



Delta Independent Science Board

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To: Peter Goodwin, Lead Scientist, DSC/Delta Science Program

From: Tracy Collier, Chair, Delta Independent Science Board

Re: DISB Comments on the Second Draft of the Delta Science Plan

In its second draft, the Delta Science Plan continues to build a framework for improving the quality of Delta science and for making science more useful in public policy. The draft begins with a clear statement of the overall problem that the Plan addresses. The draft proceeds to develop objectives, actions, and expected outcomes, both in the text and in a useful tabular summary. The draft actions include clearer links among the region's many science programs. The document reads well despite the unavoidable redundancies of restating, in chapter 4, problems that were introduced more broadly in previous chapters.

Our main advice is to respond more boldly to today's groundswell of support for organizing Delta science better, making the science more broadly available, and creating a culture in which scientific synthesis and its rapid incorporation into management and policy are the norms. This is a rare opportunity to create a cohesive and comprehensive foundation for the science that will be essential to achieving the coequal goals. Your words and approach should inspire bold actions and the broader governmental financial and policy support needed for successful implementation.

General Comments

1. **The Plan should aim higher.** Developing a cohesive and integrated body of science and scientists that can analyze, synthesize, and communicate science to a broad array of users, decision-makers, and stakeholders in the Delta will be essential to achieving the coequal goals of reliable water availability and improved ecological health of the Delta. The Delta Science Plan provides a rare opportunity to be bold and transformative. In our view, the focus of the current Plan on creating several organizational layers and committees that meet now and then to talk, develop broad action priorities, and provide top-down guidance for synthesis and adaptive management falls short of what is needed. If meetings and committees were sufficient alone, the issues in the Delta would have been solved long ago. What will make these committees and meetings more productive than in the past? How will agencies be coerced or shamed into integrating their science activities and sharing resources? How can the regulatory and

permitting hurdles be lowered so that restoration actions and adaptive-management experiments can be expedited? More to the point, how will the Plan create a new way of integrating science activities through cultural as well as infrastructural changes that will result in broader syntheses and an accelerated growth and transferral of knowledge to inform decisions and management actions?

In our view, there are several ways in which the Plan could be strengthened to increase its impact on Delta science:

Include a preamble. The Plan should begin with a strong statement that emphasizes the need and opportunity for implementing a bold Plan and the benefits that will come from doing so. Here are some points to consider in framing this preamble; you can undoubtedly think of others.

- Public perceptions of environmental issues are shifting from the polarized “development versus environmentalists” setting of past decades, which often placed science and scientists in opposing camps, to a broader recognition of the interconnected nature of environmental problems and the need for proactive, collaborative approaches.
- It used to be that the aim of management and regulation of resources, be they wildlife or water, was to maintain the status quo. But the Delta is a dynamic system plagued by future uncertainties and seemingly inevitable change. Science provides the insights and tools that are needed to manage resources in the face of change and uncertainty.
- Although large investments are made on scientific and technical aspects of the Delta, most support narrow objectives of individual institutions or agencies, with little investment and synthesis to create the broad, integrated scientific foundation needed for effective public discourse, policy, implementation, and adaptive management.
- The Delta Science Plan can define a new and more productive strategic direction for conducting and integrating the science and technical efforts of state, federal, and local agencies regarding the Delta. However, this will require a fundamental cultural change for agencies and others doing science in the Delta.
- Legal, institutional, and cultural inertia means that scientific activities across institutions are unlikely to integrate themselves without substantial external motivation. Such motivations will need to be applied by the Delta Stewardship Council and other agencies with broader governmental missions and authority.
- The Delta Science Plan is the key to leading these transformative changes in an understanding of the scientific issues affecting the Delta and how management solutions can be achieved.

