Delta Independent Science Board Comments on the Science Action Agenda of the Delta Science Program

Draft comments of May 3, 2015

The Delta Independent Science Board (Delta ISB) applauds the draft Science Action Agenda (SAA), of April 10, 2017, that was provided to us for review. The document reflects deep insights and extensive consultations. We extend our thanks and congratulations to the Delta Science Program for leading the effort and for providing such a useful "roadmap" for science in the Delta. The comments below are intended to make the SAA even more useful.

The Delta ISB regards development of the Science Action Agenda (SAA) as a way to engage the Delta science community in the processes of identifying key gaps in knowledge and prioritizing areas of needed research. As noted in the SAA Foreward [*sic*], a "well-organized and forward-looking approach" is key to organizing, advancing, and funding the science that is needed to understand critical gaps in knowledge and unify the science community. Overall, the SAA approach will prove valuable to the community and advance priority areas across agencies and programs active within the Delta.

Overall Comments

Neglect of Place and levees. The SAA should address, far more completely, Delta as a Place and risk of flooding. The draft agenda does not come close to reflecting their importance in the Delta. Clearly, there is a need to include social and infrastructure elements beyond just the ecological topics that the report tends to focus on. Perhaps the overarching theme of area four was to try to bring in more social science elements, including "Delta as a Place" considerations, but we believe that this section needs to be expanded more. The under-emphasis of these issues may reflect the community that was polled in producing this document. Natural scientists sometimes do not appreciate the importance of social issues in influencing the ecological outcomes of Delta research and management.

Alternative structure. One suggestion is to perhaps reorganize the SAA action items into categories of the co-equal goals of the Delta Reform Act—ecosystem health, water supply reliability, and Delta as an evolving place—to deal with the issues we raised earlier. This might be done by organizing the research topics by these motivating management objectives, or by including a table that ties each research topic to these management activities. It is probably important to tie major research activities explicitly to management objectives to maintain administrative attention and funding for research, and to help focus the conduct of the research.

Missing themes. We realize that many worthy topics cannot be considered in an Action Agenda without making it unwieldy and diffuse. Nonetheless, we see four themes that cut across the proposed Action Areas that should at least be mentioned. They are:

1. *Thresholds*. Understanding where there are thresholds in system dynamics or the responses of species to stressors is critical for management. The data-management actions proposed could include probing for thresholds.

2. *Climate change*. There is almost no mention of climate change and its effects, yet virtually all actions will be affected by it.

3. *Land and water*. The proposed actions are all about water and what it contains, yet land-water interconnections are critically important to the overall ecology and management of the Delta, particularly because people live and work on the land.

4. *Costs and benefits*. Most actions could be improved by incorporating cost-benefit analyses. People want to know what the return on investment is for undertaking actions, particularly if they are expensive or cross agency boundaries.

Other General Comments

1. Please shorten the length of the report. Much of the text in the document belabors the points being raised. Unfortunately, this dissipates and distracts from the important content of the SAA. In the specific comments below we give some examples of how this could be done.

2. The summary is the most important part of the draft and will be read by most who are interested in the topic. Wordsmithing for clarity is especially important for the summary, and should be improved. Some topics are unclear and these are mentioned below.

3. Perhaps the SAA should be a 4-year plan, say on a rolling 2-year update cycle. Each 2-year update could also include an assessment of how well plan implementation is going, and perhaps cite some of the new knowledge that has become available.

4. There is a need to increase the formalization and integration of agency science and monitoring activities. Perhaps this belongs in the document but certainly it is something that should be considered in the pantheon of DSP activities and is related to the goals of the SAA. It also seems desirable to us that agencies be encouraged to have their own explicit science and monitoring plans. These would make it easier to coordinate such activities both within and between the many agencies and programs involved. Moreover, there is a need in this document (or a call for this information) for a science capabilities report that identifies the science interests, capabilities, and plans of different agencies. his might include how agencies develop in-house expertise and management or employ consultants and others to extend their internal capabilities. Perhaps something can be included on their scientific workforce development and support efforts.

5. Perhaps the document could also contain more information that could be tied to management interests. This approach could get the agencies and other entities to begin to develop more explicit science plans themselves.

6. Although the process is described in Appendix C, it would be helpful to have a summary of SAA development in the initial section of the document.

