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Interactive comment on “Using high-resolution phosphorus data to investigate mitigation measures in headwater river catchments” by J. M. Campbell et al.

Anonymous Referee #2

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General comments

This paper by J. M. Campbell et al. addresses monitoring and understanding of the complex response processes of phosphorus release to streams as a consequence of changed management practices and changes in point sources, by use of high resolution phosphorus data. It is found that natural fluctuations in precipitation, antecedent wetness conditions and hydrology have a strong impact on the in-stream measured phosphorus loads, and play a significant role in terms of deducing changes in phosphorus loads inherent from changed management practices. Also, the paper illustrates the difference in responses to phosphorus loads that can occur between similar sized

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adjacent catchments. Hence, this paper addresses the very important issue of monitoring and deducing the effect of different mitigation measures which is highly relevant in relation to optimising mitigation measures. It is interesting that the study is dealing with long time series with a very high temporal resolution and addresses the difficulties of interpreting effects of mitigation measures, when dynamic changes in natural background P contributions are significant. The paper is expected to be of general interest for the readership of HESS.

Generally the manuscript is very well written with a fluent and precise language, only very few and minor mistakes were found. The abstract is concise and informative, and the paper is well structured and tables and figures are easily read. The authors could consider deleting the terms “wicked” and “filthy” as reference to diffuse and point sources, as the references are not adding to the general understanding or readability of the paper.

Specific comments

P. 10969, line 18. What is a reasonable period? Did you test for it or did you use a standard time interval? Please elaborate on this.

P. 10969, line 20. What depth is “root depth” in this study? And are all samples taken in the same depth? Please include in the text.

P. 10970, line 5-9. You mention the number of resamples, what was the reason for not resampling all (time? budget?), and have you thought of the potential impact this reduction of sample size could have on the results, despite the statistical analysis of the number of re-samples?

P. 10970, line 25. You use 20 min cycles, is that due to instruments settings, or have you tried different temporal resolutions to come up with 20 min cycles as the optimum? A reference to previous work could be in place here.

P. 10971. The nutrient management plans that you mention (for instance line 27), could

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you elaborate a bit on that. It is not clear what these management plans include, and how they are different from before the monitoring was initiated.

P. 10972, line 10 and line 18-25: You confuse the statistical term "percentile" with the percentages that are given by a Q-flow duration curve. For instance, you state that you use the percentiles to group your discharge data; however that is not consistent with the naming Q90, Q80 etc. For instance, you consistently refer to Q95 as representing the extreme low values and Q10 as representing the 10% highest values (line 22), hence the Q95 and Q10 do not represent 95th and 10th percentiles, respectively, as you state. A percentile is a value below which a certain percentage of observations fall, so the 95th percentile represents the value below which 95% of observations fall. This confusion is also seen in fig. 6, where you present of flow duration curve which is not the same as showing percentiles. You will have to change this throughout the manuscript, including fig. 6 and table 5, so that the term percentile is correctly used.

P. 10972, line 27. You write "climate signal" somewhat out of context, I suppose you refer to fluctuations in the annual river discharge as being a climate signal and "this metric" refers to the river discharge, or? Please elaborate/change sentence.

P. 10976, line 15. There is no Table 6 included in the manuscript?

P. 10976, line 26. You write that results also indicate a convergence towards optimum soil P status, this is not immediately obvious from the figures/tables, where the units are either mg L⁻¹ or kg ha⁻¹. Is convergence just in Co. Tyrone, or is it in both catchments? and is it seen on all fields? Could you exemplify with some numbers? Please elaborate on this in the text as well.

P. 10977, line 17- 20. This sentence is not really clear; what was more indicative? Are you referring back to the reductions made? Please rephrase sentence.

P. 10977, line 17-24. You mention the possibility that natural diffuse sources of P could have offset the effect of soil management changes. Did you see any indications of

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an increase in for instance extreme high events that could facilitate bank erosion? I suppose the contribution from bank erosion should have increased in this period, if it were to offset the changes in management? Please elaborate on this.

Technical corrections

P. 10973, line 23: The text says $n=66$ for index 3 and above, table 16 says 59. Which one is the right one?

P. 100973, line 13: The text says $n=85$ for index 1 and 2, the table says 78, which is right?

P. 10977, line 28: “improvement” should be plural.

P. 10978, line 17: delete “the” after “TP”.

Fig. 6. The figure does not show percentiles, it is a flow duration curve, please correct that in the title.

Table 5. If you want to show the statistical percentiles, you should correct (i.e. the last column shows the 90-95th percentiles), otherwise delete “percentile” and explain in the text what the percentages represent. Could you please include the unit (mg P L⁻¹, I assume).

Table 6. Is not found in the manuscript?

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