Strengthen the Science Steering Committee. Calling for the establishment of a Science Steering Committee (SSC), with the members selected by the Delta Lead Scientist, may be one way of moving in this direction, given the charges to the SSC listed in Appendix D. These charges were:

- 1) Translating the “grand challenges” articulated at the Policy-Science Forum into specific research priorities and actionable questions,
- 2) Recommending topics for focused science synthesis efforts (including requests for proposals),
- 3) Providing high-level guidance for topics to be addressed in the Action Agenda (e.g., research topics),
- 4) Providing guidance to science experts writing the State of Bay-Delta Science,

- 5) Conducting science synthesis in sub-groups, and
- 6) Representing the *One Delta, One Science* Community at Policy-Science Forums

These are some heady charges, especially 1-3 and 5, and if the recommendations from the SSC carry weight, this body would have potential to be transformative. The Plan needs to be specific about the responsibilities and, especially, the authority of the SSC. Regarding the Science Action Agenda, the SSC should be more than just another collaborator; it should be the high-level arbiter of subjects to be included in the Action Agenda. It is also critical that the more in-depth description of the SSC include ways to ensure non-partisan participation by individual members. Saying that the members will be non-representational is one thing; making that a fact is not simple. The authority of the SSC should include how funding is allocated to a substantive portion of science activities in the Delta. Without some say over funding decisions, it will be difficult for the SSC to implement the charges.

The SSC is not listed in either the initial table of participants on p iii, nor is it listed as having any duties under action 2.2 on p 12. In our view, the SSC could well have a primary responsibility for action 2.2.

Emphasize scientific synthesis. As in the first draft, synthesis of science is recognized as the “single most important need for developing Delta science,” yet it does not appear as a dominant theme of the Plan. Perhaps synthesis should come first, with the other themes building support for the synthesis. The description of synthesis and its benefits in Chapter 4 is also weak. For example, the objective to “provide timely support for policy and management decisions” could be stated for various bits and pieces of science; how will synthesized science make this better? On page 31, line 27, it is not at all clear how synthesis will help to manage conflict. The items listed on lines 29-36 are products; how will they foster synthetic thinking? And most importantly, what actions will be taken to inculcate synthesis into the everyday work and thinking of Delta scientists?

Strengthen the modeling section. This is an area where a community-wide model development and testing plan is needed for the Delta. Models will play an important role in hydrodynamic, water quality, ecological, operational, and economic areas, and in testing hypotheses; scenario modeling will be important not only in water management (p. 18, Box 3-2) but also in evaluating habitat restoration possibilities. Model development will require much more than grants, fellowships, workshops, seminars, and conferences (p. 30, action 4.4.3). These may be useful in scoping out the needs, but actual model development requires that the key people actually work together to create models that address specific needs. Actions need to go beyond getting together to talk.

Prioritize the actions. The Plan contains 28 recommended actions. Not all of these are of equal importance. Given the fiscal uncertainties and the ways in which the Delta Science Program has been funded in the past, serious consideration should be given to how the proposed activities should be prioritized or phased in over time, since it is unlikely that all of the resources that are needed to conduct all of the proposed actions will be immediately available. Focus first on the actions that will have the greatest short- and long-term impacts on Delta science, balanced against the feasibility and cost of the actions.

Emphasize the importance of data management. Data sharing and management are addressed in section 4.3. This text and the two actions proposed (host a data summit and develop guidelines for data sharing) barely scratch the surface of what is needed. Synthesizing information and data, conducting the

analyses required in adaptive management, or just about any other aspect of science requires that the core data be deposited in one or more data banks (“data commons”) that are readily accessible and accompanied with appropriate metadata. Data sharing is only the beginning. Developing the data systems to support Delta science and its applications across the varied sources of data will require considerable effort and will not be cheap, but it must be done, the earlier the better. The web-based tracking system of science activities (action 2.3) is only one part of this. The Plan should recognize the challenges and be much bolder in proposing how they will be met. As it now stands, the proposed actions will do little to achieve the expected outcomes.

2. Describe the “grand challenges,” with examples. There are references throughout the Plan to the “grand challenges” that will be determined in the Science-Policy Forum and translated by the SSC. Because so much of the Plan revolves around these challenges, a better understanding of what kinds of things are envisioned as grand challenges and, more importantly, how these might serve to focus science activities, seems necessary. As examples, present some of the challenges that the Plan writers have been considering and relate them to the major issues that Delta science can help to resolve. Use these issues to provide focus and strengthen justification for the Science Plan. State them near the front and perhaps include them in the executive summary. Omit quotation marks around “grand challenges” throughout.

3. The expected outcomes are often too general and performance measures are not measurable. Outcomes should be framed in ways that lead directly to performance measures that can assess progress using clear metrics. Such things as “improved interactions” and “shared understanding” (p. 11, lines 19-20) are not measurable. More to the point, what is really important is what will result from the improved interactions and shared understanding. In fact, most of the performance measures listed in Appendix A are restatements of outcomes, not actual measures of performance. Although it may be too early to define performance metrics specifically, the Appendix (if not the main text) should at least outline the process that will be used to develop rigorous and quantitative performance measures.

