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Draft Assessment of the Impact and Value of the Delta Independent Science Board

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Executive Summary

The Delta Independent Science Board (Delta ISB; Board) is charged by the 2009 Delta Reform Act to "provide oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Sacramento-San Joaquin Delta through periodic reviews of each of those programs that shall be scheduled to ensure that all Delta scientific research, monitoring, and assessment programs are reviewed at least once every four years" (California Water Code 85280 (a)(3)). Established in 2010, the Board has provided independent scientific advice and oversight for over a decade. Given this milestone, and with six new members integrating into the Board, in 2020 the Delta Science Program set out to assess the Delta ISB and its products.

In its first 10 years, the Delta ISB has completed over 50 major products. Generally, these products fall into three main categories: programmatic thematic reviews, agency document reviews, and call to action letters and memos. **Programmatic thematic reviews** are those designed by the Delta ISB to meet its legislative mandate of reviewing "programs" by themes or topical areas. The Delta ISB has completed thematic reviews on restoration, fish and flows, adaptive management, levees, Delta as an Evolving Place, water quality, non-

native species, and the Interagency Ecological Program. **Agency document reviews** are independent scientific reviews of specific documents, such as draft science plans or papers, that are requested by document authors or interested parties. Throughout the years, the Delta ISB has completed reviews on the draft Delta Plan (and amendments), environmental documents for the Bay-Delta Conservation Plan/California WaterFix, documents pertaining to the revisions to the Bay Delta Water Quality Control Plan, and drafts of the Delta Science Plan and Science Action Agenda (both parts of the Delta Science Strategy). **Call to action letters and memos** are directed to specific agencies and are meant to share the Board's emerging insights, key findings, or recommendations that require action. Often these are catalyzed by presentations from agency scientists at Delta ISB meetings or conferences, or interactions that Delta ISB members have with scientists and managers when presenting their own reviews at conferences.

In our assessment of the Delta ISB and its products, our core objectives were to document usages of Board products (i.e., their applications), determine how the Board has influenced the Delta (i.e., its impacts), and understand the significance of these impacts (i.e., its value). Findings of the assessment are intended to inform improvement to Board processes and to increase the value and impacts of its reviews.

In order to achieve these objectives for a 10-year assessment, the project team collected three types of information:

1. Inventory of Delta ISB products and verifiable uses or applications of those products
2. Stakeholder perceptions of the Delta ISB and its products based on a survey that received 174 responses and 26 interviews, and
3. Reflections of current and past Delta ISB members through interviews.

Our intent in employing this triad of approaches was to produce a more complete and holistic assessment than would be achieved by any single approach. Through our inventory analysis, we were able to identify how Delta ISB products have been applied in the region. In general, we observed that change does result directly from implementation of Delta ISB recommendations in some cases, but in other cases Delta ISB recommendations are not the sole catalyst for change. We also observed that the application of Delta ISB products often goes beyond implementing recommendations in thematic reviews or incorporating feedback provided by the Delta ISB from agency document reviews. The findings could be cited in journal articles or used in policy and management applications. Based on the assessment, below are a few highlights of how the Delta ISB's recommendations have influenced Delta programs and science direction.

- A **2016 levee hazard review** brought together scientist and managers to explore natural threats to levees as well as the consequences of levee failures in the Delta. The review was used as a resource to amend Delta Plan Chapter 7, Reduce Risk to

People, Property, and State Interests in the Delta. The research gaps from this review were included as science actions in the 2017-2021 Science Action Agenda. Based on a 2021 progress report of the Science Action Agenda, early progress has been made to implement actions on levee hazards.

- A **2017 review of the Delta as an Evolving Place** identified the lack of social science research in the Delta and in part led to the creation of a Delta Social Science Task Force, which was charged with developing a strategic plan to strengthen and integrate social sciences into the science, management, and policy landscape of the Delta. This strategic plan was completed in 2020, and the Delta Stewardship Council is now implementing the recommendations from the plan.
- A **2016 adaptive management review** and subsequent journal article found that adaptive management has rarely been implemented as described in the Delta Plan. Based on our assessment, this review is the most cited thematic review, primarily in the scientific literature to describe the state of adaptive management and as a resource in adaptive management plans for restoration projects The Delta Conservation Adaptive Management Action Strategy, developed by the Interagency Adaptive Management Integration Team, consists of a series of actions that could address the barriers identified by this review. Several of the actions are directly responsive to recommendations in the Delta ISB review and journal article, which are being implemented by the Interagency Adaptive Management Integration Team.

As shown in the examples above, the inventory approach documents verifiable information about uses of Delta ISB products. However, the inventory does not on its own convey the value or impact of Delta ISB products. For this reason, we also collected narrative, experiential, and evaluative information from both stakeholders and Delta ISB members to understand how they perceive the value and impact of the Board and its products. The next section contains highlights of our overarching findings that synthesize points of convergence between the three types of information. Subsequently, we highlight findings that we feel merit further consideration specifically by the Delta ISB and the Delta Stewardship Council.

Overarching findings

The Delta ISB is recognized as an important source of independent scientific oversight and review in the Delta. Stakeholders see the Delta ISB as an objective, apolitical entity, and a scientific resource to the entire Delta community, and emphasized the value of having a standing independent science board. Board products are widely regarded by stakeholders as scientifically rigorous and relevant to Delta science and management. Many Delta ISB members saw the independence of the Delta ISB as central

to its purpose and specifically mentioned the importance of its independent external perspective.

After ten years, the Delta ISB has an established yet evolving process for conducting reviews within the scope of its regulatory mandate. Most Board members we interviewed felt that the processes developed by the Delta ISB over the last ten years worked well and have improved during that time. They also recognized opportunities for further improvements at various stages of review, including how to select review topics, what methods to use for doing the reviews, how to write reviews and get Board endorsement of them, and how to conduct effective outreach for completed products.

Delta ISB products are used in a variety of ways, but most often in policy and management applications. According to our inventory analysis, there have been 195 citations of Delta ISB products in 137 unique documents. In addition to policy and management applications, Delta ISB products frequently provide program support and are used as scientific citations or for other informational purposes. Incorporation of feedback on agency document reviews and implementation of recommendations in thematic reviews are well documented by citations in the inventory.

"Implementation" of Delta ISB recommendations is nuanced, and not always direct. Citations in our inventory document multiple examples of direct implementation of recommendations from Delta ISB thematic reviews. Stakeholder interviewees discussed several examples of direct implementation of recommendations from agency document reviews, but no examples of implementation of recommendations from thematic reviews. However, interviews revealed that recommendations in thematic reviews are sometimes taken up through more indirect processes, as in when they provide momentum, leverage, or justification for current, planned, or proposed activities.

A range of outcomes and influences beyond "implementation of recommendations" are associated with the Delta ISB and its products. Stakeholders described several ways the Board positively influences the science, management, and policy landscape of the Delta, such as increasing scientific understanding, prompting community responses, providing various types of support for stakeholders, and directing attention to important issues.

Many stakeholders felt increased engagement would improve Delta ISB reviews and increase the likelihood that recommendations will be implemented. Stakeholders described a suite of challenges that may inhibit implementation of Delta ISB recommendations. These include a lack of specificity in the recommendations, a perceived lack of clarity as to who is responsible for implementing them, and a lack of guidance about how they should be implemented. Many stakeholders encouraged the Board to better familiarize itself with the management and regulatory context of Delta science to better inform reviews and support the formulation of practical and actionable recommendations.

Many Board and stakeholder interviewees felt that greater engagement with stakeholders at various stages of the review could increase the likelihood that the final product and recommendations are aligned with agency needs, interests, and capacities, and therefore would be more likely to be implemented.

Findings for consideration by the Delta ISB

Stakeholders conveyed largely positive attitudes about the Board and expressed affirmations for its products and other contributions to the Delta. Although it may at times be difficult to identify concrete outcomes resulting from Delta ISB reviews, stakeholders recognized a range of ways in which the Board exerts positive influence in the Delta. Even when Delta ISB recommendations are not directly implemented, they are generally perceived as deserving of consideration. Beyond direct implementation, Delta ISB recommendations can provide validation or justification for current, planned, or proposed activities, and these outcomes are widely valued by stakeholders.

Some stakeholders felt the Board has erred on the side of maintaining too much independence and urged the Delta ISB to better familiarize itself with the realities of Delta science and management. Stakeholders identified the importance of conducting reviews and formulating recommendations that are well-informed by an understanding of the regulatory context for Delta science, as well as the practical issues and constraints facing managers and scientists. This is especially important if the Board's aim is to provide relevant and actionable recommendations.

Outreach and communication were widely identified as areas for improvement. While stakeholders listed several effective aspects of Delta ISB outreach, including the accessibility of public meetings and solicitation of and responsiveness to public comments, they also highlighted opportunities for improvement. Stakeholder interviewees suggested that targeted outreach and/or an overall communications strategy may enhance the effectiveness of Board outreach and communication. Nearly all interviewed Board members recommended more direct interaction with relevant agency and stakeholder representatives to convey report findings. Although many Board members and stakeholder interviewees felt Delta Stewardship Council (Council) and Delta Plan Interagency Implementation Committee (DPIIC) meetings are effective venues for communication with decision-makers, many felt outreach should extend beyond presentations in these two forums. Interviewees in both groups felt the Delta ISB could raise awareness of its products by presenting in many different venues when the products are released.

Some felt the Board could seek more input from the stakeholder community when selecting topics for review. Although Board processes currently incorporate public participation, both Delta ISB members and stakeholders felt more could be done to inform topic selection. Interviewees suggested this could be done by interacting regularly with the Delta community, including scientists, managers, decision-makers, and other stakeholders, to hear what might be most helpful to them. Other suggestions included having in-Delta

meetings and site visits, as well as learning about Delta regulatory and management systems and the state of Delta science.

Some stakeholders encouraged engagement with target implementers as recommendations are formulated, to increase the likelihood that Delta ISB recommendations will be implemented. Commentary in several stakeholder interview groups revealed a desire for Board recommendations to be more practical, actionable, and relevant to Delta stakeholders. To this end, one suggestion was for the Board to do "reality check check-ins" with target implementers as recommendations are being formulated, to ensure the final recommendations are crafted with responsible parties' current activities and constraints in mind. However, some stakeholders felt that, as an independent scientific board, it is the Delta ISB's role to formulate recommendations based on its scientific expertise, but decisions about whether to implement or not involve value judgments made through policy processes, in which the Board should not engage nor seek to influence.

Findings for consideration by the Council

Interviews with both stakeholders and Delta ISB members revealed encouragement for greater and more deliberate interaction between the Delta ISB and the Council. Several stakeholders felt that Board activities should more regularly be reported to the Council, and perhaps DPIIC. Many Board members also felt that they were not getting sufficient updates from Council staff on implementation status and noted that they would appreciate more direct input on how the Council itself has responded to Board products. In addition, interviews with both stakeholders and Board members suggest there is a lack of clarity about the relative roles of Delta ISB members, Council staff, and Delta Science Program staff in outreach and communication. Many Board members emphasized that it is critical for the Board to have help from the Council and Science Program in these areas.

Several board members felt the Council, which is by statute the primary recipient of all Delta ISB reviews, should go beyond improving communication to raise awareness of Delta ISB reviews, and more actively promote implementation of Delta ISB review recommendations. Several members noted that the Council has the resources to promote Delta ISB products and could do more to encourage that others, including legislators, look at Delta ISB products. One felt the Council has the "weight and authority" to "push forward" Delta ISB reviews, while the Delta ISB itself does not.

