

Interactive comment on “Effects of golf course management on subsurface soil properties in Iowa” by Matthew T. Streeter and Keith E. Schilling

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We would like to start by thanking the referee for the detailed comments and effort that has been put forth to review this manuscript. We were pleased that while there were several issues that needed addressed, these issues were mostly minor. In response to the general comments made which suggests a comparison by location on the golf course rather than comparisons between golf courses by depth: While it is true that management may vary between Tees, roughs, and fairways, we found through interviews with golf course managers that management varied much more significantly between courses than between locations on the course. For example, the two central courses were located on the same landform region, yet course average N fertilizer was more than doubled at Central 18 compared to Central 9. When looking at these same

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two courses, N fertilization was the same for Tees and Fairways at the Central 9 course and was only 25% less on the fairway compared to the Tee on the Central 18 course (Table 2 in manuscript). Based on these types of observations, the decision was made to combine samples at golf courses and compare between courses where differences in management were most pronounced. Furthermore, as noted in the manuscript discussion starting at line 143, typical particle size content within parent materials in Iowa is well documented. In the case of loess derived soils in our western site, variability in particle size by depth may easily be attributed to anthropogenic factors (45% sand in the altered surface compared to less than 10% sand in the unaltered parent material). Likewise, with detailed soil description (which was done for each of our sites), soil alteration due to anthropogenic factors may be differentiated from natural pedogenesis visually (see attached image).

Response to specific comments, all grammatical suggestions have been noted and will be corrected in the revised manuscript. Line to line comments are as follows: Line 10 – Iowa is an ideal location because of the extent of “urban expansion that is developing turfgrass landscapes surrounding commercial sites, homes, and recreational areas on soils that have been agriculturally managed for decades” (lines 6-8 in manuscript). Line 113-117 – In 5 of 6 of the courses, the 0-20 cm depth class had an n of 1 or 2. Unfortunately, this did not allow for statistical comparison by depth within individual courses by location (tee vs. fairway) and as stated in lines 112-117, the geologic differences between landform regions was too great to combine all surface samples. Line 122 and 125 – We will include p-values. Line 122 - The information related to TC is a relevant addition to this work because, in the case of our paper, we were not correlating organic and inorganic carbon (as the referee suggested), but correlating TC and SOM, which are derived via two separate testing procedures. This correlation helps to highlight the variability in parent material. Line 125 - Fertilization dates were recorded as well as soil sampling dates. This information may be added to the manuscript to clarify potential differences in nitrate due to sampling date. Line 130 - See comments for line 122 in justification of the comparison of total carbon to total nitrogen. We will acknowledge the

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potential inaccuracy due to low nitrogen concentrations near line 183. Line 156 - See comments for line 113-117 regarding statistical power. Line 180-181 – “The variability in TC (and C/N ratio below 100 cm) that we have identified through this study may be entirely affected by parent material and natural weathering patterns” (lines 184-186).

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Fig. 1.

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