

Grand Challenges for Delta Science

Information Sheet



**Delta
Science
Program**

DELTA STEWARDSHIP COUNCIL

- Delta Science Program (DSP) is preparing to develop the **third iteration of the Delta Science Plan** in 2024.
- Delta Science Plan was first released in 2013, and updated in 2019, to **guide the practice of science in the Delta**.
- DSP is considering framing the 2024 Delta Science Plan update and its actions around “**grand challenges**” to ensure it is **relevant and strategic**.

Background

The Delta Science Plan fulfills a recommendation in the Delta Plan and supports requirements of the 2009 Delta Reform Act. The Science Plan proposes mechanisms to conduct science in a manner that achieves the vision of One Delta, One Science. It guides the development, coordination, and communication of science to provide relevant, credible, and legitimate decision-support for policy and management actions.

When the Delta Independent Science Board (ISB) reviewed the previous Science Plan, the ISB asked that the Science Plan be “bolder, more flexible, and more strategic.” Additionally, the Delta science community has changed greatly since the release of the initial 2013 Science Plan shifting to be more collaborative and responsive even as the landscape has experienced more frequent and extreme climactic events. In tandem with summarizing progress on the 2019 Science Plan, DSP also began to think about ways to make the 2024 Science Plan meet the demands of the current landscape.

A framework that staff proposes is to have the Science Plan be guided by the most challenging issues that Delta science faces- “wicked” problems, or grand challenges: unsolvable in a traditional sense, but manageable given appropriate knowledge and flexible institutions (Luoma et al. 2015). Grand Challenges for Delta Science were first developed by former Delta lead scientists in Luoma et al. 2015, which provided us with the basis for an updated set of Grand Challenges.

Box 1: Definition of a Grand Challenge

- To qualify as a “grand challenge,” a problem must be compelling for intellectual and practical reasons and offer the potential for major breakthroughs in science or science governance (i.e., potential for impact).
- Further, following the National Research Council (2001), a grand challenge should be feasible to address given current capabilities and assuming a significant infusion of resources.

Each Grand Challenge has barriers to addressing or managing the problem, of which we might identify actions that can be taken, or tools developed to help resolve the barrier and begin to address the Grand Challenge. This breakdown provides the opportunity to identify where additional resources and tools can be focused to chip away at barriers and get the Delta science community closer to addressing the Grand Challenges. DSP proposes structuring the forthcoming update to the Science Plan to coordinate research and management actions toward addressing the Grand Challenges.



Grand Challenges

To identify Grand Challenges (as defined by the criteria in Box 1), the Delta lead scientist and DSP staff conducted a literature review of 32 visionary documents published from 2007 to the present that are relevant to the science of the Delta, its watershed, and the broader San Francisco Estuary (Appendix A). From this literature review, three overarching Grand Challenges were synthesized:

1. Scientists and managers must anticipate a world in which environmental conditions and regulatory constraints may be fundamentally different from those faced today.
2. Rapid environmental change is incommensurate with the pace of traditional science, requiring decisions to be made under great uncertainty.
3. Flows of scientific information remain decentralized and poorly connected to policymakers and many human communities with stakes in the Delta.

Recognizing the inherent limitations of a scientific literature review with respect to including other forms of knowledge (like traditional ecological knowledge), DSP staff identified a fourth Grand Challenge:

4. Due to the historic siloing of information sharing amongst differing ways of knowing (e.g., Traditional Knowledge), there is a lack of valuation, understanding, and integration of non-western science into decision-making.

Barriers to Grand Challenges

To better understand and unpack these Grand Challenges, DSP staff explored and considered barriers that the Delta science community faces in addressing Grand Challenges. The results of these discussions provided qualitative data to better inform actionable steps to address barriers.

Nexuses

Though the barriers associated with each grand challenge are unique, there were commonalities in their thematic areas.

