

Scientific Advisory Board Comments to the US EPA- a Review

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The following is a brief review of the comments from the Scientific Advisory Board (SAB), which was charged with providing guidance to the US EPA on the development of numeric nutrient criteria for Florida's estuaries.

In essence, the SAB had many conclusions that have been also reached by the Florida Department of Environmental Protection's (FDEP) Marine Technical Advisory Committee (MTAC). These points of agreement are important, as they indicate a consensus of opinion, supported by years of rigorous scientific research, which suggests a change in direction of the US EPA's efforts is needed. Among these conclusions are the following:

1. Nutrient loads, rather than concentrations within the water column, are more often the appropriate metric of potential environmental impacts.
2. Focusing on nutrient concentrations of receiving waters can result in missing the main mechanisms of impact for those systems where degradation is manifested through macroalgae and/or epiphytic algae.
3. The conclusion that nutrient concentration criteria are "necessary" for the development of estuarine management and/or restoration programs is contraindicated by the fact that nutrient loads, not concentrations in the receiving water body, are the more common metric used in estuarine management programs in Florida and elsewhere.

In support of finding number one, it is worth emphasizing that in Tampa Bay (Johansson 1991 and many others), Sarasota Bay (Tomasko et al. 1996), Lemon Bay (Tomasko et al. 2001), Charlotte Harbor (Turner et al. 2006) and the Indian River Lagoon (Steward and Green 2007) nutrient loads, *not nutrient concentrations in the estuaries themselves*, were the metrics used to develop pollutant load reduction strategies. The SAB's examples, while appropriate, could be further enhanced as to their impact by the addition of these Florida-specific examples of the importance of this finding.

Related to finding number two, the SAB's finding on this topic could be further enhanced by the inclusion of additional examples from Florida where factors other than phytoplankton (which alone among potential stressors is quantified by concentration criteria) can adversely impact estuaries. Example of impacts to Florida's estuarine ecology via epiphytes and/or macroalgae have been documented in Tampa Bay (Jensen and Gibson 1986, Johansson 1991, Avery 1997, Dixon 2000), Sarasota Bay (Dixon 1995) the Indian River Lagoon (Virnstein and Carbonara

1985) and the Florida Keys (Tomasko and Lapointe 1991, Lapointe et al. 1994). These studies are consistent with a larger body of work on this topic, including studies in New England (Valiela et al. 1992 and 1997, Hauxwell et al. 2001), California (Huntington 2007), Hawaii (Smith et al. 1981, Texas (Dunton 1990), Denmark (Borum 1985), Mexico (Flores Verdugo et al. 1988) and Australia (Silberstein et al. 1986, Neverauskas 1987). Since macroalgae and epiphytic algae remove nutrients from the water column, their nutrient-stimulated impacts would not be adequately quantified through the use of nutrient concentration criteria alone.

Finding number three, that nutrient concentration criteria within the receiving water bodies are not “needed” for estuarine management purposes is emphatically illustrated through the following: of the four US EPA-sponsored National Estuary Programs in the State of Florida (Charlotte Harbor, the Indian River Lagoon, Sarasota Bay and Tampa Bay) none of them included nutrient concentration criteria as a metric in their respective Comprehensive Conservation and Management Plans (CCMPs). Since these National Estuary Programs were originally developed by the US EPA as effective resource management tools, and since staff from the US EPA were active members of the Policy Committees of all four NEPs, and were signatories to the CCMPs for all four NEPs, there is an obvious disconnect between those staff at the US EPA that have concluded that numeric nutrient criteria are needed for managing estuaries and those staff at the US EPA who have reviewed and approved the management plans for Charlotte Harbor, the Indian River Lagoon, Sarasota Bay and Tampa Bay.

With these findings in mind, there is a basis for concern as to the potential direction that the US EPA seems to be considering for the development of nutrient concentration criteria for Florida’s estuaries. It would appear that the US EPA is considering the use of linked pollutant loading models and water quality models for such purposes. However, it is highly likely that the US EPA and its contractors are likely to commit at least as many mistakes in the development of such tools as that which have been already made by researchers in Florida. With a much more local knowledge, and with a much more relaxed timeline, numerous mistakes have been made in these systems, and it is highly likely that the US EPA and its contractors will make even more mistakes given their unrealistic deadline and workload requirements. A few examples of mistakes made in the development of nutrient loading models include:

- The original algorithms used to estimate the nitrogen load contributions of septic tanks in Sarasota Bay’s watershed (Heyl 1992) were incorrect, and they dramatically overstated their importance to the bay.
- The original stormwater runoff loads estimated for Lemon Bay (Tomasko et al. 2001) were incorrect, and overstated the loads from those sources. And,
- The original 2005 phosphorus load estimate to eastern Florida Bay from the C-111 canal associated with the passage of Hurricane Katrina was later upgraded by a factor of three, upon further analysis (D. Rudnick, personal communication).

Other examples can be found, but it is clear that even with years of experience, with detailed local knowledge, and with a less compressed timeline for undertaking such tasks, significant mistakes can be made when developing nutrient loading models. It is highly likely that the US EPA and its consultants, with less detailed local knowledge, with fewer years of local experience, and with a much more compressed schedule, will make even more mistakes.

The apparent reliance of the US EPA on the use of mechanistic water quality models for the development of numeric nutrient criteria is extremely troubling. While mechanistic models have been used as exploratory tools in Florida, empirically-derived relationships (rather than mechanistic water quality models) have been the basis for the nutrient reduction goals that have already been developed for Charlotte Harbor, the Indian River Lagoon, Sarasota Bay and Tampa Bay. Should the US EPA not use existing pollutant loading models, existing management paradigms and existing results from *already completed efforts* in these and other estuaries, it would seem to be a serious miscalculation of the value of existing expertise.

It would be worth having the US EPA or its consultants list the specific rate coefficients and algorithms that would be contained in their chosen water quality models (i.e., WASP, CE-QUAL-ICM, etc.). It is likely that not even ten percent of the rate coefficient terms in these models would have ever been measured in any of the estuaries they would be applied to. It is important to note that the “calibration” of water quality models almost always involves the modification of rate coefficients that have not been measured for the water body being modeled; calibration typically means the modification of model coefficients until the disparity between modeled and actual data is reduced, regardless of whether or not data exists on the process rates being modified.

Therefore, it is my conclusion that the SAB is on solid ground when they concluded that the task that the US EPA has set for itself is not likely to be successful. Further, the development by the US EPA of an additional set of resource management guidelines, on top of those already developed by existing estuarine management entities, would result in a sense of confusion and/or unease between management entities and the local governments they have worked long and hard to develop collaborative relationships with.

In summary, the State of Florida has more examples of successful estuarine management than any other state in the country. It is well-documented that Tampa Bay and Sarasota Bay have more seagrass acreage at present than in the 1980s, while seagrass coverage in Lemon Bay and Charlotte Harbor shows no evidence of monotonic declines over the past twenty to thirty years (i.e., Tomasko et al. 2005 and references within). Much of the Indian River Lagoon has similar or more extensive seagrass coverage than in past decades (i.e., Magley 2010). In the light of such recent successes, it is not entirely clear what value, if any, would be added through the development of additional, more problematic criteria via the US EPA’s planned efforts, unless such efforts are more thoroughly integrated with the State of Florida’s resource managers.

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