Table 1. Broadleaf Weed Counts. Kentucky bluegrass mamagement study.

			April 27, 1998 Irrigation Timing			September 16, 1998 Irrigation Timing		
N Source[1]	**N Rate[2]**	**Herbicide[3]**	**Daily***	**Wilt****	**None**	**Daily***	**Wilt****	**None**
none	——	none	20 a	12 bc	10 cd	70 a	22 cd	18 d
Urea	0.5 lb.	biannual	3 e	0 e	0 e	4 e	0 e	0 e
Urea	1.0 lb.	biannual	1 e	0 e	0 e	3 e	0 e	1 e
Urea[4]	1.0 lb.	biannual	0 e	0 e	0 e	2 e	0 e	0 e
Urea[5]	1.0 lb.	biannual	0 e	0 e	0 e	0 e	0 e	0 e
Urea[4,5]	1.0 lb.	biannual	0 e	0 e	0 e	0 e	0 e	0 e
Urea	1.0 lb.	none	12 bc	0 e	1 e	16 d	1 e	1 e
Milorganite	1.0 lb.	none	18 ab	3 de	3 e	35 b	7 e	4 e
Ringer's	1.0 lb.	none	14 abc	0 e	1 e	31 bc	1 e	3 e
Probability				0.02			0.00	
LSD at 0.05				6.9			7.7	

Means for the same date followed by the same letter are not significantly different using the LSD mean separation test.

1. Nitrogen applications were applied 23 April, 12 June, 23 July, 9 September, and 24 November.
2. Pounds of nitrogen per 1000 sq. ft. per application.
3. Pendimethalin applied on 1 June and Trimec applied on 30 July at their highest labeled rate.
4. Dursban applied on 29 July at highest labeled rate.
5. Chipco 26019 applied on 28 July at highest labeled rate.

* Approximately 1/10 inch of water per day from May through October at 4:00 a.m.

** Approximately 1 inch of water applied at the onset of wilt.

Table 2. Irrigation Timing Effects on Quality Ratings (9= excellent, 6 and above is acceptable, 1 = chlorotic or brown.)

Irrigation Treatment	24 April	10 June	21 July	24 November***
.1 " Daily	6.4	6.7 a	6.9 a	5.3 b
Onset of Wilt	6.4	4.7 b	6.2 b	6.2 a
None	6.6	4.3 c	5.4 c	6.4 a
probability	n.s.	0.00	0.00	0.00
LSD @ 0.05	——	0.3	0.4	0.2

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

*** An interaction exists with fertility treatments on this day.

Bentgrass Green High Potassium Study

A study evaluating high annual rates of potash on creeping bentgrass that was initiated in 1990 was concluded in 1997. The study was located on a sandy loam/loamy sand putting green. There were four replications of each treatment. Plot size was 5 feet by 7 feet. All applications during the season were made at the rate of 2 lbs. K_2O / 1000 sq. ft. per application. The soil tests reported in Table 3 are for samples taken in November of 1997 and were not available at the time of printing the 1997 reports. Potassium tests are typically higher in the thatch layer than in the soil. This is due to the lower density of thatch. Potassium levels in the 0-3 and 3-6 inch layers are similar to those found in previous years, reflecting the increase in soil potassium levels with increasing potash applications. In spite of the very high potassium applications (12 lbs. potash per 1000 sq. ft. annually) there is a maximum amount of potassium this soil will hold. Further, even though the soil potassium levels are low, there has never been any appearance of potassium deficiency symptoms. These plots have not been subjected to intense traffic or other stresses, however.

There was no influence of potassium rate on calcium tests. However, magnesium tests were in the 0-3 inch depth was reduced by the high potash levels. This effect of reducing exchangeable magnesium is marginal on these plots, likely because the irrigation water contains both calcium and magnesium. For this reason, it is important to take soil samples annually from sandy putting greens to monitor all nutrients including calcium and magnesium.

