
Native Soil	3 b	7	2	23 b	5	6 a
Means in columns followed my the same letter are not significantly different at the 5% level using the LSD means separation test.*						

Table 10.

1995 Golf Shoe Study-Stimpmeter Readings, Feet									
Spikes	Aug.18	Sept.15		Soil Types	Aug.18	Sept.15			Aug.18	Sept.15
Metal	7.68	9.47		USGA	8.80	10.40		Rolled	8.46	10.45
Soft	8.30	10.30		80:10:10	7.83	9.60		Unrolled	7.72	9.56
Green	8.28	10.26		Push-up	7.64	10.00				