

Interactive comment on “Relationships between environmental governance and water quality in growing metropolitan areas: a synthetic view through the coupled natural and human system lens” by H. Chang et al.

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First, on a more minor point, there are way too many questions that the paper introduces early on. I understand that these are the overarching framing questions of the project on the whole, but consider that they should be treated much more summarily since they are not the major concerns of this piece. ==> Author responses: We will remove these overarching questions in a revised version.

Second, and more consequentially, I am not convinced by the use of temperature as a
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proxy for water quality. Presumably there is other data available (even from government sources) that would give us a more complete sense of changing water quality. Could this be used to provide a more nuanced and complex picture? I would suggest to the editor at least that this specific question be put to a hydrologist or similar expert in the context of this review (in terms of what data might be available and whether it might be mobilized to provide a stronger picture of change in these two stream systems). As well, I wonder about not using a broader data set, including other non-governmental data. There could be a concern about quality of that data, but it would also be worthwhile to run some analyses to see what different picture one might get either by including more indicators (e.g. suspended sediments, or others that might be more meaningful for water quality impacts of urbanization processes or for understanding impacts of riparian buffers), or including other types of data that might be collected at more regular intervals.

==> Author responses: Thank you for the careful insight. We used stream temperature because it is one of the most important indicators of stream health as reported in the literature. See Allen, J. D. 1995. Stream ecology: Structure and function of running waters. Chapman & Hall, New York, 388 pp.

This aspect was recently summarized by one of the manuscript authors in Yeakley JA 2014 Water Quality in Pacific Northwest Urban and Urbanizing Aquatic Ecosystems, in Yeakley et al. (eds). Wild Salmonids in the Urbanizing Pacific Northwest, Springer, New York, pp 101-121.

For example, our policy interview with a wildlife biologist from Metro identified stream temperature as the best indicator for summarizing science for policy makers. Additionally, stream temperature has been collected most frequently during our study period. While we do have some data on other water quality parameters, such as DO, nutrients and TSS for more limited periods, at present we do not feel our coverage for these other parameters is sufficiently extensive or on our par with the temperature data we have been able to assess for the entire study period. Regarding using non-governmental

data collected by various NGOs and student monitoring groups, we are hesitant to use such data. These collection sources are not necessarily verified, and we currently do not have complete access to these data. Singling out a small subset of such non-governmental data and making inferences might lead our conclusions astray.

Third, the other element I am puzzled by is the effort to connect these data to property values. It is the case that property values post-CWA were rising considerably in many markets across North America. The authors do not discuss how the general trend of rising home prices was accounted for in the analysis. As well, some of the results are peculiar—why would certain quality parameters (note that here in this analysis more parameters are included) be significant only at more than a mile from the water source? These results are discussed much too summarily and need to be analyzed and discussed more fully. As well, the very effort to link home prices needs to be theorized more fully. The authors simply say that other studies have linked water quality to home values. But how does this connect to the SES-governance linkage that is the main focus of the research effort? I think a bit more justification about why this is a particular focus of this paper is needed.

==> Author responses: The hedonic analysis focuses on one snapshot period (2005-2007) so we were able to use more water quality parameters. Notice also that we conceptualize the relationship between property values and water governance as indirect. That is to say, policy makers are potentially going to respond to property values, not to water quality itself. So the hypothesized SES-Governance linkage the reviewer is asking for is two-steps, not one. We only explored the water quality impacts on property values but not the property values impact on governance. In this context, the policy interviews (or regulatory law or any other governance factors) cannot give us any a priori clues as to which indicators are the most important for property values. So we use a different methodology to explore the significance of multiple indicators.

Regarding the general trend of rising property values during the time period of the hedonic analysis—the modeling specification, which is fully detailed in a separate

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paper (Netusil et al. 2013) includes dummy variables to capture the month and year of property sales. This separate paper is currently under review at another journal. The revised paper could direct readers to this separate paper for more details about the modeling specification and results.

The lack of significance for some water quality parameters may be due to multicollinearity. This point could be incorporated into a revised paper.

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