Table 3. Bentgrass Potassium Study. Initiated 1990 Soil test data from November 1997

	Potassium lbs./A			Calcium lbs./ A			Magnesium lbs./A		
Treatments and Rate	**Thatch**	**0-3"**	**3-6"**	**Thatch**	**0-3"**	**3-6"**	**Thatch**	**0-3"**	**3-6"**
Check Plot	223 c	67 d	33 d	1994	1350	925	219	199 a	160
Soil Test Recommendation	349 b	199 c	132 c	2142	1300	1000	210	178 ab	283
4 lbs. KCl / M annual	381 b	174 c	120 c	2119	1125	950	215	144 c	124
8 lbs. KCl / M annual	397 b	255 b	194 b	2262	1325	825	232	173 b	110
12 lbs. KCl / M annual	490 a	310 a	258 a	2070	1350	850	205	162 bc	107
12 lbs. K_2SO_4 / M annual	420 ab	343 a	263 a	1945	1325	850	212	172 b	116
Probability	0.00	0.00	0.00	0.52	0.19	0.15	0.81	0.00	0.37
LSD at 0.05	72.3	50.0	21.8	ns	ns	ns	ns	21.0	ns

Means followed by the same letter are not significantly different using the LSD mean separation test.

Phosphorous Soil Test Correlation's on Sand: Peat Green

A study was established in 1993 on a an 85% sand, 15% peat green built to U.S.G.A. specifications. The grass was Penncross creeping bentgrass mowed at 3/16 inch. Not long after establishment a serious phosphorus deficiency developed with the typical purplish/gray green appearance and the turf had very little growth. The Bray P phosphorus soil test was 4 lbs. of phosphorus per acre. At the initiation of the study treatment 1 received no phosphorus; treatment 2 received 1 lb. P_2O_5 / 1000 sq. ft annually; treatment 3 received 2 lb. P_2O_5 / 1000 sq. ft annually; treatment 4 received 4 lb. P_2O_5 / 1000 sq. ft annually; treatment 5 received 4 lb. P_2O_5 / 1000 sq. ft in 1993 with no further applications; treatment 6 was treated annually at the rate recommended by the Bray P1 phosphorous soil test; and treatment 7 was treated annually at the rate recommended by the Olsen phosphorous test. Plot size was 4 ft. by 12 ft. with 3 replications of each treatment. In 1996 the plots inadvertently received 0.2 lb. phosphate per 1000 sq. ft. as part of a complete fertilizer. With that exception no phosphate has been applied since 1995 when all treatments were ceased. Interestingly, the phosphorus soil test values in Table 4 are similar to those reported in 1997.

The plots receiving no phosphorus have exhibited typical deficiency symptoms, particularly during spring and fall. Some symptoms have been evident at times on the plots that had received 1 or 2 lbs. phosphate annually. In spite of deficiency symptoms being evident on the check plot there was no difference in clipping weights taken in June. We have observed that as soils warm the symptoms tend to disappear. Perhaps the early warm year in 1998 resulted some release of phosphorus from soil organic matter, causing no differences in growth in June. The phosphorus content in clippings in the June sampling reflect the low soil phosphorus tests. Only treatments treated with phosphorus through 1995 have at least .4 % phosphorus. Most agronomists suggest phosphorus levels in clippings should be above .3-.4%.

Table 4. Sand/peat Root-Zone Phosphorous Study. Data Collected June 23, 1998

Treatment lbs P_2O_5/1000 sq. ft.	**Clipping Weights in grams**	**% P from clippings**	**Lbs. P/A soil test**	**Lbs. P/1000 sq. ft. Recommended***
1) No Phosphorus since 1992	38.9	0.19 c	7 b	4.0
2) 1 in 1995	33.9	0.20 c	10 b	4.0
3) 2 in 1995	48.9	0.29 b	12 b	3.5
4) 4 in 1995	53.5	0.43 a	27 a	3.0
5) 4 in 1993	41.8	0.19 c	10 b	4.0
6) 3 in 1995[Y]	48.0	0.45 a	26 a	3.0
7) 3 in 1995[Z]	48.1	0.45 a	37 a	2.0
Probability	0.12	0.00	0.00	
LSD at 0.05	ns	0.03	12.9	

Means in columns followed by the same letter are not significantly different using the LSD mean separation test.

Y-Based upon Bray Soil Test Recommendations

Z-Based upon Olsen Soil Test Recommendations

* Annual phosphate recommended bases on soil P test (Bray P_1 extractable) at the Michigan State University Soil Testing Laboratory.