Soil Physical and Chemical Characterization of Aging Golf Greens

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Objectives:

1. Determine temporal term effects of a USGA specification rootzone mix with and without soil on physical and chemical factors

Start Date: 2001
Project Duration: five years
Total Funding: $109,285

The five-year project is a focused extension of the previous USGA project-Grow-in and Cultural Impacts on USGA Putting Greens and their Microbial Communities. Emphasis is being placed on characterization of the long-term effects of rootzone mix on soil physical parameters, specifically saturated hydraulic conductivity, total and air-filled porosity, and bulk density.

Data have been collected for more than ten years on this project. Results to date indicate that as a green matures, soil infiltration decreases until approximately the ninth or tenth year at which point the infiltration appears to stabilize at 20cm/hr (7.9 inches/hr) regardless of rootzone (Figure 1).

The decrease in infiltration may be attributable to placement and movement of fine sand particles from topdressing sand or accumulated organic matter. Rootzone samples that were taken from below the visible mat layer had lower infiltration than the preconstruction infiltration values. The infiltration decline with age may have resulted from increased fine sand amounts and decreased coarse sand in the rootzone. The rootzone samples had increased fine sand amounts in six of the eight rootzones, and decreased coarse sand in five of the eight rootzone sampled, compared to the preconstruction rootzones. These changes likely originated from the sand topdressing applications. The USGA recommends that topdressing sand meet rootzone particle size distribution. The topdressing sand used in our study met USGA specifications, however, it had had a higher amount of fine sand (0.25 - 0.15 mm) particles, and less coarse sand (0.5 - 1.0 mm) than the sand used in the original rootzones (Figure 2). The fine sand particles may have been placed into the rootzone during core cultivation, especially during the first two years. The decline in rootzone infiltration may be attributed to the increased fine sand content of the rootzone. However, the decline in infiltration due to increased fine sand content does not completely explain the reduction of infiltration. Organic matter accumulation may account for the decrease, but this was not measured in this study. The infiltration rate, while significantly lower than infiltration after the first year, remained above 7 inches/hr, which is more than adaquate for greens in the Central Great Plains.

A new research objective was initiated in 2006. Organic matter (OM) or, more specifically, organic matter accumulation and management, has become an important and sometimes controversial issue in golf course management. Inconsistencies in measurement of rootzone OM has resulted in confusion concerning optimal and, more importantly, supra-optimal OM levels that compromises green quality, including playability and agronomics. This project will utilize existing golf courses with a consistent maintenance history and a robust statistical survey technique to quantify national and regional rootzone OM relationships to site-specific maintenance and overall green quality. Additionally, structured research will be conducted on the established research greens of varying ages to identify the impact of traditional aerification techniques on organic matter management.

This research will document and potentially establish more comprehensive guidelines for OM accumulation management. To date, 68 golf courses from 10 different states have been sampled. This research will continue in 2007 with the generous financial contributions of the Nebraska and South Dakota GCSA.

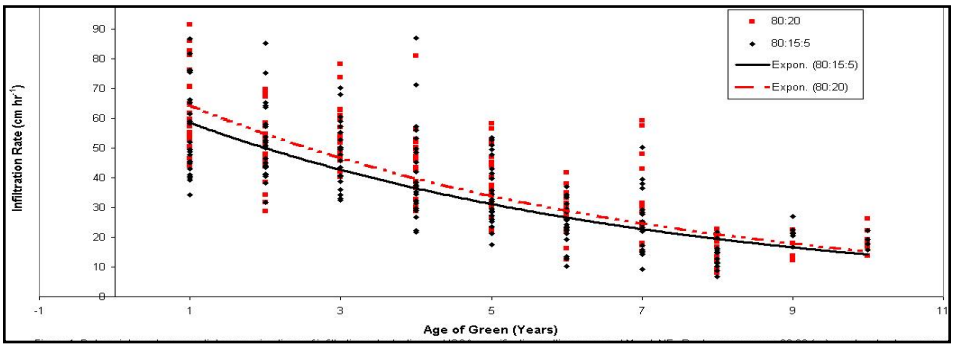

Figure 1. *Data points and exponential regression lines of infiltration rate decline on USGA specification putting greens at Mead, NE. Rootzones were an 80:20 (v:v) sand and sphagnum peat mixture and an 80:15:5 (v:v) sand, and sphagnum peat, soil mixture.*

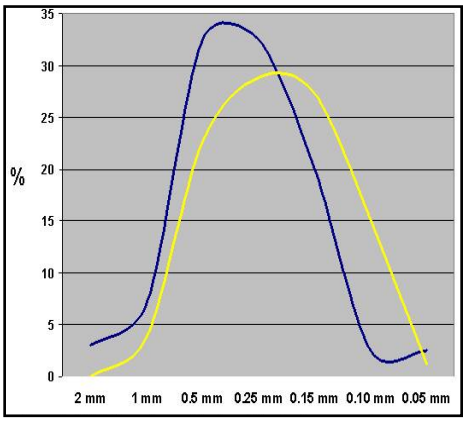

Figure 2. *USGA sand specifications (blue line) compared to sand used in the topdressing program (yellow line)*

Summary Points

- University of Nebraska researchers are characterizing the long-term effects of rootzone mix on soil physical and chemical parameters.
- Results to date indicate that as the green matures, soil infiltration decreases until approximately the ninth or tenth year at which point the infiltration appears to stabilize at 20cm/hr (7.9 inches/hr).
- The decrease in infiltration may be attributable to placement and movement of fine sand particles from topdressing sand or accumulated organic matter.