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Executive Summary

Evaluation Of New Technologies In Construction And Maintenance Of Golf Course Greens

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Three very uniform sands (coarse, medium and fine) were amended with Irish sphagnum peat, Profile®, Greenschoice®, Isolite®, and Ecolite® at 10% and 20% by volume. Soil physical properties, including bulk density, saturated conductivity, air-filled pore space and water-filled pore space were determined, as were soil moisture profiles. The results indicate that the inorganic amendments did improve soil moisture holding capacity, but much less so than did the peat. Moisture retention curves indicate that a considerable portion of the amendment-held water is unavailable to roots. Saturated hydraulic conductivity was high in all soils, probably due to the highly uniform sands used.

None of the amendments reduced nitrate leaching, but Ecolite® and Profile® were very efficient at retarding ammonium leaching. Rate and positioning effects of amendment on nutrient leaching have been determined. These data have implications for fertility practices in new putting greens.

The effect of the intermediate gravel layer and gravel size (fine and medium) on soil water retention was investigated. Soil water content was reduced by the presence of the gravel layer but was unaffected by gravel size. The gravel layer functioned essentially as a continuation of the sand rootzone with regards to drainage. Treating the gravel with a hydrophobic sealant reduced drainage and increased water content in the sand profile. This indicates that there is adequate continuity of water across the sand/gravel interface to permit normal drainage, and raises question about the concept of the perched water table.

Sixty mini-putting greens were used to evaluate SubAir® treatments. Air evacuation or injection had little or no effect on soil temperature. Rootzone gases were also unaffected by SubAir® treatments, with O_2 and CO_2 remaining at near-optimum levels throughout the season. SubAir® treatments were effective at reducing soil moisture throughout the profile, by approximately 3-4%.

Soil microorganism populations increased rapidly during the first months following seeding, independent of rootzone mix, and have remained fairly stable thereafter. It appears that the concept of a sand rootzone being "sterile" and in need of microbial inoculation is suspect. Some data indicate that seasonal root dynamics may regulate microbial activity by altering the amount of sugars and other substrates in the rootzone.

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This project is in the final phase. Four manuscripts have been submitted, with three accepted and the fourth still under review. A fifth is nearing readiness for submission. The following summarizes the important results of this project:

- ✓ None of several inorganic amendments reduced nitrate leaching, although Ecolite® and Profile® were very efficient at retarding ammonium leaching. Rate and positioning effects of amendment on nutrient leaching indicate that incorporation at 10% (v:v) gives very effective results.

- ✓ Soil water content was reduced by the presence of the gravel layer but was unaffected by gravel size. The gravel layer functioned essentially as a continuation of the sand rootzone with regards to drainage. Treating the gravel with a hydrophobic sealant reduced drainage and increased water content in the sand profile. This indicates that there is adequate continuity of water across the sand/gravel interface to permit normal drainage.

- ✓ Sixty mini-putting greens were used to evaluate SubAir® treatments. Air evacuation or injection had little or no effect on soil temperature. Rootzone gases were also unaffected by SubAir® treatments, with O_2 and CO_2 remaining at near-optimum levels throughout the season. SubAir® treatments were effective at reducing soil moisture throughout the profile, by approximately 3-4%.

- ✓ Inorganic amendments generally improved bentgrass establishment relative to unamended sand, but not to the same degree as peat moss. There were few effects of inorganic amendment after establishment. Infiltration, determined three years after putting green establishment, was uniformly high across the various rootzone mixtures, and was comparable to initial laboratory estimates for hydraulic conductivity. This indicates that rootzone physical properties had not deteriorated during the first three years of the study.

- ✓ Soil microorganism populations increased rapidly during the first months following seeding, independent of rootzone mix, and have remained fairly stable thereafter. It appears that the concept of a sand rootzone being "sterile" and in need of microbial inoculation is suspect. Some data indicate

that seasonal root dynamics may dramatically regulate microbial biomass by altering the amount of sugars and other substrates in the rootzone.