Tracking implementation of Delta ISB recommendations was identified as a gap that should be filled. Board members were often reluctant to discuss the "impact" of their work because no systematic process was in place to track implementation of their recommendations prior to this assessment. Delta ISB members uniformly felt that tracking implementation of Delta ISB recommendations is an important activity that should be done

to a greater extent. However, they also felt tracking was not within their purview, and should instead be done by Delta Science Program or other Council staff.

Summary

In summary, it is clear from our assessment that the Board has high scientific credibility in the Delta, and that its work is relevant to many audiences. Whether the Board could enhance the relevance of its work by increasing its engagement with Delta stakeholders—and how it could do so without compromising its authority as an independent, impartial scientific body—are important and intellectually rich considerations for Delta ISB members. These considerations and relevant discussions could inform Board's approach going forward, as new and continuing members define their work together and plan for the future.

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List of Abbreviations

Council = Delta Stewardship Council

Delta ISB or Board = Delta Independent Science Board

DPIIC = Delta Plan Interagency Implementation Committee

Delta Reform Act = Sacramento-San Joaquin Delta Reform Act of 2009

EIR/EIS = Environmental Impact Report/Environmental Impact Statement

IAMIT = Interagency Adaptive Management Integration Team

IEP = Interagency Ecological Program

Chapter 1: Introduction

Purpose and approach of this assessment

The Delta Independent Science Board (Delta ISB, Board) is an integral part of an ongoing, dynamic, and multi-faceted relationship between science and governance in the Sacramento-San Joaquin Delta (Norgaard et al. 2009). Charged to "provide oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Sacramento-San Joaquin Delta through periodic reviews of each of those programs that shall be scheduled to ensure that all Delta scientific research, monitoring, and assessment programs are reviewed at least once every four years" (California Water Code 85280 (a)(3)), the Delta ISB has provided independent scientific advice and oversight for over a decade.

The Delta ISB's immediate predecessor was an independent science board instituted under the CALFED Bay-Delta Program (CALFED 2000). In 2009, CALFED gave way to a new governance regime established by the Delta Reform Act, which created the Delta Stewardship Council (Council), the Delta Science Program, and the Delta ISB. The Delta ISB is envisioned in this legislation as a critical partner to the Council, providing scientific expertise to support the Council in its mandate to advance the coequal goals of a reliable water supply and ecosystem resilience, both achieved in a manner that protects and enhances the unique values of the Delta as an evolving place. The Council and the Delta Science Program, in turn, provide resources and staff support that enable the Board to conduct its work. Nonetheless, the Delta ISB operates by its own direction and authority, independent of any organization or agency in the Delta, including the Council.

Having passed the Delta ISB's 10-year milestone, and with six new members integrating into the Board, in 2020 the Delta Science Program set out to assess the Delta ISB and its products. The core objectives of this assessment are to document usages of Board products (i.e., their applications), to determine how the Board has influenced the Delta (i.e., its impacts), and to understand the significance of these impacts (i.e., its value). Findings of the assessment are intended to inform improvement to Board processes and potentially increase the value and impacts of its reviews.

To achieve these objectives for a 10-year assessment, the project team collected three types of information:

1. Inventory of Delta ISB products and verifiable uses or applications
2. Stakeholder perceptions of the Delta ISB and its products
3. Reflections of current and past Delta ISB members.

Our intent in employing a triad of approaches was to produce a more complete and holistic assessment than would be achieved by any single approach. The first approach involved compiling and analyzing numerical information about citations of Delta ISB products, while the second and third involved collecting narrative, experiential, and evaluative information from both external (stakeholder) and internal (Delta ISB) perspectives. The methods used for each approach are explained in their respective chapters and associated appendices.

Content of this report

This report is organized as follows:

- In this chapter, we provide background information about the assessment and the Delta ISB.
- In Chapter 2, we present results from the inventory.
- In Chapter 3, we report on stakeholder perceptions of the Delta ISB and its products, based on interviews and a survey conducted at the end of 2020.
- In Chapter 4, we report on past and ongoing Board members' reflections about the Delta ISB and its products, based on interviews conducted at the end of 2020.
- In Chapter 5, we summarize key findings and synthesize takeaways from the three previous chapters.

Background

Delta ISB membership

As required by the Delta Reform Act, Delta ISB members are appointed to five-year terms by the Council, following nomination by the Delta Lead Scientist. Delta ISB members may serve up to two full terms. Delta ISB members elect a Chair, Chair-elect, and Past-chair among their membership. A Delta ISB member elected to the chairship will first serve as Chair-elect, then as Chair and then as Past-chair. A Delta ISB member serves two years in each position for a total of up to six years on the chairship (Table 1-1 and Table 1-2).

Table 1-1. Overview of past, current, and upcoming Delta ISB chairs.

Chair	Term
Richard Norgaard, Ph.D.	September 2010 to May 2013
Tracy Collier, Ph.D.	June 2013 to May 2015
Jay Lund, Ph.D.	June 2015 to May 2017
Stephen Brandt, Ph.D.	June 2017 to May 2019
Elizabeth Canuel, Ph.D.	June 2019 to August 2020
Stephen Brandt, Ph.D.	September 2020 to August 2022
Lisa Wainger, Ph.D.	September 2022 to August 2024

Table 1-2. Overview of Delta ISB membership over the years and general expertise. Changes in membership are in bold and underlined. Expertise listed in the table is a generalization of a member's expertise.

#	2010 to 2012	2012 to 2014	2015 to 2020	2020 to present
1	Brian Atwater (Geology)	Brian Atwater (Geology)	**Thomas Holzer (Geology),** started January 2018. Atwater departed December 2017.	Thomas Holzer (Geology)
2	Elizabeth Canuel (Biogeochemistry, Water Quality)	Elizabeth Canuel (Biogeochemistry, Water Quality)	Elizabeth Canuel (Biogeochemistry, Water Quality)	**Diane McKnight (Biogeochemistry)**, started September 2020.
3	Tracy Collier (Toxicology, Water Quality)	Tracy Collier (Toxicology, Water Quality)	Tracy Collier (Toxicology, Water Quality)	**Tanya Heikkila (Governance)**, started September 2020.
4	Michael Healey (Fisheries, Adaptive Management)	**Harindra Fernando (Engineering)**, started October 2012. Healey departed March 2012	Harindra Fernando (Engineering)	Harindra Fernando (Engineering)
5	Edward Houde (Fisheries)	**Stephen Brandt (Fish & Food-webs**), started January 2014. Houde departed May 2013.	Stephen Brandt (Fish & Food-webs)	Stephen Brandt (Fish & Food-webs)
6	Jeffrey Mount (Geomorphology)	**Jay Lund (Engineering),** started November 2012. Mount departed October 2012.	Jay Lund (Engineering)	Jay Lund (Engineering)
7	Judith Meyer (Freshwater Ecology)	Judith Meyer (Freshwater Ecology)	**Joy Zedler (Wetland Ecology)**, started June 2015. Meyer departed December 2014.	**Robert Naiman (River Ecology),** started in September 2020. Zedler departed June 2020.
8	Richard Norgaard (Resource Economics)	Richard Norgaard (Resource Economics)	Richard Norgaard (Resource Economics)	**Lisa Wainger (Economics)**, started in September 2020.
9	Vincent Resh (Aquatic Ecology, Entomology)	Vincent Resh (Aquatic Ecology, Entomology)	Vincent Resh (Aquatic Ecology, Entomology)	**James Cloern (Aquatic Ecology)**, started September 2020. Departed June 2021.
10	John Wiens (Landscape Ecology)	John Wiens (Landscape Ecology)	John Wiens (Landscape Ecology)	**Virginia Dale (Landscape Ecology)**, started September 2020.

The original ten members of the Delta ISB first met in September 2010 (Table 1-2). Four of these original ten members decided to leave their first term early, while another member completed their first term and decided to leave their second term early. Vacancies were filled by new members who were appointed to five-year terms by the Council based on a nationwide search led by the Delta Lead Scientist. The other five completed two full terms, departing the Board in August 2020. Around the same time, one of the single-term members chose to depart after completing their first term in June 2020, leaving a total of six vacancies. In September 2020, six new members started their term on the Delta ISB, resulting in a majority of new members for the first time since its inception. With this transition arose an opportunity for the new Board to revisit its practices and future work plans; conversations that may be supported by findings reported in this assessment.

Delta ISB products

One of the first products of the Delta ISB was a memo that provided advice to the Council on addressing multiple stressors in the Delta Plan, which was based off a request that the Council received from the California legislature to develop a prioritized list of stressors in the Delta (Delta ISB 2011). The Delta ISB's advice in the memo, submitted on January 26, 2011, was based on a quick survey of efforts throughout the world and a workshop organized by the Delta Science Program held on January 12, 2011. The Delta ISB's memo was used by the Council to inform the development of the Delta Plan and is part of the Delta Plan, as Appendix I (DSC 2013).

Since then, the Delta ISB has produced three main types of products in its first ten years: (1) thematic program reviews, (2) agency document reviews, and (3) call to action letters and memos (see Appendix 1 for a full list of products). These reviews are developed with public participation and in an open and transparent manner, where there are various opportunities for public feedback. Each of these types of products is described briefly below.

Thematic program reviews

To meet its legislative mandate, the Delta ISB is currently reviewing "programs" by thematic or topical areas. This thematic approach was developed early on, based on a 2012 Delta Science Program inventory documenting over 50 programs that support adaptive management (DSC-DSP 2012), prompting the Delta ISB to recognize that it likely would not be feasible to review each individual program every four years (Delta ISB 2013). Moreover, because science cuts across boundaries of individual projects and organizations involved, a thematic approach was deemed preferable so that reviews would encompass all scientific activities addressing similar issues, rather than fragmenting issues by individual programs (Delta ISB 2013). Since 2010, the Delta ISB has completed eight programmatic thematic reviews on the topics of habitat restoration (Delta ISB 2013), fish and flows (Delta ISB

2015b), adaptive management (Delta ISB 2016a), Delta levees (Delta ISB 2016b), Delta as an Evolving Place (Delta ISB 2017f), water quality (Delta ISB 2018b), non-native species (Delta ISB 2021c), and the Interagency Ecological Program (IEP; Delta ISB 2019a).[1] The Delta ISB is currently in the process of finalizing reviews on water supply reliability (Delta ISB 2021b) and the monitoring enterprise (Delta ISB 2021a).[2]

When the Delta ISB started conducting thematic reviews, the Board proposed that it should review each theme again in the future, to provide an opportunity for the Delta ISB to assess whether its recommendations had been addressed and to provide new insights on the thematic area. Although there have been discussions from 2017 to 2021about revisiting the habitat restoration review, the Delta ISB has not yet revisited a completed review topic.[3]

Every thematic review culminates with a final report documenting Delta ISB findings and recommendations on the topic, and some reviews also included consultant or staff products prepared under the direction of the Delta ISB. This includes the first phase of the monitoring review, which was supported by ESSA Technologies Ltd., cbec eco engineering, and PAX Environmental Inc; and the water quality review, which was supported by a contractor from GEI Consultants Inc. Draft reports are discussed at public meetings of the Delta ISB, where the public can provide oral or written comments. In addition, at least one version of the draft report typically goes out for a 30-day public comment period, sometimes along with targeted individual reviews with experts in the field.

Starting in 2015, the Delta ISB began preparing an initial prospectus for each major review, describing the review's scope and eliciting stakeholder feedback before beginning the review process. The methods for developing the findings and recommendations have evolved over time and may differ by thematic review (see Table 1-3). In the current process, the Delta ISB will generally review existing documents (i.e., literature review), organize

[1] For the purposes of this assessment, we refer to both the Delta ISB's IEP review and the levees review as "thematic reviews" because this is the terminology employed by the Board, although each took a slightly different approach in comparison to the other thematic reviews. The levees review reported on proceedings from a workshop convened by the Delta ISB that focused on the latest Delta levee science. The Delta ISB's IEP review focused on the organizational aspects of the IEP to produce science, which differed from other traditional scientific themes. The IEP is a consortium of nine state and federal agencies that coordinate monitoring and ecological investigations in the Bay-Delta, to help inform State and federal activities.

