

Interactive comment on “Evaluating management-induced soil salinization in golf courses in semi-arid landscapes” by J. Young et al.

Anonymous Referee #2

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General Overview This manuscript reports on an interesting and relevant phenomena, namely, the salinization of soil through irrigation and other management practices. While this has received a fair amount of attention in agricultural settings, it has been less studied in urban/recreational settings and is thus worthy of attention. Given the Introduction, I expected to read more about the potential use of PXRF in tracking soil salinization, including advantages and disadvantages of the PXRF itself and some comparisons to other options. Instead, the PXRF is relegated to a rather minor mention at the tail end of the manuscript which I found to be, in my opinion, overly brief in its treatment of the topic. In addition, other means of determining soil salinity and sodicity, particularly EMI, have been highly reported on in the literature (e.g., Williams

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and Baker, 1982; van der Lelij, 1983; Ammons et al., 1989; Cook et al., 1989; Diaz and Herrero, 1992; Lesch et al., 1992; Nettleton et al., 1994; Doolittle et al., 2001; Williams et al., 2006; Thomas et al., 2009; Ganjegunte and Braun, 2011; Heilig et al., 2011, etc.). How, or does, the use of PXRF improve on other available techniques? What are the advantages and disadvantages in relation to these other technologies? For that matter, how, or is, PXRF an improvement over traditional sampling and laboratory analysis? In other words, why should I as a soil scientist be interested in using PXRF in an investigation of soil salinity versus the other options that are available to me? I'm sure the authors can answer these questions; doing so would significantly improve the manuscript. Finally, the entire manuscript needs to be carefully read through and edited for English. I have certainly read far worse, but there are enough places where the writing is a bit weak that it distracts from the overall paper. Addressing the issues above would lead to a paper that, in my opinion, Soil Earth should welcome into their journal.

Specific Comments Page 92, Line 3 – An example of English that needs to be cleaned up. This should be "...better assessments of their...", not "...better assertions of their...". I won't spend time pointing out all such issues, but the manuscript needs a good editing.

Page 94, Lines 8 and 9 – The USGA reference cited gives water use in length/yr/area units, which makes more sense than the 1200 mm/yr and 600 mm/yr units given here. I assume these should be 1200 mm/yr/ha and 600 mm/yr/ha?

Page 94, Lines 17-19 – The Weindorf group has done good work with the application of the PXRF to soils work, but this statement would be significantly strengthened by introducing some references that do not come from the Weindorf research group (every single reference in this list is from the Weindorf group). There are many that would work; examples include Bernick et al., 1995; Clark et al., 1999; Kilbride et al., 2006; and Jang, 2010. I suggest working references from some other research groups into the manuscript here.

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Page 95, Line 8 – “...for a more rapid soil salinity examination...” More rapid than what? I assume this is a very underdeveloped attempt to work in a comparison of the use of PXRF for salinity studies versus other techniques (something I noted was needed in my general comments), but this idea needs to be developed and clearly communicated. As currently written, it is just a vague suggestion that doesn’t carry any weight. Other techniques to investigate soil salinization could be discussed earlier in the Introduction. Then, here, you introduce the idea that this study is looking to investigate whether PXRF might be a (more rapid/less expensive/any other advantages that are applicable) technique than those currently available to investigate soil salinization.

Page 97, Lines 17-18 – Study sites A-G = 7 facilities being studied. Here, the numbers of facilities providing water quality data only add up to 4 facilities. Please explain the discrepancy.

Page 101, Lines 4 and 8 – It refers to “2-folds” and “2-11 folds” here. It would be better to use “2-times” and “2-11 times”.

Page 101, Lines 5-7 – It speculates here that pollutants in the retention pond water were taken up by vegetation and/or settled to the bottom of the pond. What about the idea that the pollutants were never there to begin with? My bet is the source of the salt ions in the well water is the geologic formations that water flows through, and the salts are dissolved into the groundwater as it makes its way through the rocks and sediments. The water in the retention pond is from runoff, which never interacted with these deeper geologic units. Ideally you would have water quality data for runoff entering the retention pond, which would clarify the situation, but that data probably isn’t available. Given that, a more complete discussion of potential reasons the retention pond water is lower in dissolved ions would be appropriate.

Page 101, Line 13 – Again, should this be 120 cm/yr/ha? Also, back on page 94 the units were mm, now they are cm. This should be changed to 1200 mm to be consistent in unit use.

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Page 101, Line 21 – It is Terrel and Johnson, 1999, not Terrel et al., 1999.

Page 101, Line 23 – I have passed by many writing issues, but can't pass this one by. "...water sources justifies the..." The water sources don't justify anything, however, they probably "explain" the higher SAR and ESP values.

Page 101, Line 26 – "...that still impacted higher..." should be "...that still led to higher..."

Pages 102-103, Section 3.4 – Comparisons of PXRF to other methods of determining soil salinity? Strengths and weakness of PXRF itself and as compared to other methods? This section should be expanded to be a more complete discussion of where PXRF may fit, based on this study, within the various methods we have available to investigate soil salinity issues.

Page 102, Line 28 – "...that could be..." should be "...that could possibly be..." This study does not demonstrate that the PXRF technique will work in other places, but it does provide justification for researching that possibility.

Page 103, Line 16 – Delete "...in the semi-arid region of the USA..." It has already been established that the study took part in a semi-arid region of the USA.

Page 104, Lines 2 and 3 – The word "quantity" is used twice here, but the way the sentence is written it seems like one of these should be quantity and the other quality.

Page 104, Author contributions – The contributions of every author except D.C. Weindorf are explained, the Weindorf contributions should be added.

Tables – Retention pond needs to be used consistently in these. On Table 1 "surface" is used, I assume that should be "retention pond". On Table 3 "lake" is used, again I assume that should be "retention pond". Consistency in labeling is very important.

Figure 2 – The choice of pattern for the bar graphs is poor. While I can tell the difference between the patterns in the bar graphs, they don't differentiate in the small windows for

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the key. Solid Earth is an online journal that doesn't charge for color. I suggest using a dark color for managed and a light color for non-managed. This will show up well on a computer screen and will also work if someone prints out and then photocopies the paper in black and white (grayscale).

Figure 3 caption – Is this data for a golf course or for multiple golf courses? Please reword to make this more clear. Also, Table 3 says the n for the wells is 15, but adding up the n values in the Figure 3 caption gives 21. Why the difference?

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