

# Organic Matter Dynamics in the Surface Zone of a USGA Green: Practices to Alleviate Problems

Dr. Robert Carrow

University of Georgia

## Goals:

- *Determine the effectiveness of selected fall/spring-applied cultivation on enhancement of bentgrass root development, water infiltration, and soil oxygen status during spring and fall root development periods.*
- *Determine the effectiveness of selected summer-applied cultivation, topdressing and wetting agent practices on bentgrass root maintenance and viability, water infiltration, and soil oxygen status during the summer months when root decline occurs.*
- *The best treatments from the objectives above will be combined to develop an integrated year-round program for maximum root development and maintenance during stress periods.*

It is the hypothesis of the author that two turfgrass growth problems arise as organic matter accumulates in the surface 0 to 2 inch zone of a USGA green. Previous research efforts revealed that organic matter increased from 1.5 to 2.0 percent (by weight) at establishment to 8 to 12 percent after 2 years. Organic matter accumulation even occurs under excellent management and regardless of construction specifications. The two problems this research will address are: 1) to evaluate summer bentgrass decline in response to root deterioration and plugging of the macropores that are important for soil O<sub>2</sub> and infiltration of water, and 2) to determine the reasons for the inhibition of spring and fall root development in the zone of high organic matter content.

*Summer Bentgrass Decline in Response to Root Deterioration and Plugging of the Macropores that are Important for Soil O<sub>2</sub> and Infiltration of Water.* A project was initiated in late spring 1996 to investigate the influence of treatments (summer cultivation, sand topdressing, sand substitutes and wetting agents) on maintaining infiltration, soil O<sub>2</sub> status, and root viability. To date, O<sub>2</sub> levels in the surface 1 inch can be below the acceptable minimum for 9 to 26 hours after irrigation. This indicates that O<sub>2</sub> stress may be a common occurrence as bentgrass roots deteriorate and the organic matter changes from live roots to dead material in the summer months. Cultivating with the Hydro-Ject in a raised position (nozzles 4 inches off the surface) created

approximately 0.25 inch diameter holes that maintained acceptable infiltration rates for about 3 weeks. Wetting agent further enhanced infiltration.

*Inhibition of Root Development (in Spring/Fall) from the Zone of High Organic Matter Content.* A second project was initiated in winter 1996 to investigate the influence of selected, non-disruptive cultivation procedures on root development. Wetting agent and sand substitute

treatments also were included. The goal is to determine whether better root growth/depth can be achieved by increasing macropores in the surface 0 to 2 inch zone without conducting the traditional spring/fall core aeration operation. Rooting data are unavailable at this time but improvements in O<sub>2</sub> status and water infiltration have been noted from selected treatments.

**Table 18. Saturated hydraulic conductivity at selected days after the cultivation treatment (DAT) in summer 1996.**

Treatment and Contrast <sup>1</sup>	7/19/96 3 DAT	8/6/96 21 DAT	8/15/96 7 DAT	9/3/96 26 DAT	9/9/96 4 DAT	9/23/96 18 DAT
Control vs	199	219	67	137	223	53
Core Aerification	299	93	116	116	223	64
HydroJect						
Lowered	190	222	192	764	538	390
Raised	448	190	470	775	652	457
Raised + Sand <sup>2</sup>	838	217	830	1136	622	599
Raised + Greenschoice <sup>2</sup>	488	160	776	545	883	307
Raised + Wetting Agent	791	145	1024	505	961	737
Raised + Biostimulant	636	100	861	413	868	379
Raised + Sand + Wetting Agent <sup>2</sup>	658	123	830	821	705	385
Raised + Sand + Wetting Agent + Biostimulant <sup>2</sup>	930	108	343	446	608	500
LandPride + Greenschoice <sup>2</sup>	176	80	233	100	323	234
LSD <sub>0.05</sub>	322	197	579	506	427	256
F-Test	**	0.78	**	**	**	**
CV, %	43	91	77	67	49	49

\*\* , \* , † Significant at P ≤ 0.01, 0.05 and 0.10, respectively.

<sup>1</sup> Contrast versus Control based on LSD value.

<sup>2</sup> Sand topdressing and Greenschoice applied 8 and 30 July. Wetting agent applied 9 and 29 July. Biostimulant applied 9 July and 9 August. Cultivation treatments were on 16 July, 8 August and 4 September.