

There were few effects of treatments on soil tests on this sand green (Table 11). The most marked effect was on soil pH. Sand topdressing caused pH to drop slightly while coring increased pH. Differences in pH were small but consistent. There were no effects on soil tests which were considered meaningful.

A similar study was established on a Penncross creeping bentgrass green growing on a loamy sand at the Hancock Turfgrass Research Center in 1985. While Sand Aid treatments at higher rates had higher quality ratings than at lower rates or where no Sand Aid was applied, differences were small and not significant (Table 12). Turf color ratings (not shown) were not affected by treatment.

Topdressing consistently increased the thickness of the thatch/sand layer compared to other treatments (Table 13). And coring treatments increased this measurement compared to the untreated check. As with other observations when treatments were applied on the sand green (Table 11) there was no difference in the total amount of organic matter in the "thatch" layer in this study with the numbers being remarkably consistent. In this study the untreated plot had a high percent (36%) of organic matter in the thatch layer.

Rooting data taken from samples obtained August 14 (Table 14) and September 16 gave evidence that sand topdressed plots had higher root weights in the "thatch layer" than cored or untreated plots, but there was little effect of Sand Aid treatment on rooting on either date.

As on the sand green, sand topdressing caused a small, but consistent, lowering of pH (Table 15). There was a tendency for plots receiving coring treatments to have higher levels of available nutrients, particularly for calcium and magnesium. This may result from bringing soil to the surface with cultivation which has a higher nutrient level than exists in untreated plots or where sand has been applied which contains essentially no available nutrients.

Another Sand Aid topdressing study has been conducted since 1985 on Penncross creeping bentgrass growing on a native soil (heavy sandy loam). No meaningful differences have been observed on this green as caused by treatments.

It is our opinion that the benefits of use of a product like Sand Aid will likely become apparent over the long term. In this third year of the study some responses have appeared indicating benefit from the use of Sand Aid, particularly when applied with sand topdressing. At this time the nature of the cause for these positive responses is not clear.

Long Term Fertility Studies

The long term nitrogen fertility study on Penncross, Penneagle and Emerald creeping bentgrasses maintained under greens conditions was established in 1982. The treatments applied are outlined in Table 16. Plot size was 4 feet by 6 feet. Note that treatments 7 and 8 include late fall nitrogen applications for urea and Milorganite, respectively. The higher nitrogen treatments had higher turf quality ratings (Tables 17-19) and color ratings

Table 12. Effect of Sand Aid treatments on turfgrass quality ratings of a Penncross creeping bentgrass green grown on loamy sand. Treatments initiated in 1985. Quality rating scale of 1-9 with 9 = highest quality turf. Averages for 3 replications.

Sand Aid	Treatment		Turfgrass quality rating (9 = best)			
	Auxiliary		July 17	Aug 14	Sept 9	Oct 1
5%	Sand topdress		6.5ab*	7.8ab	8.2ab	7.5ab
10%	Sand topdress		7.2a	8.0a	8.5a	7.8a
None	Sand topdress		6.3ab	7.8ab	8.3ab	7.0ac
15 lbs	Coring		5.8b	7.2b	8.0b	6.2c
30 lbs	Coring		6.2ab	7.8ab	8.2ab	6.2c
None	Coring		5.8b	7.3ab	8.0b	6.0c
None	None		6.0b	7.7ab	8.2ab	6.7bc

* - Means in columns followed by the same letter are not significantly different from each other using Duncan's Multiple Range Test (5%).

Table 13. Effect of Sand Aid treatment on the "thatch" layer of a Penncross creeping bentgrass green grown on loamy sand. Treatments initiated in 1985. Averages for 3 replications.

Sand Aid	Treatment		Thickness	Organic matter in "thatch"	
	Auxiliary		mm	%	grams
5%	Sand topdress		22.9a*	9.2b	1.30a
10%	Sand topdress		24.7a	8.9b	1.39a
None	Sand topdress		21.5a	8.7b	1.22a
15 lbs	Coring		15.1b	13.6b	1.25a
30 lbs	Coring		15.9b	13.2b	1.37a
None	Coring		15.2b	11.5b	1.23a
None	None		11.6c	36.4a	1.25a

* - Means in columns followed by the same letter are not significantly different from each other using Duncan's Multiple Range Test (5%).

Table 14. Effect of Sand Aid treatments on rooting by depth of a Penncross creeping bentgrass green grown on loamy sand. Sampled August 14, 1987. Treatments initiated in 1985. Averages for 3 replications.

Treatment		Root weight by depth, grams			
Sand Aid	Auxiliary	0-1 inch	1-2 inch	2-3 inch	3-6 inch
5%	Sand topdress	1.36a*	.35a	.21a	.22b
10%	Sand topdress	1.14ab	.31a	.19a	.24ab
None	Sand topdress	.98bc	.30a	.19a	.24ab
15 lbs	Coring	.67d	.30a	.21a	.25ab
30 lbs	Coring	.85cd	.32a	.22a	.23ab
None	Coring	.71cd	.29a	.18a	.23ab
None	None	.75cd	.34a	.23a	.33a

* - Means in columns followed by the same letter are not significantly different from each other using Duncan's Multiple Range Test (5%).

Table 15. Effect of Sand Aid treatments on soil tests of a loamy sand green. Treatments initiated in 1985. Averages for 3 replications.

Treatment		pH	Available nutrient, lbs/A			
Sand Aid	Auxiliary		P	K	Ca	Mg
5%	Sand topdress	7.2b*	48bc	156ab	1322c	275b
10%	Sand topdress	7.2b	53ac	183a	1372c	280b
None	Sand topdress	7.2b	50ac	152ab	1346c	259b
15 lbs	Coring	7.4a	65ab	178a	1603ab	319a
30 lbs	Coring	7.4a	61ac	178a	1524b	329a
None	Coring	7.4a	67a	173a	1712a	324a
None	None	7.4a	47c	123b	1346c	240b

* - Means in columns followed by the same letter are not significantly different from each other using Duncan's Multiple Range Test (5%).