Science Plan to Assess the Effects of Ambient Environmental Conditions and Flow-Related Management Actions on Delta Smelt

Key Messages and Recommendations

Focus on Mechanisms

1. In order to understand how environmental conditions, influence both Delta Smelt and assess the effectiveness of flow-related management actions, scientific activities must identify mechanistic response to actions when they are taken. It is also important to provide context for those actions by examining the same mechanisms under non-action conditions, i.e., ambient conditions. (pg. 37)[1]
2. Quantitative predictions of the mechanistic response to changing conditions, including flow-related management actions, is a key missing link in management of this system. (pg. 14)

   Advance an integrated process-based tool to predict the effects of annual flow-related management actions and changing ambient conditions on Delta Smelt. This will require several years and dedicated resources. The first step is a detailed approach and proposal to set appropriate expectations, timelines and resource needs. (pg. 53)

   A series of steps is proposed, that with resources and leadership, could be undertaken with about 9 months to develop a detailed plan of how to move forward. (pg. 14)

Detecting the Response

3. While routinely collected information can be used as part of a larger effort to detect and understand change associated with changing ambient conditions and flow-related management actions, it is unlikely to be sufficient to develop a full understanding of management effects. (pg. 16)

   There is no routine monitoring for predation of Delta Smelt, and there is little routine documentation of contaminants in the Delta. (pg. 16)

   Novel techniques for mapping abiotic and water quality (e.g. unmanned aerial systems, high-speed boat-based mapping) should be tested in more settings to enable a more thorough understanding of their utility, costs and limitations. (pg. 20)
4. Planning management-action specific field surveys that include broader spatial and temporal coverage for some variables, or that provide different types of information in a timely manner, needs a collective understanding of what is currently available and feasible, and emerging ideas. (pg. 21)

   Convene a workshop on new techniques for aquatic field surveys in the Delta focusing on abiotic and biotic aspects of 'dynamic habitat' in the estuarine environment. (pg. 21)
5. Non-take detection is a priority issue and many questions remain over the comparability of the data that can be produced, and what the information developed could be used for.

[1] Page numbers refer to the sections of the main report where more detail on the findings and recommendations can be found

Establish an independent science advisory panel using the guidelines in the Delta Science Plan to provide timely advice on the potential utility of approaches to non-take detection of Delta Smelt, possible pitfalls, appropriate caveats, and useful steps to refine and test such approaches individually, or in combination. (pg. 21)

6. Findings of a workshop held in in 2017 that included managers and researcher indicate there is 'broad consensus' that the potential use of cultured Delta Smelt for *in situ* experimentation would be a valuable application for the Delta Smelt culture program. The opportunity for such response detection, especially in relation to flow-related management actions, provides an exciting opportunity to explore effects across gradients of change. (Box 3, pg. 19)

Understanding the Response – Example Studies

7. Understanding linkages between carbon sources in different regions or habitats and zooplankton, microcrustaceans and Delta Smelt, and how flow and changing ambient conditions influence them is crucial to understanding how actions may influence Delta Smelt. (pg. 25)

   Conduct an inventory of existing information on the isotopic signatures of key potential carbon sources including information about potential temporal and spatial variability, and where existing information is adequate. (pg. 25)

8. The effect of contaminants on Delta Smelt under ambient conditions and when flows are adjusted as part of management actions is an outstanding question (pg. 26). Opportunities exist for routine collection of large volume water samples for use in toxicity testing and other controlled laboratory experiments. (pg. 26)

   Engage the Contaminants PWT to plan a series of specific experiments that build on existing work, and select focus locations for water collection where Delta Smelt are often caught and where contaminants are known the be an issue. (pg. 27)

Understanding the Response - Approaches

9. Competitive solicitations stimulate thinking in the research community and the development of ideas and approaches which can be refined and tuned to other funding opportunities. (pg. 24)

   Explicitly request proposals relevant to understanding Delta Smelt flow-related management actions (e.g., interacting effects of dynamic and structural habitat on food availability, response of Delta Smelt and their prey to contaminant mixtures found in Delta water) as part of existing and future solicitations that include Delta-focused scientific study. (pg. 24)

10. Over a number of years, a series of synthesis reports could be produced for:
    - Key issues, such as food availability or the effect of contaminants
    - Important locations, e.g., Cache Slough, Suisun Bay-Marsh, DWSC
    - Individual Delta Smelt life stages or transitions (pg. 28)

    Convene a work group includng managers and scientists (drawing in those outside of CSAMP to participate as appropriate) that includes participation from the Delta Science Program and IEP, to develop a multi-year list of synthesis topics (e.g., issues,

locations, species life stages/transitions) for which data/information is expected to be available, the types of synthesis outputs needed, and estimates of resource needs. (pg. 28)

Delivering Understanding for Management

11. The development and delivery of scientific understanding to users is urgent. Regular updates need to be provided including (pg. 31):
    - Monthly short presentations on progress to CAMT/DSST
    - Quarterly short written reports including available summary information. based on incoming information from scientific activities and other research developments.
    - Annual progress summaries would be developed in a similar manner and made available or presented to CSAMP Policy Group.
        - One useful vehicle for reporting and dissemination of new scientific developments could be an annual or biennial State of Delta Smelt symposium. This would enable both the presentation and discussion of emerging findings and refinement of understanding of management needs. (pg. 31) Such a symposium on a regular basis could provide an excellent venue for open discussion of management needs and how they can best be met by the scientific community. (pg. 50)

Programmatic Approach

12. The ongoing execution of science in the context of adaptive management, including detailed science plans, communication to a variety of audiences, advocacy for constrained resources, motivating delivery of information, and championing learning, requires a leader. (pg. 38) A dedicated 'Science Program Manager', who works at the interface between those who generate the science and those who use the science is essential. (pg. 52)

    Establish the position of Science Program Manager to enable collaborative, coordinated, and effective generation and delivery of scientific information around Delta Smelt response to changing ambient conditions and flow-related management action. (pg. 52)

13. A three-year cycle is proposed here for planning and executing scientific activities, with annual supplements to tailor plans, particularly field surveys and opportunistic studies, around specific flow-related management actions or ambient conditions. (pg. 40)

    Adopt the Three-Year Science Planning process, with provision for Annual Supplements. Initiating a structured approach to planning, coordinating and communicating scientific activities does not depend on any specific programmatic structure being in place. (pg. 53)

14. The approximate level of financial resources available to support scientific activities is an important constraint that needs to be considered early during the planning stage. This report assumes that ongoing monitoring programs and field surveys conducted by IEP will not be sufficient to detect changes in detail and support understanding of Delta Smelt response to changing ambient conditions and flow-related management actions. (pg. 42)