[2] The monitoring enterprise review has been conducted in two phases. The first phase, which consists of the development of an inventory and initial analysis of the inventory by a contractor under the direction of the Delta ISB, was completed at the time of this assessment. The second phase, which provides the Delta ISB's findings and recommendations based on its own analysis, was not completed at the time of this assessment, but was recently released for public review on October 12, 2021.

[3] Revisiting the habitat restoration review was included in Delta ISB's 2017 planning document and 2020 planning document, which were used to brainstorm and prioritize future reviews.

workshops/panel discussions, attend conferences of interest, conduct interviews with program personnel, and release a public questionnaire to help inform the review.

Table 1-3. Methods used to develop findings and recommendations in different thematic reviews. Table is based off information documented in the reports. The methods for the water supply reliability review and monitoring enterprise review may change, as the reports have not been finalized. In this table and Table 1-4, the adaptive management review is abbreviated as AM and the water quality review is abbreviated as WQ.

Approach	Restoration	Fish & Flows	AM	Levees	Delta as Place	WQ	IEP	Non-Natives	Monitoring	Water Supply
Prospectus	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Literature review	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Interviews	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**
Questionnaire	No	No	**Yes**	No	No	**Yes**	**Yes**	No	**Yes**	**Yes**
Agency presentations, panel, or workshop	No	Yes	No	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Attending other conferences, workshops, meetings of interest (not sponsored by Delta ISB)	**Yes**	**Yes**	No	No	**Yes**	**Yes**	No	**Yes**	No	No
Inventory of science activities	No	No	No	No	No	No	No	No	**Yes**	**Yes**
Public comments	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Contractor support	No	No	No	No	No	**Yes**	No	No	**Yes**	No
Delta Science Program staff support	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

The process for selecting topics has changed over time. Topics were originally selected in alignment with the chapters of the Delta Plan, but selection now also involves stakeholder feedback through retreats, panel discussions, and questionnaires to the Delta community. The Delta ISB also receives input from Delta Science Program and other Council staff on priority review topics through staff briefings with the Delta Lead Scientist and Delta ISB

support staff, along with occasional briefings between the Delta ISB chair, the Council chair, and the Council's executive officer.

With the current approach, these reports usually take two to four years to complete. Upon completion, final reports are provided and presented to the Council, which considers implementing Board recommendations. As findings and recommendations are applicable to many other organizations as well, the Delta ISB typically conducts additional outreach to share its findings with the larger Delta community. Outreach activities vary by review (see Appendix 1 and Table 1-4) and have changed over time. For example, for the first thematic review on habitat restoration, a copy of the final report was provided to California legislature, but this practice stopped in subsequent reports.

Table 1-4. Overview of outreach conducted by the Delta ISB upon completion of thematic reviews. Outreach for all Delta ISB reviews continue to be ongoing. For example, summary sheets for the habitat restoration, fish and flows, and adaptive management reviews were not completed until 2018.

Approach	Restoration	Fish & Flows	Adaptive Management	Levees	Delta as Place	Water Quality	IEP	Non-Natives
Council listserv	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Summary Sheet	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**
Journal Article	No	No	**Yes**	No	No	No	No	No
Presentation to Council	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Presentation to DPIIC	No	**Yes**	**Yes**	No	No	No	No	No
Presentation at other venues	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**
Post-completion workshop/panel	**Yes**	**Yes**	**Yes**	No	No	**Yes**	No	No

Current outreach activities may include presentations at scientific workshops, conferences and meetings at other venues (e.g., Delta Stewardship Council (Council), Delta Plan Interagency Implementation Committee (DPIIC), and IEP director meetings), direct follow up with stakeholder groups who could implement recommendations, and preparation of a summary sheet and/or a journal article. The Delta Science Program and Council Communications staff help distribute many completed products to various outlets including the Council listserv, Maven's Notebook, and Delta eNews. In addition, the Delta Lead Scientist helps communicate findings and recommendations to various bodies, including the Delta Conservancy, State Water Resources Control Board, and the IEP, as part of the Delta Lead Scientist Report to these venues.

Agency document reviews

Outside of thematic reviews, the Delta ISB has provided independent scientific review or commentary on specific documents, such as draft science plans, scientific reports, and environmental impact reports. Some of these document reviews were requested by a specific organization, and some were initiated by the Delta ISB. The review process differs by request. In general, the organization requesting the review has the opportunity to provide suggestions on the review questions or scope of the review, but the ultimate decision about the review scope is made by the Delta ISB.

To date, the Delta ISB has completed 36 agency document reviews, including 14 Delta Plan reviews, eight Bay-Delta Conservation Plan/California WaterFix reviews, seven Delta Science Strategy reviews of the Delta Science Plan or Science Action Agenda, three Bay-Delta Water Quality Control Plan reviews, and four other reviews (see Appendix 1 for a list of all Delta ISB products). This type of review usually takes two to six months to complete. Many of these document reviews stem from legislative mandates in the Delta Reform Act for the Delta ISB to (1) provide independent advice to the Council on the Delta Plan (California Water Code 85308 (a)) and (2) to consult with the California Department of Water Resources on the Bay-Delta Conservation Plan/California WaterFix, which included submitting comments on the environmental impact report for this project to the Council and to the California Department of Fish and Wildlife (California Water Code 85320 (c)). When complete, agency document reviews are discussed at a Delta ISB meeting, posted on the Board's website, and presented to the organization that requested the review and/or authored the reviewed document. Compared with thematic reviews, there is generally little outreach for these reviews, beyond interactions with specific target audiences. Broader outreach is not conducted for public feedback (e.g., releasing a draft report for a 30-day public comment period via the Council listserv), but there are opportunities for public comments at meetings where the review is being discussed by the Delta ISB.

Call to action letters and memos

Finally, the Delta ISB periodically prepares letters or memos to specific agencies, in which the Board shares emerging insights, key findings, or recommendations that require action. These letters or memos are usually completed within one to three months. Often these are catalyzed by presentations that the Delta ISB either gives to or receives from agency scientists at Delta ISB meetings or conferences. Since 2010, the Delta ISB has completed seven letters/memos, such as letters/memos on stable funding for the Delta Science Program to the California legislature (Delta ISB 2012b), drought and related management opportunities to the Council (Delta ISB 2015a), and organizing the science enterprise to better prepare for and support management in the face of rapid environmental change to DPIIC (Delta ISB 2019b; referred to as rapid change letter; see Appendix 1 for a full list of letters/memos).

Upon completion, these letters and memos are sent directly to the entity or entities to which they are addressed. As with agency document reviews, there is generally little outreach around these letters/memos, beyond interactions with their specific target audiences. The main exception is the Delta ISB's rapid change letter to the DPIIC in February 2019, in which the Delta ISB called for better organization of the science enterprise and to accelerate efforts to address rapid environmental changes through a Science Needs Assessment (Delta ISB 2019b). This call was based upon the Delta ISB's review of the draft 2019 Delta Science Plan and draft Delta Science Funding Resiliency Strategy (now known as the Delta Science Funding and Governance Initiative). The Delta ISB presented this letter to DPIIC in April 2019 and the Science Needs Assessment was incorporated as a priority action of the Delta Science Funding and Governance Initiative implementation report in July 2019 (DSC 2019a). Since then, the Delta ISB has provided periodic updates to DPIIC on the development of the Science Needs Assessment in July 2020, October 2020, and March 2021. Broader outreach is not conducted for public feedback (e.g., releasing a draft letter/memo for a 30-day public comment period via the Council listserv), but there are opportunities for public comments at meetings where the letter/memo is discussed by the Delta ISB.

Chapter 2: Inventory of Delta ISB Products and Applications

Introduction

The purpose of this chapter is to identify how Delta ISB products have been applied, which can then be used to help understand the value and impact of the Delta ISB as perceived by stakeholders (see Chapter 3) and past and current Delta ISB members (see Chapter 4).

Prior to this assessment, applications of Delta ISB products have not been comprehensively summarized. The most comprehensive information available pertains to applications of Delta ISB products by the Council. In the past the Delta Science Program tracked usage of Delta ISB products by the Council based on staff's direct knowledge, along with feedback from Council Executive staff at public Council and Delta ISB meetings. Once the Delta ISB completes a final report, the Council considers the findings and recommendations, and reports back to the Delta ISB at its public meetings on how the recommendations may be implemented. Council staff also periodically provide updates on Council work that may help advance a Delta ISB recommendation, or on Council work that the Delta ISB has reviewed.

Less is known about applications of Delta ISB products by organizations other than the Council. There are a few reasons for this. First, the recommendations in thematic reviews cover multiple programs and are widely circulated to through various venues and listservs and communicated to other organizations by the Delta Science Program or other Council staff. Moreover, although multiple programs provide feedback on thematic reviews as they are developed (e.g., by providing public comments, participating in workshops, or completing questionnaires), it is largely unknown how these programs use the reviews once they are complete. Although the Council did report out on some of the key outcomes of the Delta ISB's thematic reviews, as part of the Delta Plan Five-Year Review (DSC 2019b), there was large uncertainty about how the Delta ISB's products have been used outside of the Council.

Outcomes of agency document reviews or call to action memos can be difficult to track as well. In some cases, the Delta ISB reviewed multiple versions of one document, such as the initial draft of the Delta Plan (2011 to 2012) and multiple iterations of the Bay-Delta Conservation Plan/California WaterFix environmental documents (2012 to 2017). Looking at subsequent versions afforded the Delta ISB some ability to assess how the documents or projects changed as a result of its feedback. However, in many other agency document reviews, the recipient organization or individual did not provide a written response to the Delta ISB describing how the Delta ISB's feedback or recommendations were or will be

incorporated. This makes it challenging to ascertain whether or how the Delta ISB influenced subsequent changes to the product.

Given these gaps in understanding usage of Delta ISB products, we inventoried applications of Delta ISB products as documented by citations in literature, reports, plans, or public comments to help gain a fuller picture on the usage of Delta ISB products. This chapter first describes the methods to develop the inventory and then presents a synthesis of results on major themes on how the Delta ISB's products have been applied.

Methods

In an effort to document applications of Delta ISB products, a spreadsheet inventory was developed that tracked documents citing Delta ISB products. This inventory included the author, title, and link to the product that cited the Delta ISB review (see Appendix 1), and only accounts for Delta ISB products (including draft products) that were published before December 2020, which aligns with the closing of the survey. At the time of development, the Delta ISB had not yet finalized its review on non-native species, the monitoring enterprise, or water supply reliability. However, prospectuses for all three reviews were included in the inventory because they had been published at the time of this assessment. In addition, a draft report of the non-native species review was available, along with the three reports (Nelitz et al. 2019; Nelitz et al. 2020a, Nelitz et al. 2020b) and workshop summary for Component 1 of the monitoring enterprise review (ESSA et al. 2019). These products were part of the inventory.

The inventory was developed based off:

1. Known outcomes of Delta ISB products through initial tracking of the Delta Science Program prior to this assessment and discussions with Council staff.
2. A review of public comments, presentations or response letters back to the Delta ISB.
3. Internet searches for citations of Delta ISB products. We used Google Scholar and general searches on Google using the name of each Delta ISB product and "Delta Independent Science Board," and conducted searches on the websites of the California Department of Water Resources (which also maintained the IEP webpage at the time), the California Department of Fish and Wildlife, the Delta Stewardship Council, and the State Water Resources Board who had requested reviews from the Delta ISB and/or were the target of Delta ISB recommendations.
4. Responses to a survey by stakeholders, which asked participants to list documents where they have cited Delta ISB products (see Chapter 3 for methods and full results).
5. Interviews, which asked participants how they have implemented recommendations (see Chapter 3 for methods and full results).