4. Funding is not adequately considered. There should be some up-front recognition of the ball-park funding that will be required to implement the Science Plan. For example, if the SSC is to perform the functions suggested above, the amount of work to be done by this group will be large; the funding strategy needs to address how the SSC will be resourced, or what will be done if the proposed functions cannot be funded. Establishing and running the organizational infrastructure proposed will require funding, but that is only the tip of the iceberg. Actually doing the synthesis of the existing science, much less supporting the science to fill the gaps identified in the Action Agenda, will succeed or fail depending on funding, and data management and modeling will add additional expenses. It seems unrealistic to propose a Plan for Delta Science without an indication of what it will cost, how the costs might be prioritized, and who will pay. If funding issues are to be addressed in a separate document, it should be prepared quickly and reviewed by the DISB.

5. The Plan needs careful editing. Comments on style may seem picky, but clear, consistent, and readable text is essential to communicating the Plan effectively. For example, the inconsistent use of commas throughout the text is distracting. In some places, a comma is added in the sequence of three terms (A, B, and C), but in other places it is eliminated (A, B and C). In some cases, this lack of a comma makes the sentence confusing (e.g., p. 3 line 8; p. 5, line 3; p 7, line 6 [“Evaluate and Respond” is not a single step]; p. 34, line 32 [reads that the forms are from the digital media]). Standardization (the former would be better throughout and confusion eliminated) is needed.

Other suggestions to improve clarity and style are included in the specific comments below.

Specific Comments from Individual DISB Members

Page 22, Figure 4.1. Is the size of each box intended to communicate its relative importance? If not, I recommend using the same size box for each component.

Page 24. Action 4.1 Support Research. I recommend that the research grants and science fellows proposals also be ranked relative to their ability to address science needs as well as existing and anticipated gaps in knowledge. I think it would be helpful to define “Broader Impacts”. Are these the same types of Broader Impacts as defined by NSF or will they differ for the DSP proposal and fellows solicitations?

Page 24, Lines 16-17. Revise to, “Rapid-response Research Grants - To maintain flexibility and responsiveness of Delta science, some research funds WILL BE set aside ...”

Page 26, Line 22. Improved availability of data for use in regulations. I think that this statement should be broadened since improved availability of data will support many elements of Delta science (e.g., modeling and research efforts), and is not limited to regulations.

Page 27, Lines 10 and 16. “data is” should be changed to “data ARE”.

Page 28, Line 1. Add a statement about the need to develop criteria for “metadata” to be included with all data available for sharing. Having a systematic, unified system for “meta data” will aid in making data available for many purposes and enhance its usefulness over time. This is mentioned on Line 17 but should be addressed earlier in this section.

Page 28, Line 14. Typo. Should read, “that crossES agency and disciplinary boundaries”.

Line 29, Section 4.4 Shared Modeling. Consider presenting an example (or examples) here. You could use the Community Surface Dynamics Modeling System (CSDMS) or ROMS (Regional Ocean Modeling System) as examples of the power of community model building.

Page 29, Line 2. Typo. Revise to, “and WILL be a key component in the design, management, and performance assessment of projects and actions.”

Page 29, Lines 13-15. Revise to, “Even when using the same model, CONFLICTING CONCLUSIONS CAN BE DRAWN, due to different scenarios, different assumptions and different data USED BY INDIVIDUAL MODELS.”

Page 31, Lines 18-19. Use stronger language than “delayed” here. Suggested rewording: “protocols and resources for conducting ongoing synthesis, new insights and better understanding of the Delta system and science-based decision making VITAL FOR THE HEALTH OF THE DATA ECOSYSTEM will be HINDERED AND/OR OBRUCTED.”

Page 31, Line 25. Section 4.5.1 Establish mechanisms and protocols for ongoing synthesis. Consider adding an action item that is focused on enhancing synthesis activities across the science and policy disciplines.

Page 32, Lines 30-31. Revise to, “TO BE MOST EFFECTIVE, high-quality peer reviews SHOULD BE CONDUCTED IN A WAY THAT IS OBJECTIVE, RIGOROUS AND TRANSPARENT.”

Page 32, Line 32. Omit “might”.

Page 33, Figure 4.6-1 Structure of reviews conducted under the Delta Science Plan.

