Review of “Assessment of the cumulative effects of restoration activities on water quality in Tampa Bay, Florida” … Beck et al.

This manuscript develops an ambitious statistical approach to address the long-standing problem that the water quality benefits associated with environmental restoration projects are difficult to establish and quantify, as is the time-frame required for responses to be observable. Both efficacy and time-frame for effects are often raised during the process of evaluating potential projects. If effective, an approach such as is developed here could be very important.

To be most effective, the text would benefit from editing for clarity and conciseness. In the latter case, I provided numerous suggestions on more concise language that could be incorporated even without major rewriting. Sometimes a thought is stated one way, and then another way, when a single clear statement would be preferred.

With respect to clarity, this is greater challenge because the analysis itself is complex. Improved clarity will be needed to sustain a connection with readers who want to fully understand what’s been done and not just seek the “upshot.” I noted some places where greater clarity is needed, but more substantial reworking is recommended in some places.

The paper has one potential Achilles’ heel, which the authors allude to. The issue is that we know chlorophyll-a is decreasing over time and that the number of restoration projects is increasing over time. The story that has long been told is that point source reductions early in the recovery set nutrient loading, chlorophyll-a and water clarity where it needed to be for seagrass, and other projects over time have been to “hold the line” and maintain the recovery trajectory that was already happening.

The challenge then, is to show that water quality in close spatial and temporal proximity to restoration projects improved MORE than water quality not so situated in time and space. As I read it, the authors fretted that the overall downward trend in Chlorophyll-a could contribute to the tendency for before/after differences to be negative, but they did not tackle the challenge head on.

My thought was this: What if you RANDOMLY selected dates and water quality stations and evaluated the change in chlorophyll-a during windows (of different sizes) before and after the random date. This would provide a baseline associated with the long term trend. Then, if you applied your approach to link water quality stations and restoration actions in space and time and evaluated if before/after comparisons tied to restoration actions differed from the random distribution. If they are the same, then it is not possible to resolve local time/space water quality benefits of restoration, even if they may be contributing to the overall trend or even contributing to the lack of trend when otherwise there might have been an upward trend in chlorophyll-a (because population increased a lot, as Holly would and has pointed out). On the other hand, if the before/after differences are more pronounced than in the random draw, then local benefits are demonstrated. I believe that what you’re trying to demonstrate is that near restoration projects, the date of project completion is some sort of inflection point in the broader water quality trend, wherein the trend was further improved by the project.

Another thought I had is that perhaps your approach has somehow already done this or something equivalent and I’ve failed to grasp it. If so, then your challenge is to improve the description of what you did so that an understanding of the work is easier to come by.

This work certainly has an important and worthwhile objective. As I would expect, the authors have taken this task on with vigor and admirable quantitative skill. What’s needed now is to “close the sale” for the reader. I think that can be done.

Toward the end I slowed the pace of comments, mainly because I was beginning to formulate a larger-picture response to the paper, and depending on how you respond to that, comments in later parts of the paper might be less useful.