

Responses to comments are given below, with comments italicized and responses in plain text.

*General Comments:*

*This paper is well-written analysis of a 22-year citizen science water quality monitoring program in Buzzards Bay. By using principal component analysis and factor analysis, the authors present evidence of climate change (increasing summer temperatures), the dependence of water quality on geomorphology (riverine-fed systems decreased water quality), and ecosystem shifts (Chl response to nutrient loading increased). The paper is innovative in that the citizen science program provided consistent data over 22 years to find significant trends and shed some light on long-term drivers of water quality. This paper presents data and findings that are potentially useful to coastal managers in terms of offering recommendations about nutrient reductions as well as longer term impacts of climate change on these systems. As such, the paper is topical, timely, and of sufficient quality to be accepted with minor (very minor) revisions.*

We thank reviewer #2 for their kind comments regarding our analysis.

*Specific Comments:*

*It is very difficult to determine if a symbol is a triangle or a circle in Fig 1. Coastline is too faint. #s of estuaries and lat/lon is hard to read. The figure can be improved with changes in font and symbol.*

We thank the reviewer for pointing out these issues. We will update the figure to include larger and bold font for the embayment numbers, increase the size of the font on the axes, and increase the line width of the coastline. We will also improve the quality of the figure by increasing the dpi and changing the file format.

*Figure 5: The caption states that color and symbols indicate trend and direction? This is confusing for this first figure of this type (Figure 5) in that there is no negative slopes in the figure. I would suggest removing “and direction” from the Figure 5 caption. The captions are fine for Figures 6-8 as written.*

We will remove “and direction” from the Figure 5 caption.

*–Can you please clarify why a river-fed embayment is defined as having a standard deviation of >5 salinity units? Can some rivers have fairly constant flow so that salinities do not vary that much? Could tidal ranges lead to characterizing a site as river-fed? In general higher salinity sites have lower SD so are groundwater-fed systems simply farther downstream from freshwater sites? This definition has implications for water quality so the definition deserves further description/definition.*

We used the variability of embayment mean salinity across many sampling locations within each estuary as an indication of geomorphology and freshwater input. Embayments with high standard deviations in salinity contained a classical estuarine gradient with riverine input, while embayments with low standard deviations were more lagoonal in structure with largely similar salinity across sampling locations, and thus low surface water inputs. However, this method may also be biased by sampling location if no sampling sites were contained in fresh or brackish water areas. In response to this comment, we propose to redefine embayments as river vs. groundwater fed based on surface water inflows to the embayments. This new definition does not change the embayments designated as groundwater-fed or river-fed. We propose to update the text such that:

“Embayments were classified as “river-fed” (Fig. 1, triangles) if they had large surface water inputs, and “groundwater-fed” (Fig. 1, circles) if they lacked large riverine inputs. Embayments classified as

“river-fed” tended to have higher variability in mean salinity across the embayment, consistent with sampling across a classical estuarine gradient.”

*–Could the citizen volunteers be thanked by name in the Supplement (or a few key volunteers selected by # of samples or # of years) or Acknowledgements?*

While we would love to thank the volunteers by name, there have been more than 1074 volunteers over the history of this program, and we believe thanking this many people would be an inefficient use of space. We will, however, add to the Acknowledgements the specific number of volunteers who have participated in the program.

*–Introduction Line 23-29: These conclusions are described in the Abstract and Conclusions, but do not really belong in the Introduction.*

We thank the reviewer for pointing out this issue. We propose to move this text to the conclusion section as a summary of our findings.

*Technical Corrections –Abstract, line 10: “...little correlation between inorganic nutrients, organic matter, and chlorophyll a ...”*

We thank the reviewer for pointing out this confusing sentence. We believe this clause should read: “little correlation between inorganic nutrients and organic matter or chlorophyll a”.

*–While I can find the definitions of POC and PON, I do not see the definitions of DIN and TN*

We will add definitions to the text of DIN and TN also as a response to Reviewer #1. Regarding this point, our response to Reviewer #1 reads:

We will add a definition of TN and DIN to the manuscript where TN is the sum of all nitrogen species ( $\text{NO}_3^- + \text{NO}_2^- + \text{NH}_4^+ + \text{DON} + \text{PON}$ ), while DIN is the sum of the inorganic nitrogen species ( $\text{NO}_3^- + \text{NO}_2^- + \text{NH}_4^+$ ). We will also clarify our references to nitrogen in general as “nitrogen”, rather than “N”.