

Dear Dr. Julian

Below, I listed some comments that might be relevant for the interactive discussion of this manuscript.

General comment:

Novelty of the results: It is difficult to identify what is novel with this manuscript as compared to other published studies on water quality trends in New Zealand rivers (and in general). In the Introduction for example, the reader cannot find clear statements about findings from the NZ monitoring activities and the open question that need to be addressed (e.g., L. 79 – 82: what are the reported trends, what are open questions?). In which sense does this manuscript add to previously published work? At the same time, there is a lack of international context that illustrates which scientific questions should be tackled and how this study contributes to generating new insight.

Specific comments:

L. 20: The term “disturbance” is not clear for a reader at that stage of reading. Only when going through all your later explanations it gets obvious what is meant by this term.

L. 34 – 37: This conclusion is not really based on results in this manuscript but refers to an interdisciplinary approach that is quite common in studies on land use and water quality.

L. 40: This statement does hold in its generality – many important human activities (e.g., arts, science etc.) are not reflected in water quality.

L. 55 – 64: These sentences evoke the impression that mitigation has only focused on point-source pollution and that causal understanding about diffuse pollution is lacking. However, abating diffuse pollution has been pursued in many countries for several decades and many essentials are known about the drivers of diffuse pollution. Corresponding monitoring activities have been implemented and yield insight about success and short-comings of such programs (see (Kronvang *et al.* 2008) as just one arbitrary example). Your wording should better reflect the international state-of-the-art.

L. 65 – 67: I think this statement does not hold true (see comment above).

L. 73 – 74; 87 – 88; 124 - 125: I doubt whether these statement hold true: There are many countries that have well-designed monitoring programs that run for several decades already. Some of them may also have more advanced sampling strategies than what you describe in this manuscript. In Switzerland for example, the national monitoring program starting in the 1970s for some parameters provides decade-long time-series of flow-proportional samples at weekly or bi-weekly resolution instead of monthly grab samples (Zobrist & Reichert 2006; Zobrist 2010). In the UK, some time-series date back in time over 100 yrs and make clear links between water quality and land use (Howden *et al.* 2011). Your statements should better reflect what others have been doing for quite some time.

L. 161: P retention: please provide a reference for this method.

L. 223 – 228: Do you have ground truth data?

Table 1: Give the temporal resolution of the data sets.

Table 8: For judging the quality of the regressions one should see scatter plots of the actual data.

Fig. 4: The plots reveal pronounced heteroscedasticity. How did you deal with this issue?

Sincerely

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References:

- Howden, N.J.K., Burt, T.P., Worrall, F., Whelan, M.J. & Bierzoza, M. (2011) Nitrate concentrations and fluxes in the River Thames over 140 years (1868–2008): are increases irreversible? *Hydrological Processes*, **24**, 2657-2662.
- Kronvang, B., Andersen, H.E., Børgesen, C., Dalgaard, T., Larsen, S.E., Bøgestrand, J. & Blicher-Mathiasen, G. (2008) Effects of policy measures implemented in Denmark on nitrogen pollution of the aquatic environment. *Environmental Science & Policy*, **11**, 144 - 152.
- Zobrist, J. (2010) Water Chemistry of Swiss Alpine Rivers. *Alpine waters* (ed. U. Bindi), pp. 95 - 118. Springer.
- Zobrist, J. & Reichert, P. (2006) Bayesian estimation of export coefficients from diffuse and point sources in Swiss watersheds. *Journal of Hydrology*, **329**, 207–223;
<http://dx.doi.org/210.1016/j.jhydrol.2006.1002.1014>.