



Survey of Root Zone Properties in Amended Native Soil Pushup Greens

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ABSTRACT

USGA recommendations for putting green construction were developed following years of extensive research. Although the design is widely accepted with proven results, many golf courses in mostly rural areas do not have the budget, expertise, or desire to reconstruct existing putting greens to USGA specifications. In 2001, research was initiated on 108 'pushup' putting greens constructed from native soil on 36 golf courses in South Dakota. Onsite infiltration rates at or near field capacity ranged from 1.40 to 40.54 cm h⁻¹ with a mean of 4.51 ± 2.67. Soil properties sampled at 0 to 15 cm provided mean values of 1.35 ± 0.13 g cm⁻³ bulk density, 48.92 ± 4.92% total porosity, 12.34 ± 8.00 cmol kg⁻¹ cation exchange capacity (CEC), 7.59 ± 0.30 pH, 0.99 ± 0.62 dS m⁻¹ electrical conductivity (ECe), and 3.79 ± 1.77% soil organic matter (SOM). Mean values at 15 to 31-cm depth included 14.74 ± 8.63 cmol kg⁻¹ CEC, 7.81 ± 0.35 pH, 0.76 ± 0.62 dS m⁻¹ ECe, and 3.01 ± 1.78% SOM. Mean soil mineral fraction was 79.48 ± 15.51% sand, 8.63 ± 6.19% silt, and 11.89 ± 10.67% clay at 0 to 15 cm, and 64.42 ± 22.92% sand, 14.17 ± 9.22% silt, and 21.41 ± 15.32% clay at 15 to 31 cm. Penetration resistance averaged across all putting greens increased linearly with depth of profile, but resistance was highly variable among putting greens. Soil layering at the sand/soil interface caused by long term core aeration and topdressing was common. Results of the study will be used to develop recommendations to improve putting green performance on pushup greens.

INTRODUCTION

Root zone properties are critical to turfgrass survival on intensively managed golf course putting greens. To improve these properties, USGA green construction specifications were developed from extensive research and are highly regarded; however many 9-hole or rural golf courses may not have the budget, expertise, or desire to reconstruct existing greens.

Most putting greens in South Dakota were not constructed with USGA specifications. "Pushup" greens constructed with native soil root zones are common and nearly all have been amended in the upper 7 to 10 cm with sand, affecting soil physical and chemical properties that are quite different compared to USGA specification greens.

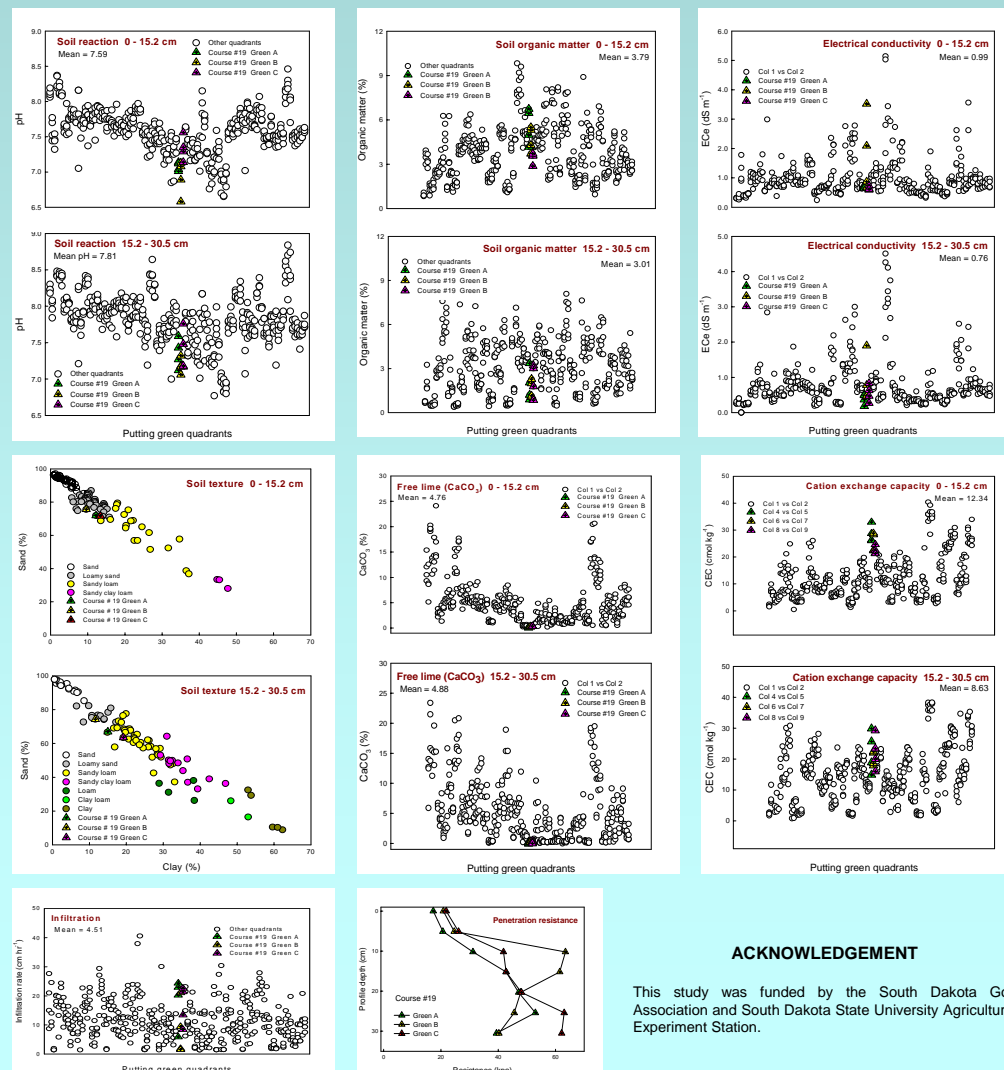
This study was initiated to obtain data on amended native soil pushup greens and provide recommendations to improve management.

MATERIALS AND METHODS

In 2001, three native soil pushup greens from each of 36 South Dakota golf courses were evaluated and sampled. Onsite data were collected for green area and surface characteristics, turf quality, thatch thickness, infiltration rate, and penetration resistance. Intact soil profile sections (0 to 18 cm) and 0 to 15.2 and 15.2 to 30.5-cm cores extracted for laboratory analysis were obtained randomly from each of 4 quadrants per green. Properties tested include soil texture, bulk density, porosity, soil organic matter, electrical conductivity, cation exchange capacity, pH, and CaCO₃.

RESULTS AND DISCUSSION

Results presented in this poster offer a visual demonstration of the variability in amended native soil root zones among golf courses, among greens at individual golf courses, and among quadrants for individual greens. Results from one of the 36 golf courses (#19) are highlighted. Although data have not been statistically analyzed to date, nor results of all tests included, it is apparent that 1) there is little consistency among putting green root zones, 2) improper methods to amend original root zones may cause additional problems, and 3) individual green management programs may be indicated to achieve acceptable green quality.



Soil profiles of native soil pushup greens taken from 12 of 36 South Dakota golf courses sampled.

ACKNOWLEDGEMENT

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