The inventory is not comprehensive of all citations of Delta ISB products. It relied heavily on Internet searches and does not include documents that are not available online. Furthermore, we did not include any citations provided by survey respondents that could not be verified. Verification involved checking the source documents named in the survey, to ensure they in fact cite the Delta ISB product. Although we were not able to verify all of examples from the survey, there is still a possibility the Delta ISB's reviews were utilized for these projects or documents even when not cited. For instance, the Delta ISB's water quality review recommended that the Delta Regional Monitoring Program expand the contaminants it monitors, so it is possible that this review could help direct the activities of this program, as indicated by two survey responses. However, we could not verify this use through a citation.

Once the inventory was developed, we reviewed the citations and summarized key applications and uses of Delta ISB products. To help with the synthesis of results, we grouped related Delta ISB products:

1. Reviews of the **Bay-Delta Conservation Plan and California WaterFix** environmental documents. In 2020, the Delta ISB reviewed the Notice of Preparation for Delta Conveyance Project and summarized key lessons learned based on its review of the California WaterFix environmental impact report/statement. Although the Delta Conveyance Project is a separate project, we included the Delta ISB review on this the Notice of Preparation in this grouping since the Delta ISB's comments focused on lessons learned from its review of the final California WaterFix environmental impact report/statement.
2. Reviews for the State Water Resources Control Board linked to the revisions to the **Bay-Delta Water Quality Control Plan.**
3. Reviews for the Council on the **Delta Plan**, which includes multiple reviews of the initial Delta Plan chapters, along with later reviews of the Delta Plan amendments.
4. Reviews for the Delta Science Program on the **Delta Science Strategy**, which included drafts of the Delta Science Plan and Science Action Agenda.
5. **The monitoring enterprise review**, which includes the prospectus, a workshop summary and three reports: (1) lessons and methodology report (Nelitz et al. 2019), (2) summary of monitoring activities (Nelitz et al. 2020a), and (3) a synthesis of monitoring activities. These products were grouped, as they were a series of reports.
6. The **adaptive management review** and subsequent journal article (Wiens et al. 2017), which was based off the review findings and recommendations. These were grouped, as there was overlap in content between products.
7. The **rapid change letter (2019)** and **rapid change memo (2020)**. The rapid change memo (Delta ISB 2020a) also includes a draft version (2019) of "Preparing Scientists, Policy-Makers, and Managers for a Fast-Forward Future," which was later published

in June 2021 in the *San Francisco Estuary and Watershed Science* (Norgaard et. 2021). Like with the adaptive management review and journal article, there was some overlap in content among these products.

Results

Overall, we documented 195 Delta ISB citations based off 137 unique documents, as a single document can include multiple citations of Delta ISB products. Each citation of a Delta ISB product can be found in Appendix 1. For a general synthesis, Figure 2-1 shows the percent of citations for the top 14 Delta ISB products or product groupings. Overall, the greatest number of citations were for the Bay-Delta Conservation Plan/California WaterFix reviews (see Figure 2-1). The Delta ISB's most cited thematic review was the adaptive management review followed by the fish and flows review. Call to action memos were not frequently cited with the exception of the Delta ISB's letter to DPIIC on better preparing for rapid change in 2019, and its follow up memo to DPIIC and the Council in 2020.

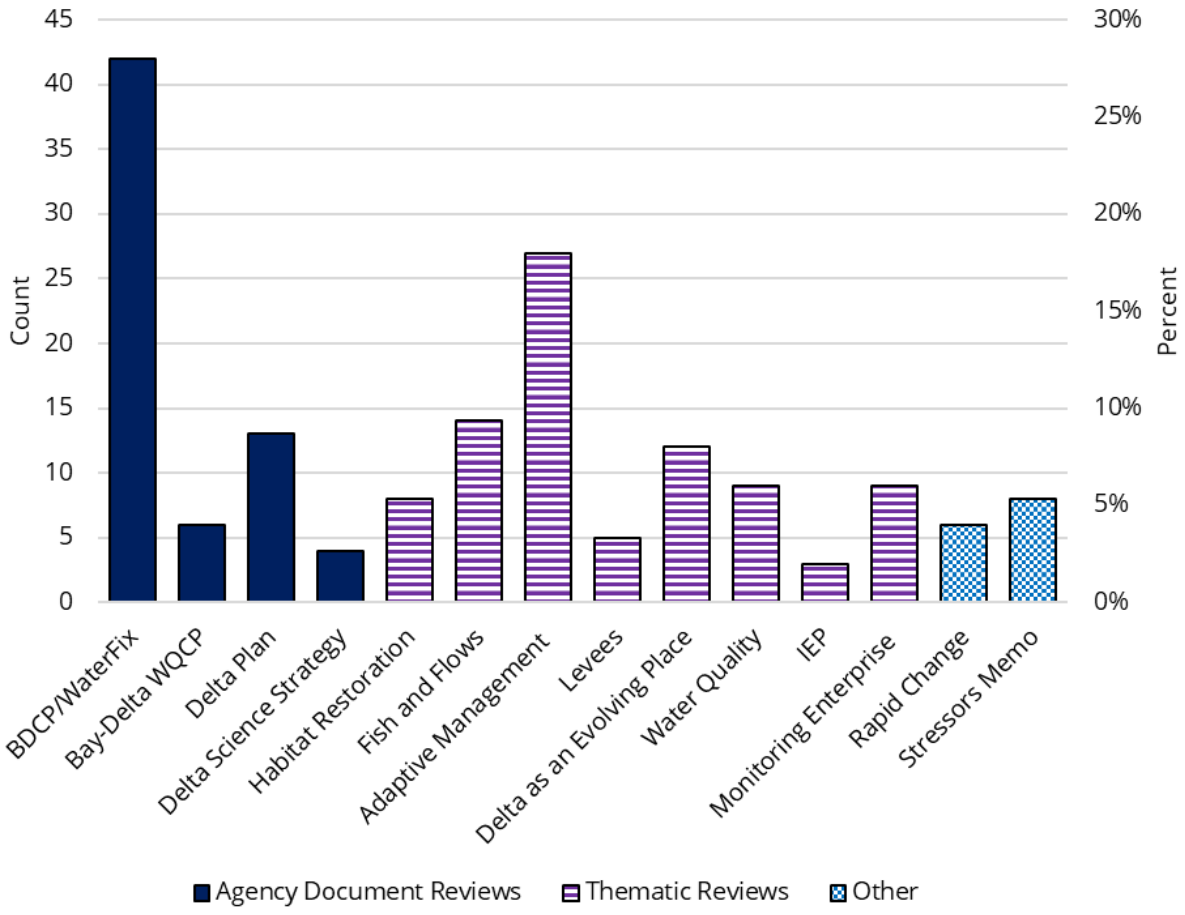

Figure 2-1. Percent and number of citations for each Delta ISB review.

As the inventory was developed, we found additional usages of Delta ISB products beyond implementation of recommendations. For example, a recommendation could be used to support an organization's policy position, or key scientific findings could be cited to help support other work. To capture these different usages, we developed categories, which allowed for the calculation of simple statistics to provide some general insights on the application of the Delta ISB products.

Delta ISB citations usually fell into the following six categories: (1) implementation of Delta ISB recommendations, (2) incorporating Delta ISB feedback, (3) program support, (4) policy and management application, (5) scientific citation, and (6) informational (see Figure 2-2 and described in more depth below).

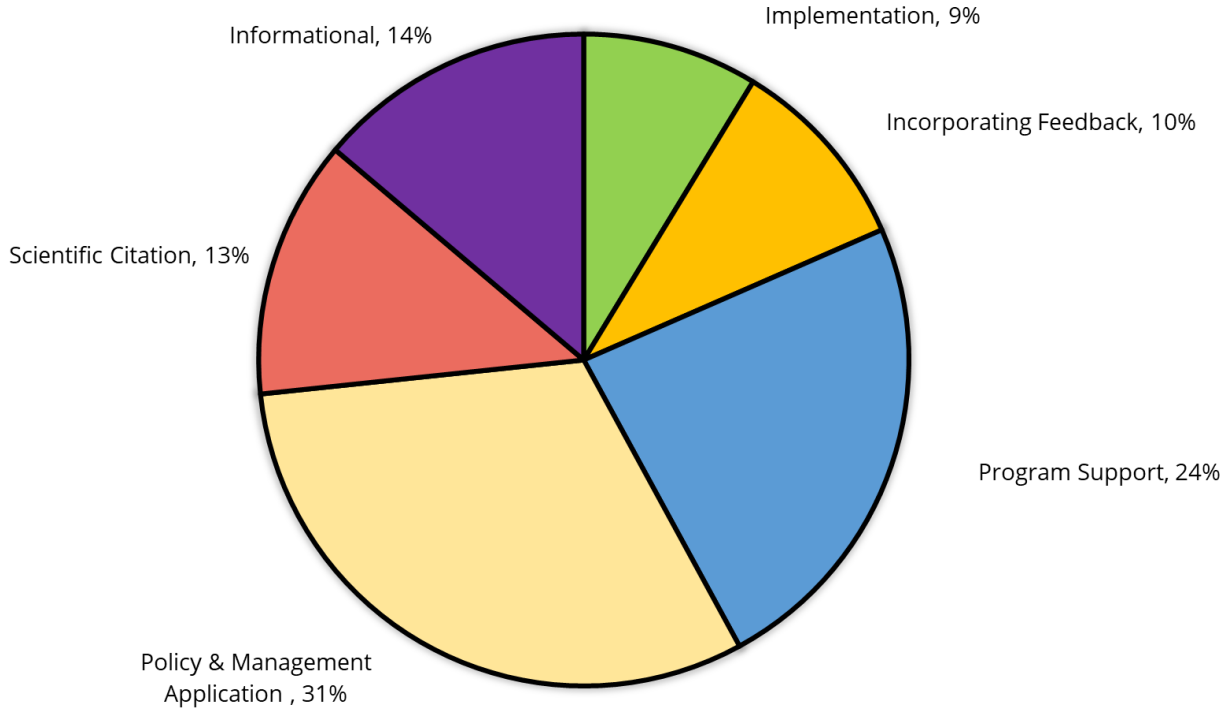

Figure 2-2. Breakdown of citations by category.

Category 1: Implementation of Delta ISB recommendations

The citation indicates a recommendation has been implemented or there are plans to address a recommendation.

Note that this category only includes implementation of Delta ISB recommendations from a thematic review or call to action letter/memo, and not agency document reviews, which often take a different form. Recommendations from a thematic review or a call to action letter/memo often require programmatic changes and could be applicable to multiple organizations. In comparison, agency document reviews are made on a specific document.

In these cases, the Delta ISB's recommendations could be as minor as adding or correcting a scientific citation to more programmatic suggestions, such as changing the way a document is developed, as was the case for the Delta ISB's review of the preliminary draft of the Delta Plan Conveyance, Storage and Operations Amendment (Delta ISB 2017a, Delta ISB 2017b, Delta ISB 2017h). Given the different nature of implementation, we separated out the implementation of recommendations from agency document reviews into Category 2, "incorporating feedback."

An example of Category 1 is the Delta Science Plan, which was developed in response to a Delta ISB recommendation. In its early years, the Delta ISB called for a science plan to address regional challenges that span across agency boundaries (Delta ISB 2012a), based on the need to strengthen the scientific foundation, framework, and coordination of science to support management decisions in the Delta. In response, the Council included a recommendation in the Delta Plan (G R1; DSC 2013) for the Delta Science Program to develop the Delta Science Plan. The first Delta Science Plan was released in December 2013 and last updated in June 2019 (DSC-DSP 2019a).