Consider renaming boxes, “Internal Reviews” and “External Reviews” rather than the current “Reviews conducted in-house” and “Reviews conducted by others”.

Page 34, Lines 2-3. Revise to, “Research reports and science-based planning and management documents are often used in decision-making despite the fact that they have not been evaluated by an effective process of scientific peer review.”

Page 38, Lines 27-28. Use partnerships by federal programs (e.g., NSF – EPA STAR RFPs or the National Oceanographic Partnership Program (NOPP)) as a model for creating funding efficiencies via pooled resources in the Delta to address questions beyond the limited mandates of individual agencies.

Page 39, Lines 8-11. While the Primary Responsibility for implementing and sustaining the science infrastructure resides with the Delta Science Program, I think it is important to communicate that everyone has responsibility for this including the legislature, the citizens and taxpayers of California, particularly those that rely on the Delta for water, food, economic benefit, etc. I think it would be beneficial to communicate that the Science Plan will only be successful if there is broad support both for the Plan itself as well as the resources needed to sustain it.

p. 1, line 21 the two coequal goals are not named. These should be better described or at minimum “the” in the sentence should be changed to “these”.

p. 2, line 24. “When the stakes are high, conflicting conclusions can be presented”. Actually, this can occur when the stakes are low as well. This comes up again in p. 6 lines 10-12. I think that the point to be made is that “When the stakes are high, conflicting conclusions make actions difficult.”

p. 4 lines 6-10. This is the good strong statement that we had hoped the document would convey!

p. 10 line 8. I think the point here is that transformation “requires”, not needs.

p. 10 line 26, should be “among” not between

Fig. 2-1 is good but in Fig. 4.6-1, how does the NRC fit? It just “hangs’ there.

p. iii, line 1 -- Replace "Audiences and Participants" with "Users and Uses"

p. iii, line 1 -- Here and elsewhere, consider minimizing use of uppercase. The headings are everywhere evident from their bold fonts. The only words needing capitalization are the first word and proper nouns. The draft already contains plenty of new proper nouns, as in "Science Action Agenda" and "Policy-Science Forum" and "Science Steering Committee." Lowercasing other parts of headings will help these terms stand out.

p. iii, line 4 -- Unclear from the table who is in the passive audience and who is an active participant.

p. iii, order of entries in left column -- Consider listing the most consequential users first, the obligate users last. DSP, as the plan writer, is one of those obligate users. Akin to ranking stressors, perhaps.

p. 1, line 1 -- Overall impression of the "Executive Summary": it gets bogged down on its first page and says too little about the actions.

p. 1, lines 2-22 -- This text buries the lead and tries to rescue it with bold font. Answer the question right away: **Why a Delta Science Plan?** No need here for more on the problem. Cutting the rest of lines 2-22 will make room below for big actions that the summary currently ignores, such as the funding in section 4.1 and the monitoring in 4.2.

p. 2, line 17 -- The optimistic verb "achieve" undercuts credibility with the thoughtful reader. Ditto on p. 1, line 11 and the reiteration on p. 4, line 7.

p. 2, line 27-28 -- Restate "independent and transparent processes" more concretely?

p. 3, line 1 -- Search on "establish" in hopes of replacing it in most uses with language that goes farther downstream.

p. 3, line 4 -- Search on "path" to guard against overuse

p. 3, line 7 -- Begin with a verb

p. 4, line 19 -- limited --> insufficient

p. 4, lines 20-25 -- Sentence could be stated more clearly

p. 4, sidebar -- Nice, these boxes headed "Efforts to Build On"

p. 5, vision box -- Expand into a diagram that depicts the three-part strategy and uses the most important of the text now in the orphaned subsection that begins on line 27. With that fuller view of the vision, lines 6 and 7 can describe the Delta Science Plan as the first part of a broader strategy, and the text can proceed from line 26 to the next big section, the one beginning on line 8 of page 6.

p. 6, line 8 -- This section covers more than objectives, for it describes actions and refers the readers to specific examples of them. The section could be headed with an active verb: **How will the Delta Science Plan work?**

p. 6, box 1-2 -- Too many Delta Plans in the heading. Consider: HOW THE DELTA SCIENCE PLAN HELPS IMPLEMENT THE DELTA REFORM ACT

p. 8, line 3 -- What is the "State of Delta Knowledge." Is it related to the "State of Bay-Delta Science"?

