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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Influence of groundwater on distribution of dwarf wedgemussels (*Alasmidonta heterodon*) in the upper reaches of the Delaware River, northeastern USA" *by* D. O. Rosenberry et al.

Anonymous Referee #2

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General comments: The paper reports an interesting study on the correlation between mussel occurrence and groundwater discharge in and to a large river.

The methods used to study and quantify the river-groundwater interactions are not new, but one of the main points in the paper is that it clearly demonstrates the need for applying several different methods to map and estimate seepage patterns and rates.

I am not entirely convinced about the general conclusions that there is compelling evidence that diffuse groundwater discharge is responsible for the occurrence of mussel habitats in the river. Or, the argumentation is not exactly clear. From my understand-

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ing it is exactly not the diffuse discharge but seeps or areas with focused groundwater discharge that sustain these mussel populations. The data is not always pointing to the same observation, so this needs more clarification and is why I recommend major revision, because the authors may not agree to this.

It was also interesting to see that simple manual temperature readings of the river bed actually provided a good mapping of the major inflow zones. We tend to use advanced methods like DTS or UVAs to do this, but keep it simple seems to work nicely – and maybe cheaper and more effective?

Specific comments: L133: The piezometers where groundwater samples were collected are not shown on Figure 2? L141: Suspended sediment. That suggests to me a very high discharge. Were they found at all three sites? L175: Are these places with suspended sediments? L310-318: You estimate a rather low K value (0.063 m/d), which I think represents silt more than sand. You call it different things; sandy sediments, silty sand, sand and fractured shallow sandstone, in this section. Maybe it is not so important what it is called, more so that this diffuse discharge is low? At least, here I am left with the impression that it is not the diffuse groundwater discharge that sustains DWM populations? L319-327: The same goes for site 3 with even lower discharge. Maybe the last sentence is important in this context and for the whole study. That it is not slow, diffuse groundwater discharge that is responsible for sustaining DWM populations, but, rather the preferential flow paths. L337-339: Unclear. L344-345: These "median" values are also the first and last entries in Table 1 – is that just a coincidence? L345: I find that there are other sites with "consistently" upward seepage, so does consistently mainly refer to "substantial", i.e., they show high fluxes and does not refer to "direction"? L367: Is it fair to say that this indicates a greater potential for seepage at N locations, which goes against your conclusion? L374: With my experience some of the fluxes are not just moderate, but also high. L382: How is this error bound explained? Maybe you should also put an error bound on the seepage meters? L413: An interesting observation. L423-425: I am not entirely convinced about this

conclusion. To me your data and observations collectively suggest that it is not the diffuse groundwater discharge (rather low), but known seeps and unknown preferential flow paths that are related to DWM occurrence. (1) Seeps, I agree. Your observations support this. (2) fluxes measured by seepage meters. I am not quite convinced as you measure positive/negative fluxes in all places and by the fact that they do not compare well with fluxes estimated from temperature profiling. (3) Hydraulic gradients. Maybe not the best measure as the flux will depend on Kv. And, Kv was higher at N sites? L434-435: Which brings me to this conclusion, which I am not sure I fully understand or agree with. On the one hand, you argue that DWM rely on "substantial" discharge, which I read as high fluxes; on the other hand, that DWM do not rely on focused (=high?) discharge. L441-442: Upward seepage .. is primarily the result of groundwater discharge. Is that not obvious, or are you referring to the possibility of hyporheic flow? L461-462: Exactly here you argue that a strong clustering of animals is related to the occurrence of springs, I can agree with this. L468-470: Why will the methods produce two different results because of a cobble-bed river? L471: Now you argue that hyporheic flow can dominate, see comments above? L490: Are you then saying that discharge cannot happen uniformly/diffusively, but must occur as springs, focused flows, through preferential flow paths?

Technical corrections: L153 and Figure 2: Should the figure legend say "hole" instead of monitoring well? L350: Maybe say larger instead of faster (like in the sentence just below)? L358: Maybe help the reader by saying "q estimated from seepage meters .." L379 and Figure 8: There are three red curves in the figure, but only one legend?

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