It is important to note that this category only includes implementation of Delta ISB recommendations from a thematic review or call to action letter/memo, and not agency document reviews, which often take a different form. Recommendations from a thematic review or a call to action letter/memo often require programmatic changes and could be applicable to multiple organizations. In comparison, agency document reviews are made on a specific document, where the Delta ISB's recommendations could be as minor as adding or correcting a scientific citation to more programmatic suggestions, such as changing the way a document is developed, as was the case for the Delta ISB's review of the preliminary draft of the Delta Plan Conveyance, Storage and Operations Amendment (Delta ISB 2017a, Delta ISB 2017b, Delta ISB 2017h). Given the different nature of implementation, we separated out the implementation of recommendations from agency document reviews—referred to here as "incorporating Delta ISB feedback"—from "implementation of Delta ISB recommendations," which only cover thematic reviews and call to action memos.

About 9% (n=17) of the citations in the inventory fall into the implementation category (see Figure 2-2). The main organizations involved in implementing Delta ISB recommendations are the Council (73%, n=13), Collaborative Adaptive Management Team (18%, n=3) and the State of California (6%, n=1).[4] All of the Delta ISB's thematic reviews have at least one

[4] This is in reference to the 2020 California Water Resilience Portfolio, which is authored by the California Natural Resources Agency, California Environmental Protection Agency, and the California Department of Food and Agriculture. It includes an action to "improve Delta monitoring efforts based on Delta Independent Science Board recommendations," a reference to the Delta ISB's monitoring enterprise review, which was just released as a public review draft on October 12, 2021.

citation in the implementation category. The thematic review that had the most citations in this category was the adaptive management review with three citations.

Results in this category indicate that the Council is the primary implementer of Delta ISB recommendations; however, it is important to note that this is biased by the methodology of assigning only one implementing organization, when multiple organizations could be involved in implementation. As an example, the Delta ISB recommendation to develop a Science Needs Assessment, as part of its letter to DPIIC in 2019, is being implemented in a collaborative effort led by the Council with other organizations, including the United States Geological Survey and United States Bureau of Reclamation. However, for the purposes of our inventory, only the Council was recorded as the implementing organization.

The inventory cannot be used to estimate the total number of recommendations from thematic reviews or call to action memos that have been implemented, given the nature of many of the recommendations. Some recommendations are generalized or abstract. As an example, in its fish and flows review, the Delta ISB called for enhanced national and international connections, such as opportunities for travel to conferences and workshops. In 2018, the Council cited this Delta ISB recommendation to help justify out-of-state travel for its staff to bring insights from other ecosystems that may be applicable to the Delta. Note that the Council or other organizations could continue to cite this recommendation repeatedly as justification for future out-of-state travel for its employees.[5]

Category 2: Incorporating feedback from agency document reviews

A Delta ISB review is cited by another entity to acknowledge that their product/program has undergone independent review by the Delta ISB. The reviewed entity may or may not address how the Delta ISB comments are incorporated.

For instance, the State Water Resources Board is conducting a review and update of the 2006 Bay-Delta Water Quality Control Plan, which designates beneficial uses of waters within the Bay-Delta and establishes water quality objectives that must be met to protect these uses. The Delta ISB has provided input at various stages of the update and last provided input to the State Water Resources Board on the draft Scientific Basis Report in 2017 (Delta ISB 2017g), which describes the science on which proposed changes to the Bay-Delta Plan will be based for the Sacramento River and its tributaries. The final Scientific Basis Report acknowledges the report underwent review and describes how Delta ISB comments were incorporated or not (SWRCB 2017).

A final document may not always indicate how Delta ISB's comments are incorporated. For example, the Delta ISB reviewed the draft California EcoRestore Adaptive Management

[5] This example highlights the challenges in measuring whether or not a recommendation has been "fully implemented." Some recommendations may be better labeled as "ongoing."

Program white paper (Delta ISB 2017d), which later evolved into the Delta Adaptive Management Conservation Strategy (DSC-DSP 2019), but the final version of the document did not indicate that it had been reviewed by the Delta ISB. This highlights a limitation with the inventory methodology, which did not capture any usages of Board products that were not cited in writing. However, we are aware that the authors of the Delta Adaptive Management Conservation Strategy did take into account the Delta ISB's comments based on the overview of the final document that was presented to the Board at its public meeting in September 2019.

About 10% (n=19) of the citations in the inventory fall into the category of incorporating feedback. The main organizations that have used Delta ISB reviews as part of their process for developing or refining a document are the Delta Stewardship Council (53%, n=9), California Department of Water Resources (24%, n=4), State Water Resources Control Board (18%, n=3), and the Environmental Data Summit Organizing Committee (6%, n=1).

Category 3: Program support

Findings from an ISB review are used and cited for a science or adaptive management plan, implementation strategy, solicitation for research, etc., but a specific recommendation is not addressed.

For example, the California Department of Fish and Wildlife's Delta Conservation Framework provides a template for regional and stakeholder-led approaches to restoring ecosystem functions to the Delta landscape (Sloop et al. 2018). It cites the Delta as an Evolving Place review to indicate the need for interdisciplinary science to inform decision-making. Based on the survey, there were two individuals who indicated that the Franks Tract restoration design (Franks Tract Futures) followed the recommendations in the Delta as Evolving Place review. Although we were not able to verify this use through a citation, the Franks Tract Futures website did indicate that it was guided by the Delta Conservation Framework, which was the closest evidence that we could find.

About 24% (n=46) of the citations in the inventory fall into the category of program support. Program support is primarily made up of documents that cite a Delta ISB thematic review (36 out of 46 citations or 78%). The other nine citations are for both call to action letters/memos and agency document reviews. Ten unique organizations used Delta ISB reviews for this purpose, with the Delta Stewardship Council being the primary organization that used Delta ISB reviews for program support (see Table 2-1).

Table 2-1. Organizations that have cited Delta ISB reviews for program support. Organizations were separated out if there are multiple authors. In this table, the n represents the number of citations.

Organizations	n	%
California Department of Fish and Wildlife	3	7%
California Department of Water Resources	3	7%
California Governor's Office of Emergency Services (Cal OES)	1	2%
California Sea Grant College Program	3	7%
Collaborative Adaptive Management Team	4	9%
Delta Stewardship Council or Delta Science Program	25	54%
Ducks Unlimited	1	2%
Interagency Ecological Program	3	7%
San Francisco Estuary Institute-Aquatic Science Center	1	2%
Social Science Task Force	2	4%

Category 4: Policy and management applications

Delta ISB reviews are used in public hearings, lawsuits, and public comment letters to support a position on a policy or management issue or to demonstrate the adequacy of science in a particular document.

The Delta ISB's agency document reviews are intended for the authors of the document that the Delta ISB reviewed or those who requested the review. However, these same reviews are often used by other organizations to determine the adequacy of science cited in a different document, or to formulate a position on a management decision. For example, the Delta ISB was required to review the environmental impact report/statement for Bay-Delta Conservation Plan (later California WaterFix), pursuant to California Water Code 85320 (c). In addition, the Delta ISB was required by statute to submit comments on the environmental impact report/statement to the Council and California Department of Fish and Wildlife, and to consult with the California Department of Water Resources on this project. Based off the Delta ISB's comments, the California Department of Water Resources considered feedback from these reviews to help produce the final environmental impact report (see DWR 2017), which is an example of a citation that incorporates Delta ISB feedback (see Category 2). However, there are broader applications of these reviews that fit into Category 4. The Delta ISB reviews and comment letters were referenced in comment letters from other organizations regarding the State Water Resources Control Board hearings on the petition to change the water rights for the project, and in the appeals of the Certification of Consistency with the Delta Plan.

The Delta Plan requires that all major ecosystem and water projects file a certification of consistency with the Delta Stewardship Council, attesting that the project (i.e., the covered

action) is consistent with the policies in the plan to achieve the coequal goals. Any party can file an appeal on the certification of consistency, in which case the Council will make a decision, following established procedures,[6] on whether to remand the covered action back to the agency based on the appeals. In its Certification of Consistency, the California Department of Water Resources indicated that project underwent peer review and cited all of the Delta ISB's reviews on the Bay-Delta Conservation Plan/California WaterFix, as part of its Certification of Consistency for Delta Plan General Policy 1(b)(3), which requires all covered actions to document use of best available science. In addition, the Department indicated that its adaptive management and monitoring plan was informed by the Delta ISB's adaptive management review (2016), as part of its Certification of Consistency for Delta Plan General Policy 1(b)(4), which requires a covered action to include and implement adaptive management (DWR 2018). For this project, nine organizations appealed this certification of consistency and three of these organizations cited the Delta ISB reviews on the Bay-Delta Conservation Plan/California WaterFix to indicate that the project was not consistent with General Policy 1(b)(3) on best available science (Sacramento County 2018, San Joaquin County 2018, City of Stockton 2018).

About 31% (n=61) of the citations fall into the policy and management applications category. The following organizations in the list below have used Delta ISB reviews in this capacity.

- A member of Congress
- Association of California Water Agencies
- California Department of Water Resources
- California Coastkeeper Alliance
- California Department of Fish and Wildlife
- California Sportfishing Protection Alliance
- California Water Research
- City of Stockton
- Coalition of Environmental, Environmental Justice and Fishing Organizations
- Contra Costa County
- County of Butte
- County of Sacramento
- Defenders of Wildlife
- Delta Stewardship Council
- Environmental Water Caucus
- Friends of the San Francisco Estuary
- Local Agencies of the North Delta

[6] For additional information, please refer to the Delta Stewardship Council's Administrative Procedures Governing Appeals.

- Mountain Counties Water Resources Association
- Natural Resources Defense Council
- North Delta Water Agency
- Northern California Water Association
- PAC Environmental and Urban Land Use Planning Consulting Services
- Private individual
- Restore the Delta
- Rural County Representatives
- Sacramento County
- Sacramento Regional County Sanitation District
- San Joaquin County
- Solano County
- State and Federal Contractors Water Agency
- State Water Contractors
- The San Luis & Delta-Mendota Water Authority
- The Bay Institute
- Yolo County
- Westlands Water District

About 92% (n=56) of the citations in this category were of agency document reviews. The use of these reviews for policy and management applications was often related to the project that the Delta ISB reviewed, such as the Delta Plan, Bay-Delta Conservation Plan/California WaterFix, or the Bay-Delta Water Quality Control Plan. The Delta ISB's thematic reviews were also used for policy and management applications, but to a much lesser extent. The thematic review most frequently cited for policy and management applications was Delta ISB's fish and flows review, cited to the State Water Resources Control Board on its Bay-Delta Water Quality Control Plan update to indicate flow is just one factor affecting fishes (e.g., Mountain Counties and Water Resources Association 2015 and San Luis & Delta Mendota Water Authority and Westlands Water District 2017).

Category 5: Scientific citation

Findings are used in a peer-reviewed journal article or white paper, but no recommendations are addressed.

About 13% (n=25) of the citations fall in this category. Of this total, about 88% (n=22) of the Delta ISB citations in this category are thematic reviews. The remaining three citations were of the Delta ISB's Science Action Agenda review (Delta ISB 2017c), the monitoring enterprise review prospectus, and a draft of an article of rapid environmental change. Except for the IEP review, all of the Delta ISB's thematic reviews have been used in this capacity at least once. About 44% (n=11) of citations in this category cite either the Delta ISB's adaptive

management review or journal article (2017). Common uses for citations in this category include defining adaptive management or how it has been applied in the region, based on the adaptive management review, or citing to the lack of social science research in the region, referencing the Delta as an Evolving Place review.