7. Although the SAA identifies areas of consensus it might be useful to document some areas where it was difficult to reach consensus, either because of controversy or because these areas were not deemed feasible to address during this time window. An understanding about where consensus was not reached or where science and/or funding are not available to enable advancing a topic of concern is important to share. This information may help identify goals and actions beyond 2017-2021.

8. The separate breakdown of Management Needs and Science Action (with examples) is a strong and valuable approach. However the linkage of the Science directly back to the Management was not always direct and clear to us.

9. The Science Actions seemed to be very uneven. For example, the management needs under #1 seem broad but the science actions are very specific and project oriented. Science actions were much broader in other areas. Another example under #4, Science action B is very specific and science action C is extremely broad and covers the entire Delta. The scientific aspect of some of the Science Actions needs strengthening. Some of these are processes to improve science rather than specific science priorities, such as 2B, 5A, 5B, 5C, 4C.

10. In Section 3, there is a need to develop tools and methods to support and evaluate habitat restoration.

11. Perhaps some text should be added up front to say that Priority Science Actions include ways to better improve science collaboration/coordination and are not entirely focused on the main scientific questions. This does not seem to be the case in most of the second tier science actions (Appendix A). Does this reflect the different priorities of scientists and science program managers? Appendix A seems very clear, concise, and even-handed. Perhaps one could ask the question: If we gathered the right groups of scientists together, can we accomplish this? Or, do we need a group of managers to do this?

12. There seems to be a lot of overlap in Area 3 and Area 2. Indeed, management needs were identical (2B=5A and 2A=5C). Clearly more clarification is needed here.

13. Science Priority 5A seems to be the same as 2B.

14. Overall the process needs better clarification. The Science Priority Criteria (page b-2) seem very vague. Exactly how were these 27 priorities reduced to 12? How rigorous/scientific was the process and how much could representative one or two individuals ‘weigh in’? Also, the process started with 27 and resulted in 12 first tier and 12 second tier. What happened to the other 3?

15. The measures used to evaluate 'collective success' actually do not contain any measures. We are not sure how to measure 'scientific knowledge' for example. How do you attribute any of this to the Science action agenda? We don't know how the DISB will use this in our reviews except perhaps as ideas for reviews. Much more thought needs to be put into this.

Specific Comments

1. Foreword; The dual concept of being pragmatic and aspirational is interesting and worthwhile. Although the Delta ISB appreciates Cliff Dahm's personal experience with NSF and his description of this topic, that may be lost to the intended audience. NSF likely could be thought of as being more basic than applied in its research mission. The body of the text, however, seems to have lost the aspirational components of the arguments.

2. As mentioned above, we believe the manuscript can be shortened to remove redundancies or elaborations not needed. For example, on page 3 sentence on lines 33-35; page 4 for the 2 sentences on lines 5-7. Perhaps improvement on these efforts will be dealt with when the report is submitted for editing. Likewise, the meaning of some statements is unclear and not readily apparent: Action Area 2, B; Action Area 3, B. Others can be better expressed: Action Area 4 add at end "including floodplain management"; Action Area 5, C Explore innovative "….analysis of flow, water quality, and ecosystem characteristics." The above mentioned need for a science capabilities report identifying the science capabilities and interests of different agencies, roles of consultants, academics, etc." could be included as point D.

3. Page 6, Line 24: Please avoid the term "success" in the restoration context—it is a much overused. Subjective terms are best replaced with more objective, perhaps even graded terms, like "performance" or "progress." Most projects have more than one goal, and few projects fall into yes/no outcomes, i.e., all goals achieved or no goals achieved.

4. Page 6, Line 32: Add "Explore opportunities to set up field experiments or sequential trials to test alternative restoration approaches."

5. Page 6, line 34: Consider adding a reference to Diefenderfer et al. (2016), who developed a formal approach for using multiple lines of evidence to assess whether multiple restoration projects in the Columbia River benefited juvenile salmon. Their 7 lines of evidence were: An ecosystem model, a physical model of controlling factors, meta-analysis of restoration actions, target species data analysis, research on critical uncertainties, literature review, and changes to the landscape. The seven lines of evidence agreed and gave powerful support for continued restoration. Here's the reference; Diefenderfer, H. L., G. Johnson, R. M. Thom, K. Buenau, L. Weitkamp, C. Woodly, A. Borde, and R.Knapp. 2016.