p. 8, line 14 -- Consider scrapping this heading, which promises too much and lacks sufficient support in lines 15-38. Try adapting lines 15-38 as preamble to the section that begins on page 6, line 8.

p. 9, line 17 -- The Delta Action Agenda will flesh out the actions sketched in the Delta Science Plan.

p. 11, line 30 -- The choice of "guide" raises the question of how the Delta Science Plan will provide the teeth needed to solve the problem stated in section 1.

p. 16, line 5 -- Several --> Many

p. 16, line 7 -- making --> proceeding with

p. 16, lines 28-31 -- An exception to the clear writing in section 3

p. 17, line 13 -- Verb at start?

p. 18, line 14 -- Modeling --> Model [as a command]

p. 23, lines 8-9 -- The example is difficult for me to understand because example stressors and contaminants are not named.

p. 26, line 10 -- A tall order!

p. 33, Fig. 4.6-1 -- The [Delta] Independent Science Board rarely if ever oversees the reviews that the Delta Science Program has organized. Move the DISB box off to a side?

p. 39, lines 2-4 -- More than a matter of funding. The rotators help break down silo walls.

p. 40-47, PRIMARY RESPONSIBILITY -- Omit this column. The Delta Science Program is listed as the lead for every action in the table. The space would be better used describing how DSP will work with other agencies, even to the point of delegating the lead in some cases. Would IEP, for instance, be the logical lead in for action 4.2.2?

p. C-1, lines 31-37 -- The question of teeth, as on page 11, line 30.

p. G-1, line 28 -- Any other science advisory boards?

p. G-2, Box G-1 -- Worth the space?

The first draft was criticized for not addressing how scientific conflicts might be resolved. The second draft mentions science conflicts so prominently (e.g., p. 4, line 22; p. 6, line 9 ff.) that it makes it seem like conflicts are the major problem, rather than fragmentation and a lack of synthesis.

The Plan makes the point (p. 5, lines 24-25) that the Plan will provide products to inform decisions, “but expressly will not pass value judgment on the trade-offs among different decisions.” This weakens the role of science. Yes, science should not get involved in determining the relative merits of the values of different stakeholder groups, but science should make the benefits, costs, and consequences of the trade-offs clear. This goes beyond simply stating the trade-offs.

P. iii: What does it mean to “inform” the DISB about oversight and recommendations? How would DISB use the Plan?

In many places (e.g., p. 1, line 32; p. 5, line 10; p. 12, line 36; p. 29, lines 20-21 and 24) the phrase “knowledge discovery” is used. I’ve previously complained about this, as follows: “knowledge is not something that exists, waiting to be discovered like some lost continent; discovery creates knowledge, which in turn can foster discovery.” Please avoid.

I’ll repeat my concern that *The State of Bay-Delta Science* is not really a component of a broader strategy, but is a product of the overall science strategy. The *synthesis activity* that leads to the report is in fact part of the strategy. That is what should be highlighted, rather than the product.

P. 11, line 22: “Integrate” and “Track” are really two separate activities that are not tied together here. Either treat them separately or make the linkage clear.

P. 12, line 24: It’s not at all clear how the proposed action will result in leadership. This seems to be a word tossed in for effect. If you’re going to claim that the actions will strengthen the leadership provided by the Science Program, explain how.

P. 13, lines 28-29: This is a good outcome, but it is not clear from the preceding text what will produce it. It also relates directly to modeling as a synthesis tool; that link should be made clear.

P. 14: The objectives here and elsewhere are (appropriately) framed using active verbs, yet later on (e.g., p. 35) the style has reverted to the earlier, passive style. Use active verbs to frame objectives throughout.

P. 15: The diagram belongs at the beginning of the section.

P. 16, lines 16-21: Does the continuous nature of adaptive management conflict with the setting of priorities in the Action Agenda, which implies less flexibility?

P. 17, first objective: The words at the beginning of the statement are repeated at the end of the statement.

P. 22, Figure 4-1: Peer review should be applied to research projects and the design of monitoring programs as well.

P. 25, second objective: You should emphasize that monitoring needs to be strategically targeted to provide the critical information quickly and effectively. This depends on a clear understanding of what is being monitored, why (what will the results tell one?), where, and when. No one-size-fits-all protocol exists.