A list of journals in which Delta ISB products were cited is shown below. Except for *San Francisco Estuary and Watershed Science*, which is a local journal that is funded in part by the Council, only one unique article citing Delta ISB products was published in each journal.

- Canadian Journal of Fisheries and Aquatic Sciences
- Environmental Management
- Estuaries and Coasts
- GeoForum
- Journal of Environmental Planning and Management
- Journal of the American Water Resources Association
- Limnology and Oceanography
- Restoration Ecology
- San Francisco Estuary and Watershed Science
- Stanford Digital Repository
- Urban Planning

Category 6: Informational

Findings and recommendations are summarized in blog posts or news articles to educate or inform readers on various issues.

Citations in this category can take many different forms from citing a finding to using it to advance policy positions. For example, FishBio, as part of its blog, The Fish Report, summarized the key findings and recommendations from the Delta ISB's fish and flows review, and thereby helped promote a Delta ISB product (FishBio 2015). The California Fisheries Blog (Cannon and Shutes 2015) and the Natural Resources Defense Council Blog (Swanson 2015) published posts that responded to the findings and recommendations in the fish and flows review, and offered critiques that the Delta ISB's call for more research and modeling would only lead to inaction.

About 14% (n=27) of the citations fall in this category. The outlets that have cited Delta ISB products are listed below:

- California Water Blog
- California Water Research Blog
- Daily Kos
- Daily Republic
- Delta Stewardship Council Blog

- Estuary Magazine
- Maven's Notebook
- Natural Resources Defense Council Blog
- The Fish Report (FishBio)
- Water Deeply
- Western Water

General insights on the applications of Delta ISB reviews

The inventory (Appendix 1) provides information on how individual citations utilized Delta ISB products. For this assessment, we synthesized major themes in applications of Delta ISB products. Through a review and synthesis of the inventory, we learned that Delta ISB reviews have been used in a variety of ways that have resulted in changes to help (1) support adaptive management, (2) facilitate the application of social sciences, (3) advance integrated modeling, (4) prioritize and integrate scientific activities, and (5) contribute to helping understand the state of science in the Delta. However, this inventory and analysis alone cannot determine the impact of a Delta ISB product since it is based on an interpretation of the intent of the author(s) who cited the product, and the Delta ISB's recommendation may not always be the sole catalyst for a specific change.

As an example of a project with multiple catalysts including the Delta ISB, in 2020, the Council funded two scientific investigations to help fill knowledge gaps regarding the upgrade to the Sacramento Regional Wastewater Treatment Plant (DSC 2020a). As indicated in the Council's staff report, these scientific investigations were responsive to multiple recommendations from the Delta ISB's water quality review (2018) and were also responsive to the Central Valley Regional Water Quality Control Board's Delta Nutrient Research Plan and the 2017-2021 Science Action Agenda.

Information gathered from stakeholders through interviews and surveys corroborates this account, and provides more nuanced understanding of the impacts and influences of Delta ISB reviews (see Chapter 3). Still, broad insights on the application of Delta ISB reviews can be garnered from our synthesis of the inventory. These are described below.

Supporting adaptive management

The Delta Plan requires the use of adaptive management for major ecosystem restoration and water management projects as part of its Certification of Consistency with the Delta Plan. However, the Delta ISB found in its 2016 review and subsequent 2017 journal article that adaptive management has rarely been implemented as described in the Delta Plan (DSC 2013, Appendix C). The Delta ISB noted various impediments to fully implement adaptive management, including insufficient funding and lack of regulatory flexibility, and provided recommendations on how to move forward. To address the barriers identified in

the Delta ISB's review on adaptive management, in 2019, the Council released the Delta Conservation Adaptive Management Action Strategy (Adaptive Management Action Strategy; DSC-DSP 2019b), which was developed through the Interagency Adaptive Management Integration Team. The Delta Science Program presented an overview of the Adaptive Management Action Strategy in September 2019 to the Delta ISB and indicated that the Adaptive Management Action Strategy will address five of the eight recommendations from the review (Table 2-2; DSC-DSP 2019b). Although the Adaptive Management Action Strategy brings forward and promotes these recommendations from the Delta ISB review, it is important to note that inclusion in the report does not necessarily result in action or alignment of resources. However, through the presentation, we are aware that the Interagency Adaptive Management Integration Team is implementing several actions in the Adaptive Management Action Strategy.

Table 2-2. Delta ISB recommendations from the adaptive management review that will be addressed by the Delta Conservation Adaptive Management Action Strategy (DSC-DSP 2019b).

Delta ISB Recommendation	Addressed by Action Strategy
Convene a workshop to determine how to coordinate and assist adaptive management in the Delta.	Yes
Support adaptive management with dependable and flexible funding.	No
Design and support monitoring.	Yes
Integrate science and regulations to enhance flexibility.	No
Develop a framework for setting decision points or thresholds that will trigger a management response.	No
Use restoration sites to test adaptive-management and monitoring protocols.	Yes
Capitalize on unplanned experiments.	Yes
Recognize when and where adaptive management is not appropriate.	Yes

In addition, the Delta ISB's adaptive management (2016) review was used to inform implementation of an action in the Delta Science Plan (DSC-DSP 2013) to hold regular Adaptive Management Forums to coordinate learning and discussions about adaptive management in the Delta. Although the Delta Science Plan action predates the Delta ISB review, the Delta ISB's recommendation to "convene a workshop or review panel to determine how to coordinate and assist adaptive management in the Delta" helped advance implementation of this Delta Science Plan action. The first Adaptive Management Forum was convened in 2019, and a second Forum was held in 2021.

Lastly, the Delta ISB's review has helped the community understand how adaptive management is implemented in the Delta and revealed some of the barriers to implementation. Articles citing this review often use it to define adaptive management or describe the state of adaptive management in the Delta (see Donley Marineau et al. 2019; Kraus-Polk and Milligan 2019; Marmorek et al. 2019; Milligan and Kraus-Polk 2017; Tamburello et al. 2019). In addition, the Delta ISB's review was cited for its definition of adaptive management in the plans for the Decker Island Restoration Project (CDFW 2017), Winter Island Tidal Restoration Project (DWR and CDFW 2018), and Sherman Island Belly Wetland Restoration Project (DWR and Ducks Unlimited 2020).

Facilitating the application of social sciences

As stipulated in the Delta Reform Act of 2009, the coequal goals of water supply reliability and habitat restoration "shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place" (California Water Code Section 85054). In its 2017 Delta as an Evolving Place review, the Delta ISB noted that social science research in the Sacramento-San Joaquin Delta was sparse and sporadic, despite its importance to achieving the coequal goals. The Board's overall recommendation was to establish an ongoing research program on the Delta as an evolving place. Soon after the completion of the review, the 2017-2021 Science Action Agenda included three priority science actions that help address the Board's recommendation within Action Area 1: Invest in assessing the human dimensions of natural resource management decisions (DSC-DSP 2017).

The Council - Delta Science Program and other funding partners use the science actions in the Science Action Agenda as the priority topic areas for research solicitations, and now include those addressing human dimensions. In addition, the Delta Science Program convened the Social Science Task Force in 2018 in response to the Delta ISB's Delta as an Evolving Place review to identify opportunities to improve the integration of social sciences into science, management, and policy; and to identify critical steps and priorities for establishing a social science research program, which would address the Delta ISB's overall recommendation from the review.

In March 2020, the Social Science Task Force released "A Social Science Strategy for the Sacramento-San Joaquin Delta," which identified barriers to the integration of social science in Delta planning and provided recommendations on how to address these barriers (Biedenweg et al. 2020). The Council is now acting on these recommendations.

Advancing integrated modeling

In 2016, the Delta ISB wrote a memo recommending that the Council, the State Water Resources Control Board, and the California Department of Water Resources co-sponsor a modeling study on the effects of barriers and island flooding on salinity throughout the

Delta in response to presentations that were provided at a Delta ISB meeting (Delta ISB 2016c). The Board also highlighted the importance of integrated modeling and forecasting to support decision-making. This is an example of "a call to action" memo.

In June 2017, the Council funded a three-year research project to better understand the effects of levee breaches and island flooding in the Delta, as is called for in the memo. The project was completed in April 2020, and showed how different modeling approaches could be useful to understand island flooding under different scenarios

In addition, the Integrated Modeling Steering Committee was formed in 2017 to create a collaborative modeling community to help with decision-making in the Delta. Its formation was responsive to Delta ISB's 2016 letter on co-sponsoring a modeling study on the effects of barriers and island flooding, in addition to recommendations made at the 2016 Science Enterprise Workshop (DSC 2018c) and at the Workshop on Integrated Environmental Modeling Estuarine Systems (Medellín-Azuara et al. 2017). Other Board products like the Delta ISB's fish and flows and water quality reviews both made specific recommendations on modeling, and these two reviews provided high-level direction on the Integrated Modeling Steering Committee's efforts to develop a strategic plan for building a sustainable modeling community and a governance framework (Tetra Tech et al. 2020b, 2020d).

To help with the development of a strategic plan, Tetra Tech, under the direction of the Integrated Modeling Steering Committee, developed an online inventory tool, along with a memo on modeling best practices (Tetra Tech et al. 2020c), a survey of integrated modeling applications (Tetra Tech et al. 2020a), a memo on technological solutions and challenges with modeling (Tetra Tech et al. 2020b), and a synthesis memo that summarizes the work (Tetra Tech et al. 2020d). The synthesis memo (Tetra Tech et al. 2020d) states that the Delta ISB recommendations from the fish and flows review and water quality review were used to provide high level direction of the work. The water quality review was also used to inform the state of water quality data in the memo on technological solutions and challenges with modeling (Tetra Tech et al. 2020b).

Outside of the Council, both the National Marine Fisheries Service and the United States Fish and Wildlife Service highlighted through interviews how the Delta ISB's work has played a role within their respective organization on modeling (see Chapter 3 for details of the stakeholder interviews). The National Marine Fisheries Service indicated the Delta ISB's recommendations on integrated modeling from the fish and flows review helped influence a directive to improve forecasting tools in the west to support water management. Similarly, the United States Fish and Wildlife Service indicated that the Delta ISB's findings and recommendations on improving integrated modeling have helped provide the support to build up the United States Fish and Wildlife Service's modeling team.

Prioritizing and integrating scientific activities

As described earlier in the chapter, Delta ISB recommendations advanced the development of the Delta Science Plan, which has helped with prioritizing and integrating activities within the region; and the Science Needs Assessment, which is still in development. The first Delta Science Plan was developed in 2013, and Delta ISB thematic reviews have since been used to inform the actions in the 2019 Delta Science Plan. The 2019 Delta Science Plan cited all the Delta ISB thematic reviews completed at the time, with the exception of the levees review. The 2017-2021 Science Action Agenda considered all of the Delta ISB's recommendations in thematic reviews that were completed at the time, but ultimately only the recommendations or findings from the adaptive management review, levees review, and Delta as an Evolving Place were cited as informing a management need or science action. A progress update on the 2017-2021 Science Action Agenda indicated that early progress has made on science actions that could address the research gaps on levee hazards from the Delta ISB reviews, and on the formation of research program on the Delta as an Evolving Place (DSC-DSP 2021). In comparison, significant progress has been made on actions to develop tools to assist adaptive management, which were responsive to the Delta ISB's review.

