

# Anticipating California Delta Futures

A proposed joint activity of the Delta Independent Science Board and the Delta Science Program.  
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## Goals and Background

The California Delta is undergoing continual and often rapid change and predicting and preparing for those changes is becoming more challenging as the past is an inadequate model of future variability. Anticipating change is critical for effective management in the Delta. Science can be applied to make reasonable predictions of some future conditions and much scientific effort aims to improve accuracy and the time and space scales of those predictions (e.g. climate change). However, many changes cannot be scientifically forecast or may be forecast but largely ignored due to their perceived low probability of occurrence. Yet, as recent events have helped us realize, preparing for low probability events with potential high consequences for water supplies, ecosystems or human well-being is needed for effectively managing risks.

Forward thinking can be used to improve our capacity to prepare for, respond and adapt to rapid change by providing opportunities to plan for alternative futures. The science that has been developed to structure future thinking can be applied to broaden the range of future possibilities that we consider and assist us in avoiding typical mental traps such as a focus on incremental, rather than fundamental, change. Anticipating unlikely, but still plausible, future conditions has been demonstrated to speed up responses during crises, improve resilience, and can create new insights about effective preparation for change.

A common element of future thinking is scenario analysis, in which alternative future conditions are developed and used to test how well alternative policies, scientific capabilities, or projects perform under highly uncertain conditions. This approach improves decisions because ignoring uncertainty can lead to inefficient investments since the solution that is optimal under a “best guess” future is not necessarily the one that performs best under diverse plausible future conditions (Wainger et al. 2021, Groves et al. 2019). For scenarios to be useful at anticipating surprises, they need to go beyond including risks that have been estimated using existing data and models and include *deep uncertainty*, which is system variability that cannot be well characterized with existing data, models and understanding.

This effort will build on emerging techniques in future thinking to develop a scientific approach to identifying scenarios that include low-probability but high-impact scenarios (e.g., a pandemic), for which preparedness would be an important component of resilient management. The anticipated outcomes of this effort are a set of creative future scenarios and a participatory process that deepens understanding of potential future scientific and management challenges and opportunities in the Delta. The scenarios will represent conditions, perhaps 10-20 years in the future, that are potential outcomes of rapid socio-ecological system change or surprises. The scenarios and the process of their development will enable the Delta science and management enterprise to better characterize, prepare for, and adapt to uncertainty for a range of management needs such as salinity management, water supply, and ecosystem goals and may help to prioritize scientific needs such as early warning indicators, improved monitoring and assessment.

This effort is responsive to multiple recommendations produced by the Delta Independent Science Board (Delta ISB) and the Delta Science Program (DSP) that have noted the need for anticipatory management (Delta ISB 2022; Norgaard et al. 2021). The benefit of thinking ahead is to be better prepared to act nimbly in the face of urgent needs, as was recently required to prevent salinity intrusion under extreme low flow conditions. Although scenario planning is already being used by many government agencies, this effort aims to delve deeper into scientific, social and policy responses needed to maintain the co-equal goals. Further, decision science, psychology, and futurism have developed techniques that can be applied to generate scenarios that encompass more diverse drivers and more extreme changes than would typically be used.

Scenarios offer the opportunity to introduce new ways of thinking about challenges and could spur new, and possibly joint, analyses and strategic scientific plans by agencies and other activities to anticipate and prepare for the future. Thinking creatively about the future helps to prepare agencies to act quickly to unexpected change and could reveal monitoring, analytic, planning and communication needs. Additional benefits of this activity could be to improve engagement of scientists and managers across agencies, another recommendation that has been made by both the DISB and the DSP.

## Proposed Activities

1. Initial joint seminar series to introduce the concepts of future thinking, some signals of future change, and other useful background information.
2. Discussions with stakeholders who are interested in contributing to or using scenarios
3. Workshop to elicit future thinking from members of the Delta Science enterprise and other stakeholders and apply that thinking to develop a set of planning scenarios.
4. Joint report from DISB and DSP describing scenario elements and potential applications.

## References

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