

We thank the Dr. Costello his kind comments regarding our analysis. Responses to comments are given below, with comments italicized and responses in plain text.

This paper has brought forward data from an important long-term citizen effort to document specific water quality parameters in Buzzards Bay. The paper should be published subject to the author's satisfactory revisions as recommended in the review process.

The paper innovatively characterizes the several different, but complementary physical inputs to the Buzzards Bay over a long period of summer season monitoring. The paper effectively states the need for continued monitoring to further differentiate the causes and extent of the different stressors to the Buzzards Bay ecosystem.

Specific Comments

1. The monitoring effort described in the paper should be continued and extended over a longer window in the calendar year.

We agree with Dr. Costello regarding this comment as changing in phenology of phytoplankton blooms may be aliasing our results. For example, if blooms occurred regularly during September of each year are now occurring in August, they would be captured in our data, and could perhaps be interpreted as a worsening of water quality. As such, in partnership with the Buzzards Bay Coalition, we have begun to expand their sampling to June and September to capture some of the seasonal variability in water quality.

2. Other parameters such as the measurement of light attenuation should be included in the monitoring protocols.

Secchi depth is monitored through the citizen-science program; however, we did not include these data in our analysis as most commonly samples are collected during low tide, at shallow sites. As such, most sites do not record a Secchi depth as frequently the sediment surface is visible. We propose to add the following text to clarify this:

“Secchi depth data were not analyzed because a large number of measurements of Secchi depth came from shallow sites at low tide where the sediment surface was visible and thus Secchi depth did not characterize water clarity.”

3. The climatic factors (temperature and precipitation) described in the paper are important elements in the analysis of the reasons for the continued degradation of the Buzzards Bay coastal systems, but climate change-related conditions shouldn't interfere (or delay) efforts to reduce the unsustainable inputs of N into the system.

We agree with Dr. Costello on this point as well. The purpose of this work is not to suggest that efforts to reduce nitrogen inputs should be stopped because climate change may be impacting water quality in Buzzards Bay, but rather to acknowledge that there are other factors involved in addition to nutrient loading that may be exacerbating the eutrophication problem.

4. Unlike Buzzards Bay's neighboring regional system, Cape Cod, there is still time and much undeveloped open space in the Buzzard's Bay Watershed to implement future sustainable development policies and remediation efforts. Wise policy action using the data and concepts introduced in this paper and future monitoring efforts will be needed to prevent further water quality degradation and loss of natural systems.

We agree with the reviewer on this point as well.

List of specific comments

1. *In many places in the paper the term “normalized” was used. I was confused with what that meant and how it might effect the data.*

The term normalized refers to the factor scores reported. To fit on comparable axes as the factor loadings, factor scores have been scaled by the largest factor loading. This does not alter the interpretation of the factor scores; rather, it only rescales the values such that the scores fall between -1 and 1. We propose to add the following text to the data analysis section to clarify this point:

“Reported factor scores have been normalized by the largest factor loading to scale from -1 to 1.”

The initial plots for Figs 3 and 4 contained factor loadings and scores that were rescaled such that the largest value of the first factor was given a positive value. While this does not impact our interpretation of the data, we thought this may have caused some confusion as the factor loadings reported in Table 2 were the raw loadings, and the plot (Fig. 3) showed the loadings with the altered signs. We propose to update the plots to contain the actual factor loadings rather than the rescaled factor loadings for clarity.

2. *There didn't seem to be a definition of TN in the paper and I found the analysis referencing TN and N to be confusing.*

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”.

3. *Little mention of light availability was present in the analysis. Light is an important component for life in and under the water column and should be considered as an important element of future monitoring efforts.*

We agree that light availability is a critical factor in determining ecosystem responses to reduced water quality (e.g., eelgrass loss, etc.). Although we do not have reliable direct measurements (see above response to Secchi depth), we propose to add the additional text below to the discussion to reflect potential changes in light attenuation as a result of increased chlorophyll.

“Higher Chla concentration in most embayments implies increasing water column light attenuation and decreasing in light reaching the benthos that can have strong impacts on ecosystem functioning. Loss of eelgrass is common when less than 20% of incident light reaches the sediment surface (e.g., Dennison et al. 1993). Although we do not have direct measurements of light attenuation, the widespread rate of increase in Chla ($4\% \text{ yr}^{-1}$) across Buzzards Bay was consistent with declines in bay-wide eelgrass extent (loss of $3.5\% \text{ yr}^{-1}$, Costello and Kenworthy 2011).”

4. *In the Conclusion of the paper I found the statement that a “five-fold reduction in nitrogen load might be required to mitigate the effects of nitrogen enrichment in some embayments” confusing and in need of explanation.*

We agree that this statement was confusing. We will remove this statement from the text.