The IEP and Collaborative Adaptive Management Team have also used Delta ISB products to inform their priorities to lesser extents. For IEP, Delta ISB's water quality review on chemical contaminants was cited in the IEP Science Strategy 2020-2024, which describes the most pressing issues that should be used to inform IEP's annual workplan over the next four years (Culberson et al. 2019). The Delta ISB's review helped identify issues of direct management concern for contaminants and the need to account for additional stressors, but no specific recommendation is addressed from the review. At the start of the Delta ISB's water quality review, the IEP Contaminants Project Work Team had provided input on the Delta ISB's water quality review, as indicated in IEP's annual work plans (e.g., see IEP 2019). Furthermore, the IEP Science Strategy also cited the Delta ISB's adaptive management journal article to provide context of IEP's role with adaptive management in the region and indicates that it does not implement adaptive management in its entirety, but helps inform several steps (Culberson et al. 2019).

In addition, the Collaborative Adaptive Management Team cited Delta ISB products, as part of the 2018 Science Plan to Assess the Effects of Ambient Environmental Conditions and Flow-Related Management Actions on Delta Smelt (Reed 2019). This plan used findings of the Delta ISB's water quality review to highlight the need to understand the effects of contaminants on Delta smelt under ambient conditions and when flows are adjusted as part of management actions. The science plan provides examples of types of investigations to understand the effects of contaminants.

Lastly, various Delta ISB products, such as the adaptive management review, were used to inform the Collaborative Adaptive Management Team's Coordinated Salmonid Science Planning Assessment for the Delta to identify, integrate, and logically prioritize salmonid science, monitoring, and management activities (Tamburello et al. 2020). This assessment indicates that it is responsive to the Delta ISB call from its rapid change memo (2020) to DPIIC; and for proactive collaboration, science synthesis, and adaptive management, which were recommendations of the fish and flows review.

Scientific contributions

Although individual members of the Delta ISB do co-author peer reviewed journal articles based on Delta ISB reviews (e.g., Wiens et al. 2017 for adaptive management), often the non-peer reviewed products are also cited in peer-reviewed journal articles. As previously noted, the Delta ISB's adaptive management review is often cited to indicate the state of adaptive management in the region, and the Delta as an Evolving Place review has been used repeatedly to indicate the lack of social science research in the region.

Other citations in the scientific literature include the Delta ISB's conceptual model from the fish and flows review on how flows, combined with other ecological drivers, affect fish production (see Rypel 2020; Tamburello et al. 2019). Also, the Delta ISB's levees (2016) review reported overestimation of earthquake induced levee failures, which has been cited in both the peer reviewed literature (Rittelmeyer 2020) and in two management plans: the Delta Plan (DSC 2020b) and California State Hazard Mitigation Plan (California Governor's Office of Emergency Services 2018).

Closing thoughts

From the inventory analysis, we found that Delta ISB reviews have resulted in implementation of programmatic changes in the region. Although the Delta ISB's thematic reviews are targeted to multiple programs, the Council is the primary implementer of Delta ISB recommendations.

In addition, there is evidence that agencies have considered and incorporated Delta ISB feedback into their documents, even though the agencies may not always document and/or follow up directly with the Delta ISB on how they are addressing Delta ISB comments. Final products related to the Bay-Delta Water Quality Control Plan, Bay-Delta Conservation Plan/California WaterFix, and the Delta Science Strategy (Science Action Agenda and Delta Science Plan) included responses documenting how Delta ISB feedback was addressed.

Even when Delta ISB feedback in reviews is not addressed directly, it could still result in future changes. For example, when reviewing the draft amendments to the Delta Plan Chapter 3 (Conveyance, Storage, and Operations), the Delta ISB found the amendments did

"not easily accommodate a dispassionate, diagram-rich, rigorously referenced analysis that lays out scientific evidence both for and against key decision options and recommendations" (Delta ISB 2017h). To address this, the Delta ISB suggested the "use of reports other than the Delta Plan to assemble scientific and technical information and issues on especially controversial aspects of the plan amendments" (Delta ISB 2017h). The Council did not end up changing the process for the draft amendments to the Council's Delta Plan Conveyance, Storage, and Operations Chapter, but this recommendation informed the amendments to Chapter 4 of the Delta Plan ecosystem chapter, which resulted in three synthesis papers to help inform the amendment (DSC 2018a, 2018b, 2018d).

Lastly, it is important to note that Delta ISB products are used in ways other than directly implementing recommendations or incorporating feedback. The findings could be cited in journal articles or used in policy and management applications, as seen with the large number of citations to Delta ISB reviews on the Bay-Delta Conservation Plan/California WaterFix.

This inventory and analysis provide a factual account of the usage of Delta ISB products, based on citations. To complement this account, information about how these products are perceived to provide value or have impact by stakeholders and previous and ongoing Delta ISB members is covered in Chapter 3 and Chapter 4, respectively.

Chapter 3: Stakeholder Perceptions of the Delta ISB

Introduction

In this chapter we discuss stakeholder perceptions of the Delta ISB. From a methodological standpoint it is beneficial to assess stakeholder perceptions to augment and corroborate information gathered by inventory and self-assessment, a form of triangulation that yields a fuller portrayal of the Delta ISB than any one approach could provide on its own (Hammersley 2008). But there are also more substantive reasons to assess stakeholder perceptions. In a complex socio-ecological system, such as the Delta, science is invariably and unavoidably situated within a larger social and political context (Norgaard et al. 2009). The Delta ISB cannot be understood, let alone assessed, without reference to this larger context and its diverse ensemble of stakeholders.

Stakeholder perceptions are an important component of a robust assessment. Stakeholders actively participate in the policies and processes through which Delta science, management, and decision-making occur (e.g., Mehwirter et al. 2017). These actors, policies, and processes also constitute the context through and within which the Delta ISB influences the Delta (or not). Whether the Board finds traction, faces resistance, or is met with indifference depends, at least in part, on stakeholders and their perceptions of the Delta ISB (see, e.g., Kharel et al. 2018; Ramirez and Belcher 2019). Furthermore, as a public body, the Delta ISB is accountable to public stakeholder groups. It is important to represent stakeholders' perspectives in assessing the scope and quality of Delta ISB impacts, since stakeholders are ultimately the parties affected by these impacts (see discussion in Lane et al. 1997).

Content of this chapter

We begin our presentation of findings in this chapter by sketching a picture of the Delta science and management context that emerged through interviews. We next discuss how stakeholders characterized the Delta ISB against this backdrop, focusing on the core perception that the Delta ISB is at once independent from but also connected to the Delta. The discussion then turns to impacts and influences attributed to the Delta ISB, including implementation of recommendations; followed by outreach and communication, which emerged as a shared difficulty and a clear area for improvement. Finally, we report findings that speak to broader visions for the Delta ISB. With several new Board members still transitioning to service, the Delta ISB is at a juncture that presents an opportunity to reimagine how it can fulfill its roles and responsibilities as a public body. The ideas reported in this final section may inform the Delta ISB in its internal planning efforts, but they also speak more broadly to Delta stakeholders' needs and hopes for Delta science and management.

While the Delta ISB and support staff are clearly a core audience for this chapter, there are implications for wider audiences as well. Intermingled with visions for the Delta ISB are ideas about and aspirations for Delta science at large. Furthermore, in line with efforts to increase social scientific understanding in the Delta (Biedenweg et al. 2020), findings reported in this chapter may support the growing body of research on Delta science, management, and governance (e.g., Heikkila et al. 2005; Lubell et al. 2020).

A detailed description of methods used to collect and analyze data about stakeholder perceptions is provided in Appendix 2. Findings reported in this chapter are primarily based on interviews with 26 knowledgeable stakeholders who were selected based on their past and current engagement with the Delta ISB to share in-depth and informed views about the Board and its products. Interview questions are provided in Appendix 3. Interviewees represent the following organizations:

- California Department of Fish and Wildlife
- California Department of Water Resources
- California State Water Resources Control Board
- Central Delta Water Agency
- Delta Protection Commission
- Delta Stewardship Council
- Interagency Ecological Program
- MBK Engineers
- Metropolitan Water District of Southern California
- National Marine Fisheries Services – National Oceanic and Atmospheric Administration
- Regional San
- Santa Clara Valley Water District
- State Water Contractors
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service

We also distributed an online survey to stakeholders representing a broader spectrum of familiarity and engagement with the Delta ISB. We received 174 responses. Information about respondents' organizational affiliations and professional roles is presented in Tables 3-1 and 3-2.

Table 3-1. Organizational affiliations, as self-identified by survey respondents. Examples of "other" affiliations include legislative staff, one former ISB member, other NGOs and businesses, and no affiliation. N = 162.

Organizational affiliation	Percent	Count
State	37%	64
Federal	17%	29
Local	10%	17
Other	10%	18
University	8%	14
Water contractor	6%	10
Private organization	4%	7
Environmental organization	2%	3

Table 3-2. Professional roles, as self-identified by survey respondents. Examples of "other" roles include attorney, resident/citizen, advocate, visitor/user, professor, and policymaker. N = 171.

Role	Percent	Count
Scientist	41%	72
Manager	14%	25
Other	14%	24
Engineer	7%	12
Executive	7%	12
Regulator	6%	11
Consultant	4%	7
Student	2%	4
Communicator	2%	3
Planner	<1%	1

To understand our survey sample's knowledge about the Delta ISB, which provides important context for our findings, we asked respondents to indicate their level of awareness of the Delta ISB early in the survey. The distribution of responses is depicted in Figure 3-1, with breakdowns by affiliation and role in Figures 3-2 and 3-3.

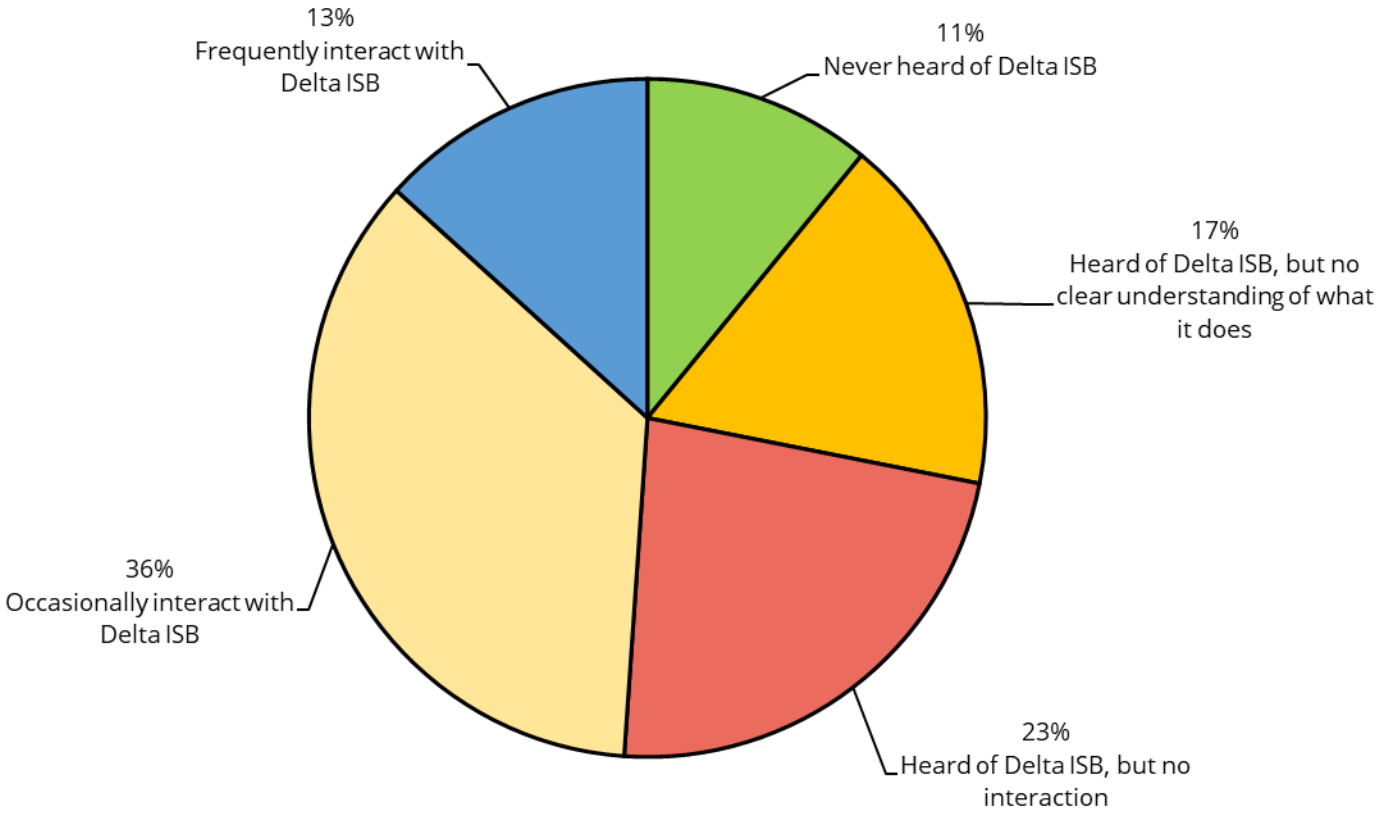

Figure 3-1. Awareness of the Delta ISB. N= 174.