Evidence-based evaluation of the cumulative effects of ecosystem restoration. Ecosphere 7(3): e01242. While the idea to consider multiple lines of evidence is not new or unique, the formalization of the approach should give credibility to future applications.

6. Lines 29-34 Priority Science Actions *A. Implement studies to understand the ecosystem response before, during, and after the Sacramento Regional Wastewater Treatment Plant's EchoWater Project upgrades.*
Example science questions: What do we know about current ecosystem responses to the existing 32 nutrient loading regime? Where are the 'hot spots' of nutrient transformations and uptake in the 33 Delta that traditional monitoring methods miss?

Efforts to understand ecosystem responses to the Sac Regional WWTP should be done within a holistic context that achieves "a broader understanding of critical Delta features that drive nutrient distribution, concentrations, forms and biological transformations." These efforts should seek to understand ecosystem responses to changing nutrient inputs through consideration of physical processes and dynamics, within-system uptake and transformation processes, and taxon-specific responses to nutrients (see Ward and Pearl Report 2017).

7. Page 6, Lines 4-8

Identify and prioritize the most used data sources that should be interconnected to promote collaboration and provide the technology needs that will allow this information to be easily available through web-based services.
Potential action: Integrate data that focuses geographically on the Cache Slough Complex into a portal section on the My Water Quality page.
The authors of the SAA should consider providing some additional information behind the rationale for the prioritization of developing a collaborative data framework for the Cache Slough Complex. We don't doubt that this could be a useful action but we think it is important to specify what can be learned from this proposed collaboration that will promote a *Delta-wide Collaborative Analysis and Synthesis effort*? How can connecting these data be used as a model for other regions and collaborative efforts in the Delta?

8. Page 6. Lines 33-35

Develop methods for evaluating long-term benefits of habitat restoration based on current understanding of how species use restored areas.
The authors may also want to consider ways to broaden the evaluation of long-term benefits of habitat restoration within the context of ecosystem functions. In addition to considering use of restored areas by native species, science should consider the effects of restoration on wetland functions such as sediment trapping, nutrient filtration and promoting diversity.

9. *Page 7. Invest in assessing the human dimensions of natural resource management decisions*

Overall, we view the inclusion of text such as, "Invest in assessing the human dimensions of natural resource management decisions" as positive and innovative but suggest that next steps could go a bit further. The Delta ISB recommends that the DSP consider the following as potential areas for advancing the "human dimension".

i. Consider inclusion of a priority action that evaluates human responses to management actions more holistically (e.g., implement recommendations from Delta ISB to establish ongoing research in the area of the Delta as an evolving place). Keep in mind that the Delta ISB recommends that this area of research become comparable in size to Delta research in other areas such as habitat restoration, flows, or water quality.

ii. Consider development of a research framework that incorporates feedbacks between human and natural systems.

iii. Instead of, "Identify policy alternative and potential incentives for changing human behaviors to improve species' habitat conditions," perhaps change this statement to "Consider human behaviors and stakeholder concerns when developing policy alternatives and potential incentives for improving species' habitat conditions."

10. Page 8-9, Modernize and improve monitoring, data management, and modeling Improve data and information exchange.
We offer two preliminary recommendations from the Delta ISB's review of water quality.

i. Consider adding a recommendation for geo-referencing data obtained from monitoring and research studies to enhance linkages between data collected for different purposes.
ii. Collect water quality data at same locations as flow measurements to enhance information and interpretation.

11. On page 11, the outlining of measures that will be used to evaluate success of implementation may need rethinking. Of the 8 measures listed, 1-4 and 8 are really those "famous aspirational" measures that were hoped for and struggled with back to the CalFed era. They sound good but in reality cannot be actually assessed. Former Delta ISB member Judy Meyers regularly raised this question regularly and would have asked for more defined and measurable metrics.

In conclusion and as stated at the beginning of our review of the SAA report, we think this is a very good draft of what will be an important product of the Delta Science Program. One Delta ISB member commented that reviewing the draft made them want "to dig into the issues more, because it's intriguing and points to positive things for the regional science community to undertake." Our efforts in preparing the comments in this review are intended to make it an excellent, comprehensive, and meaningful document for the whole Delta community. Please let us know if we can provide any additional information and we appreciate the opportunity to comment on this important development toward "One Delta, One Science."