Determining the Health of the Estuary

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“Is the estuary healthy?” is a common question asked of estuarine researchers and managers. Answering this question is important for environmental decision-making. Citizens of the Bay Area have a right to a comprehensible assessment of whether we are doing enough of the right things to protect the Estuary for future generations. We require an assessment of health, or integrity to use the words from the Clean Water Act, to track the cumulative impacts of our actions and the status of the ecosystem.

Health is not an objective characteristic of the Estuary that can be measured, but is a subjective assessment that we make by considering measurements of important attributes of the ecosystem. We can simplify the problem a little if we inquire about the relative condition of the ecosystem over time. Is the condition of the system improving, or is it deteriorating? And thus we arrive at the other frequently asked question, "Are things getting better or worse?"

It is important to recognize that in tracking ecological condition we are examining the state of the ecosystem. Determining whether things are getting better or worse doesn't tell you why something is happening, or suggest what might be done to alter the trends. This means that measuring ecological condition must occur in conjunction with other monitoring and research that help us understand ecological processes and interactions that act to change the condition of the system.

The challenge before us is to use our existing statements of goals for the ecosystem, along with our present conceptual models of ecosystem function, to identify essential ecosystem attributes that are publicly meaningful and scientifically justified. We then must track the status of these attributes, or indicators of them, over time to build a record of ecological condition for the estuary.

What I am suggesting here is not really news. In fact, work reported in the last State of the Estuary proceedings identified 9 ecosystem attributes and a set of 13 ecological indicators for the Bay/Delta and it's watershed. Moreover, we have much raw material to work with, from both a policy and a scientific perspective, through our adopted public goal statements and the results scientific research and monitoring.

Yet we still need to integrate this raw material into an assessment of ecological condition. Let me suggest some strategic considerations if we are to accomplish this task. First, there are many opportunities to learn from what others are doing, as we are not alone in this effort. Across the nation those responsible for the health or integrity of aquatic ecosystems are trying to establish meaningful ecosystem goals, and find consensus metrics to evaluate progress. The National Academy of Sciences and the Science Advisory Board of EPA have provided or will soon be providing guidance on approaching this problem.

Second, we must recognize that developing a meaningful assessment of the ecological condition is a long-term proposition that may require specialized institutions. We need to consider all alternative institutional structures to identify one particularly well-suited to this task. If we are going to understand and track cycles in our ecosystems on the scale of decades, this task should be assigned to institutions with a long-term mission and long-term funding mechanisms.

Third, we must recognize that developing a meaningful assessment of ecological condition is a job that is over and above the collection, documentation, and publication of data sets. This job that requires its own dedicated resources, and it will require the time and attention of senior scholars and other respected members of our community.

Fourth, communicating the findings in an accessible format is critical to making a report of ecological condition useful. Communication specialists, including graphic designers, webmasters, and technical editors are as vital a part of the team as the scientists and other stakeholders.

Finally, we must take the long view in embarking on such an effort, recognizing that we will have to learn as we go. Whatever the indicators that are used to assess ecological condition, they will be imperfect, and reaching agreement on benchmarks of evaluation will take time. There will obviously be alternative assessments that could be created from the same data, and our first attempts at an overall assessment of condition are likely to be soundly criticized. In the long view, our assessment of condition would need to be repeated on a bi-or triennial basis, and there will certainly be an opportunity for multiple authors to take their turn.

In conclusion, consider this thought: when you need a car, you don't go to the parts department. Similarly, if we want to create a cogent assessment of the ecological condition of the estuary, we should not examine and approve each part separately. Instead, we must build a complete assessment and take it out on a test drive, and then recommend alternate parts based upon the performance of the complete product.

It has taken us a long-time to modify the Estuary to its present state, and it will take a long time for us to authoritatively document future trends in its condition. Those of us who study the Bay on a regular basis owe our fellow citizens, who don't have the time or training to delve into our technical reports, a straightforward answer to the question "are things getting better or worse." If we commit to the attempt, there can be no doubt that the product will inform our debate, and that we will learn over time how to improve our assessment and make the product more useful. Our imperfect attempts to answer this question will not reflect as poorly on us as our unwillingness to try in the first place. Although a completed and compelling presentation of the health of the Estuary is presently outside of our experience, there is no reason to think that it is beyond our capabilities.