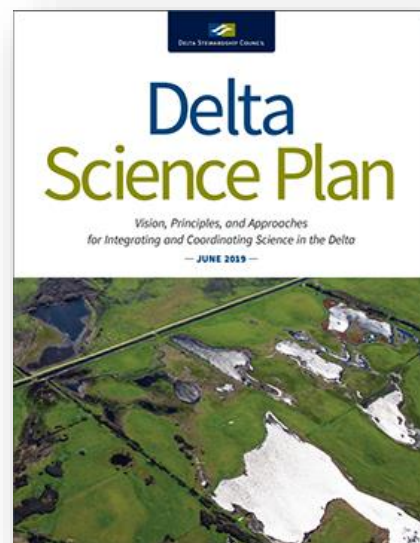
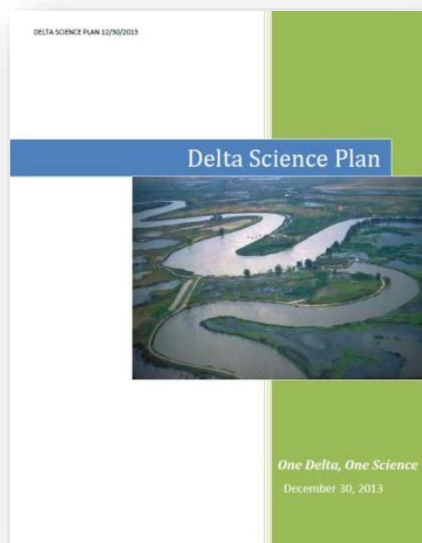


Box 2: Barriers to Grand Challenges

- **Institutional:** Barriers reducing access to decision-making must be examined.
- **Coordination:** Flows of information must be standardized, streamlined, and be easily accessible.
- **Synthesis:** Information needs to be synthesized rapidly and comprehensively. Maintaining a workforce to do so is paramount.
- **Funding:** Funding cycles are short and only available to certain models of research.
- **Time:** Increased coordination and synthesis can allow for more timely decision-making; however, co-production and the expansion of roles at the decision-making table may require slowing down to make the right decision.

Next Steps

The Grand Challenges and identified barriers illuminate the major issues facing the Delta. Creating actionable steps to address the barriers to the Grand Challenges will provide a framework for the next Science Plan.



Appendix A- Table of Literature Used in Review

Visionary documents were chosen for this review- those that are high-level, strategic, and focused on broad sectors of the Delta science community.

The literature review used the 2007 Delta Vision Blue Ribbon Task Force report as the earliest document, with material published after this report considered to be part of the modern Delta science era.

Title

Delta Vision Blue Ribbon Task Force report (2007)

Envisioning Futures for the Sacramento-San Joaquin Delta (Lund et al. 2007)

Delta Plan (2013)

Challenges facing the Sacramento-San Joaquin Delta (Luoma et al. 2015)

A case study in integrated management: Sacramento–San Joaquin Rivers and Delta of California, USA (Lacan and Resh 2016)

Science Enterprise Workshop: Executive Summary (USGS and DSC 2016)

Estuary BluePrint/CCMP (San Francisco Estuary Partnership 2016)

Science Enterprise Workshop: Complete Proceedings (USGS and DSC 2016)

Biological Goals Advisory Panel Report for the SWRCB (2019)

A Review of the IEP's Ability to Provide Science Supporting Management of the Delta (ISB 2019)

ISB letter on draft Ecosystem Amendment performance measures (2019)

ISB letter to DPIIC: Urgency & Opportunities for Improving Delta Interagency Science & Technical Integration (2019)

Delta Science Funding and Governance Initiative report (DSC 2020)

ISB memo on review of draft Ecosystem Amendment (2020)

ISB memo to Delta Social Science Task Force on A Social Science Strategy for the Delta (2020)

Critical Needs for Control of Invasive Aquatic Vegetation in the Sacramento-San Joaquin Delta (Conrad et al. 2020)

Social Science Task Force Report (Biedenweg et al. 2020)

Building an Effective Delta Science Enterprise (DSC 2020)

IEP Science Strategy 2020-2024

How to Respond? An Introduction to Current Bay–Delta Natural Resources Management Options (Sommer 2021)

Science Needs Assessment (excerpts) (DPIIC and ISB 2020)

Delta Adapts: Creating a Climate Resilient Future (DSC 2021)

Integrating Science for a rapidly changing Delta: Principal Science Recommendations (DPIIC and ISB 2021)

Preparing Scientists, Policy-Makers, and Managers for a Fast-Forward Future (Norgaard et al. 2021)

The Science of Non-Native Species in a Dynamic Delta (ISB 2021)

Outcomes from the 2021 SAC meeting on Bay-Delta Integration

Early Detection Rapid Response Draft Framework (Delta Interagency Invasive Species Coordination Team 2021)

CAMT Assessment of Reviews (2021)

Science Action Agenda 2022-2026 (DSP 2022)

Estuary BluePrint/CCMP (San Francisco Estuary Partnership 2022)

Review of the Monitoring Enterprise in the Sacramento-San Joaquin Delta (ISB 2022)

Review of Water Supply Reliability Estimation Related to the Sacramento-San Joaquin Delta (ISB 2022)