P. 28: Why is the box style different from elsewhere?

P. 33, diagram: It's not clear why the DISB sits at the top of everything. In fact, the diagram indicates a hierarchical structure to reviews, when in fact the scope and nature of reviews should be individually designed to fit the scope of what is being reviewed. The DSP can coordinate such reviews.

P. 34, objectives: Perhaps the overarching objective should be to develop standardized, multi-level review processes and guidance on what requires review and what doesn't, at what stages of development. Models of the review processes used by other programs or organizations may provide some ideas.

P. 34, line 26: "clearly outlining assumptions and limitations" is not mentioned in the action items, so it's not clear where this will come from.

P. 38, problem statement: This simply repeats the earlier text.

P. 38, lines 29-30: what does "Reform the underlying capacity challenges to conduct science for ecosystem and water management" mean? You want to reform the challenges?

P. 39, Actions: These should be more specific. This section mostly boils down to saying that more staff and more money are needed, without presenting a compelling argument why.

Appendix F: There needs to be some discussion at the beginning about how to determine when adaptive management is warranted and when it is not, or when full-blown adaptive management (all nine steps in all their glory) is appropriate and when a "Reader's Digest" version can be employed.

Box G-1: Why is this included? What is supposed to be learned from it? Why are no other examples provided for other topics?

An overall objective might include "Develop and sustain scientific capacity to guide Delta solutions"

The inabilities of federal and state agencies to contract efficiently and in a timely way pose a huge burden on scientific activity.

The Action Agenda and *The State of Bay-Delta Science* seem like products under the overall plan and not stand-alone bits.

Some of the actions are major and some are minor. At the end, it might be useful to focus on what is needed to accomplish the major ones.

Several communication audiences might be mentioned: a) scientists, b) with and among stakeholders and agencies, c) legislature, and d) public. Communications with each of these groups seems very different.

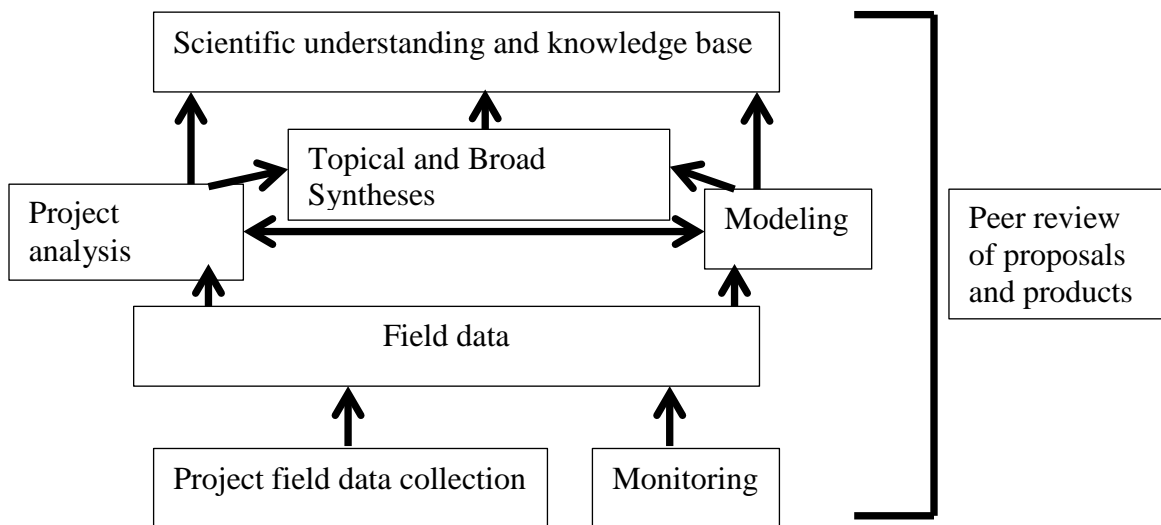
Probably all major scientific products (not just their proposals) should be externally reviewed, perhaps with different tiers of intensity. This should be a contractual expectation.

Similarly, firm requirements in science and technical contracts to make data and documentation available might be useful. Agency work should have similar requirements, since the work by one agency is often needed by many agencies.

A common monitoring plan across agencies might also be a good idea, with data management being a part of this.

Adaptive management is going to be really hard, harder than will be resolved in this plan. What you have is as good as any.

Here is a different version of Figure 4-1.



cc: Phil Isenberg, Chair, Delta Stewardship Council
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