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Hydrology and Earth System Sciences Discussions

Interactive comment on "Groundwater surface water interactions through streambeds and the role of phreatophytes in identifying important recharge zones" *by* T. S. Ahring and D. R. Steward

Anonymous Referee #2

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This interesting study compares phreatophyte distributions between 1965 and 2005 along two rivers in Kansas using aerial photography and automated classification techniques. The authors found that cottonwood especially prefers soils with higher permeability. With declining groundwater levels, the trees get closer to the losing streams in general, but in some areas they disappear, and the authors recommend these areas for potential artificial recharge.

The serious caveat of the study is the limited number of wells employed and the resulting groundwater elevation field. Further, it is not mentioned what readings of the wells

were used. If summer values are used, they are biased due to the potentially significant localized drawdowns due to irrigation. Rather, winter readings are much preferred. But truly, the number of wells, as shown in Fig. 1, has low well density per square km (way less than one, guessing from the number of dots). The authors subtract surface elevation from a 30m DEM and the krigged groundwater elevation values with a sampling distance of, maybe a mile (at best), on average. This subtraction may generate large errors. Is there any way to increase the number of wells within the valleys? Typically the river valleys have a much higher number of wells than other areas simply because irrigation tends to exploit the advantages of shallow water table.

Maybe this resolution issue results in finding that phreatophytes flourish in areas with a depth to groundwater more than 20 m! Even if the authors' approach is commendable, their results may remain largely qualitative in nature

There are several items of editorial nature that must be addressed in revision.

Pg. 7619, line 10 with the 1975 photographs needs clarification about color. Were these black and white photos, or in color?

Claim on pg. 7616, lines 9-10 "The rate of recharge to the Ogallala Aquifer is low..." is inaccurate. For example, the Sand Hills of Nebraska is a vital and large part of the Ogallala aquifer, with "high" rate of recharge. A recent study by Szilagyi et al. (2012) in J. Hydrogeology (DOI 10.1007/s10040-011-0769-3) shows a detailed map of estimated net recharge distribution in the Sand Hills, which is very significant in many places. Under any circumstances, term "small" needs clarification.

The title could be shortened by dropping the "through streambeds" and "important" terms.

Sentence "The distribution of root depth to water...." (pg. 7623, line 1) should be clarified. Groundwater?

One line below: "In almost every case, more trees rooted in deep water..." As opposed

to shallow water?

Pg. 7620, line 16: “Techniques similar to those used to map phreatophyte locations in the size study areas were used. . .”

The same page, line 27: “Light Ground”. As opposed to hard ground? And what is it after all?

Table included in Fig 5 (!): the caption talks about depth to groundwater while the Table presents “Mean groundwater elevation”. Table should be separated from the figure The negative values of the depth to groundwater are puzzling. After search, it turns out that the numbers are indeed depth to groundwater relative to channel bottom (or mean stage of the river, not clear).

There should be “that” instead of “than” on pg. 7614, line 14 and pg. 7624, line 16.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 7613, 2012.