Response to reviewer comments "Four decades of water quality change in the upper San Francisco Estuary" Beck MW, Jabusch, TW, Trowbridge PR, Senn DB.

We thank the editor and reviewer for providing helpful comments on our manuscript. Responses to these comments are shown in italics.

Editor's comments:

Thank you for submitting your manuscript to Estuarine, Coastal and Shelf Science. We have completed the review of your manuscript. One reviewers recommended rejection, while the other was more lenient. If you can address the comments of Reviewer 1 adequately I will consider the MS for another round of reviews by the same reviewers. A summary is appended below. Particularly, the paper is not suitable for publication because ".....in its present form unless there is a substantial revision to better explain/identify how this research advances our knowledge on nutrient / phytoplankton dynamics in estuarine ecosystems". While revising the paper please consider the reviewers' comments carefully. We look forward to receiving your detailed response and your revised manuscript.

We appreciate the concern of reviewer 1 regarding significance of this work beyond the study system. Our revision addresses this primary concern by making the novel contributions of this work beyond San Francisco estuary more clear. We have also addressed the minor comments from both reviewers, including requested revisions to the figures.

Reviewer 1:

The authors conducted a detailed data/trend analysis of nutrient variability in the upper San Francisco Estuary (SFE) based on observations collected during the last four decades. Overall, this is a very nicely written, organized and presented manuscript and I don't have major comments related to the content or analysis presented in the manuscript. However, I am very concerned that the paper seems to be a study of only local significance as it is difficult to identify new methodologies or findings of widespread impact. The method implemented for the trend analyses, namely WRTDS, has been previously used in other investigations to describe decadal trends in rivers and tidal systems (see references in MS-Lines 92-96). So, unfortunately, it doesn't seems that the implementation of WRTDS for the SFE can be considered as a novel approach. The conclusions and analyses presented from the use of WRTDS seem to be supported by the data (e.g. DIN changes at P8 following the implementation of the WWTP), but again, it is difficult to identify new causal relationships or new information that can be used to better understand nutrient dynamics in other systems around the world.

We greatly appreciate these comments and we have revised our paper to address these concerns. In particular, the application of WRTDS to tidal systems is indeed a novel application that has only been reported in two publications (Beck and Hagy 2016, Beck and Murphy 2017). Our application of WRTDS to the San Francisco Delta presented new challenges and novel insights. We have revised the text to make these more clear:

Because of the limitations identified above, and having in mind that the journal discourages the submission of research of mainly local significance, I believe the paper should be declined in its present form unless there is a substantial revision to better explain/identify how this research advances our knowledge on nutrient / phytoplankton dynamics in estuarine ecosystems.

We have also included text in the discussion that articulates importance of this work for advancing the science of nutrient/phytoplankton dynamics at other locations:

Minor comments

Check figure 1. Seems disorganized. Map of California in wrong place and not at scale.

Figure 1 was simplified and the California map was given its own inset.

Line 270 - 271. The figures don't seem to support this statement. If the colors are correct, then I see NH4 as the predominant form of Nitrogen in most stations.

We have changed the color scheme to make this distinction more clear. This was also noted by reviewer 2. The dominance of nitrite/nitrate (grey) relative to ammonium (dark blue) is now apparent.

Reviewer 2:

This is a very well written article on an important subject. It makes a significant contribution to the literature with regard to analysis of nutrient loading to an estuary. This is a very well studied estuary already, and the results of the study are not at all unexpected, but it is an excellent application of new analysis methodology for estuaries subject to temporal, seasonal, and hydrologically influenced changes. There is not much that I could find in the way of suggested improvements. I would recommend it for publication with minor revisions as follows.

p. 7, line 130 Seasonally, inflow from the watershed ...

This a long sentence with three clauses that don't quite follow from one to the next, in my opinion. I think the manuscript would read better by splitting the sentence into two.

Changed to "Seasonally, inflows from the watershed peak in the spring and early summer from snowmelt. Long-term trends have shown that consumption, withdrawals, and export have steadily increased from 1960 to present, although climate effects have contributed to inter-annual variability (Cloern and Jassby 2012)."

p. 10, line 186 - I think readers would appreciate another sentence or two on how the weighting within the time window is accomplished. I assume it is with some sort of exponentially decaying time function, but there isn't any description provided. A short

explanation is all that's needed.

Details were added: "Weights within each window are estimated using a tri-cube weighting function, which is similar to a bell curve except the tail ends do not asymptote at zero (Hirsch et al. 2010). This ensures that observations outside of the window are given zero weight, as compared to an infinitely small value. The final vector of weights used for each regression is the product of the three separate weight vectors for time, season, and flow."

p.10, line 195 - This is a follow-up to the previous comment. Adding a mention of the time constant in the description of the method will help setup the presentation of the times used for averaging. I think you should add some information here on how these time windows were chosen.

An additional sentence was added to the previous paragraph to describe how time and season values are evaluated: "Annual values are described using decimal time as a continuous numeric value (e.g., July 1st, 2017 is 2017.5) and season is described as a numeric value for day of year.".

The text on line 195 was also modified for clarity: " Model predictions were evaluated as monthly values that were the same as the day of sampling in the observed data and as annual values that averaged monthly predictions within each water year (October to September)."

Figure 2. More contrast in colors (perhaps blue and gray) would make it easier to distinguish ammonia and nitrate in the time history. As is, it is somewhat difficult to see

Figure was modified, also in responese to reviewer 1.

p.18, line In the text, I believe in the introduction, you mention one invading asian clam (potamocorbula), but the second clam genera (corbicula) isn't mentioned until the results and in figure and figure caption. Is corbicula a native clam that was displaced? It is not clear from the text what we are to make of the decrease in abundance of corbicula. A few explanatory sentences in the introduction and/or the results sections are needed.

Both are non-native invaders with different competitive advantages. This was clarified in the text: "Invasion in the 1980s showed a clear increase of P. amurenusis at D7 that coincided with a reduction in abundance of the non-native and previously established Asian Clam (Corbicula fluminea) (Fig. 7a)."