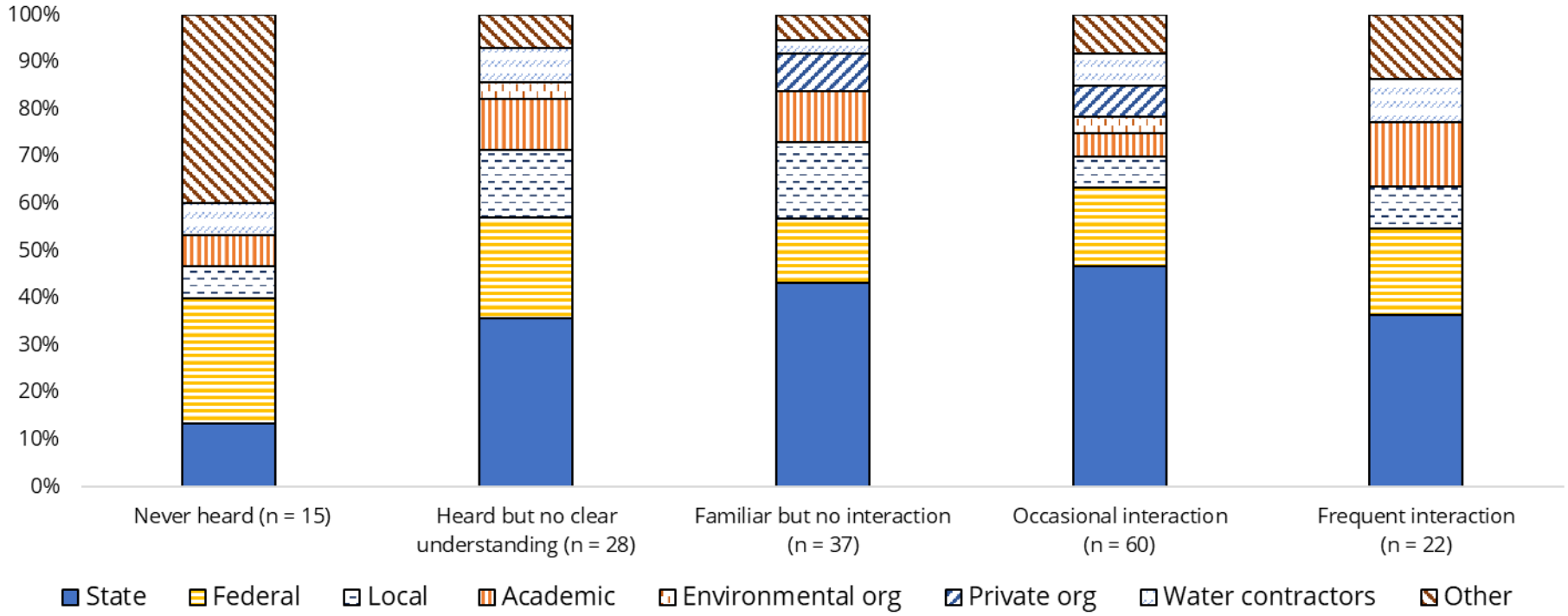

Figure 3-2. Awareness of the Delta ISB by organizational affiliation. The total number of respondents who selected each response is shown in parentheses (counts do not include respondents who did not indicate an organizational affiliation). N = 162.

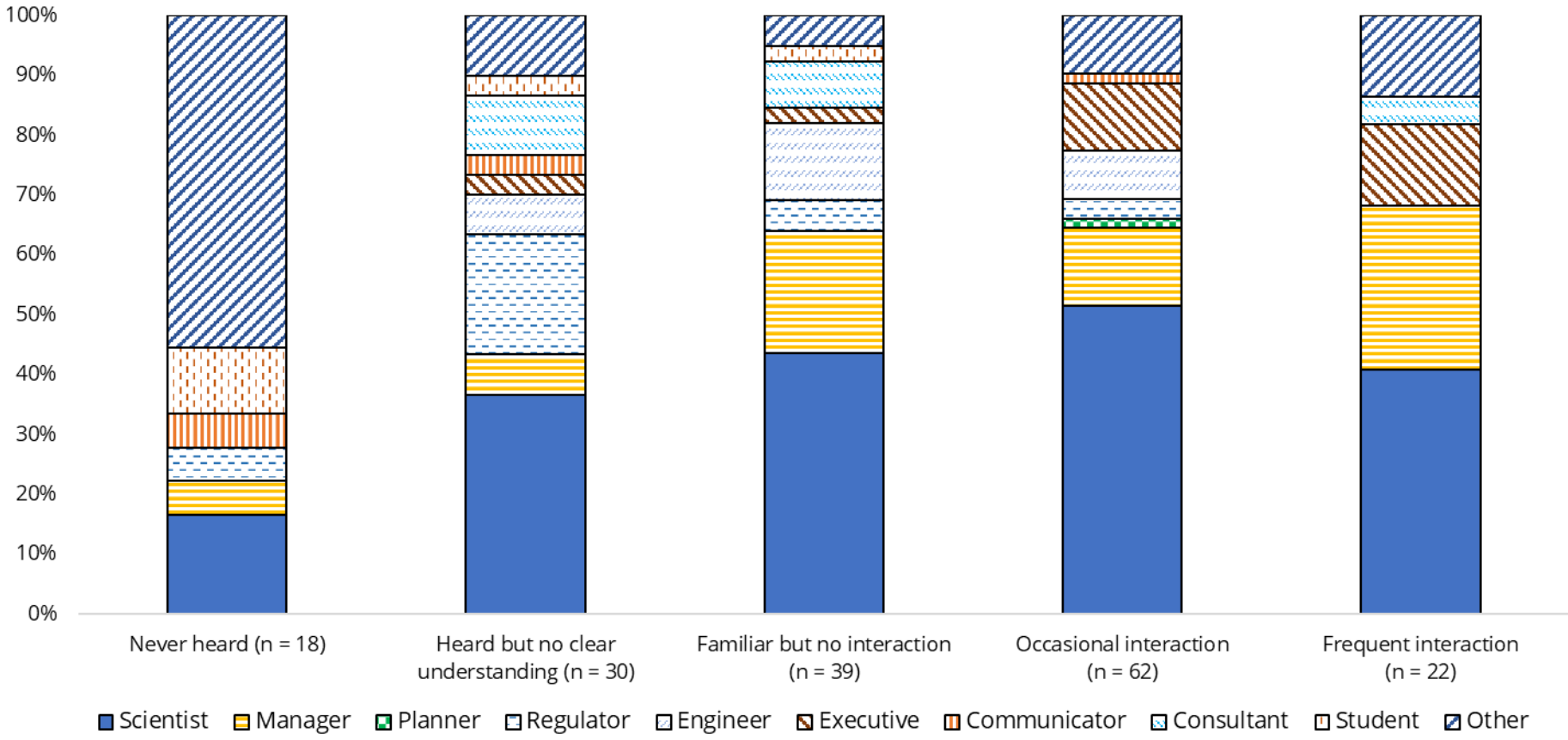

Figure 3-3. Awareness of Delta ISB by professional role. The total number of respondents who selected each response is shown in parentheses (counts do not include respondents who did not indicate a professional role). N = 171.

Respondents who indicated no awareness of the Delta ISB were directed to the end of the survey after answering this question. Responses on subsequent questions reflect the perspectives of individuals with at least some prior knowledge of the Delta ISB.

Additional survey results are reported throughout this chapter to supplement interview-based findings. The survey instrument is available in Appendix 4, along with consolidated summaries of responses to all survey questions.

Findings

The Delta science and management context

We begin our presentation of findings by describing how stakeholders depicted the Delta science, management, and governance context. Orienting to this context is critical to understand stakeholder perceptions of the Delta ISB, as stakeholders' understandings of the Delta ISB—including its roles and responsibilities, impacts, and recommendations—emerge against this backdrop.

Stakeholders understand Delta management and science as a complex governance sphere differentiated along horizontal and vertical dimensions. Horizontally are the various organizations (including federal, State, and local) charged with the science and management of the Delta, each with specific missions, objectives, and priorities. Vertically, within organizations individuals occupy different roles, which are commonly described as different "levels." Perceived to sit outside this structure are Delta communities and landowners, i.e., people who work, live, and/or recreate in the Delta. Similarly, legislative staff and the Governor's office are perceived, by some, as distanced from and at times aloof to Delta science and management, although they are also seen as making decisions that influence the Delta.

Interviewees described high degrees of stratification, and compartmentalization of interests and attention in the Delta. As one interviewee observed, barriers in communication and coordination are created by "different federated roles and institutional arrangements." Especially telling is the comment by an interviewee who, when discussing a move from one organization to another, described the two work contexts as "different worlds." Collaborative interagency networks and working groups bridge across institutional divides to some extent, but the allocation of attention and/or resources is ultimately

determined by the scope of any given organization, and any individual's role therein.[7] Thus, a complex interplay of interest and attention shapes how stakeholders respond to the Delta ISB, its outreach, its products, and its recommendations.

The politics of the Delta were also a pervasive undertone of interviews; as one stakeholder remarked, "there's a big game of politics in the Delta." Although often identifying themselves as scientists, or scientifically minded, and while defending the quality of science done in the Delta, stakeholders also acknowledge that science is implicated in issues with many different sides, points of views, and perspectives, as well as ongoing polarization. In this context, science can be used, misused, or ignored in the service of particular interests. While a handful of stakeholders characterized the Delta today as an arena for "combat science," more generally the politics of science-based management seemed to be acknowledged as a simple fact; neither inherently good nor bad, but a reality that requires consideration and deft navigation by the Delta ISB.

Politics aside, stakeholders emphasized the busy-ness of the Delta and the density of the issue environment, which includes climate change, water flow and distribution, introduced species, levee failure and island flooding, harmful algal blooms, and methylmercury, to name a few. Activities occurring in the Delta include adaptive management; research and scientific review; monitoring; regulatory and permitting activities; and outreach and communication. The water projects are a steady backdrop, along with associated social, legal, and regulatory activities. People living and/or working in the Delta also juggle a litany of priorities such as farming, flood control, water rights, and levee maintenance, among others.

Stakeholders frequently discussed the difficulty of keeping track of all the issues in the Delta, especially when information is filtered through the lenses of organizationally defined interests and professional roles. Coordination is perceived as a challenge, and Delta ISB recommendations requiring broad collaboration by various parties are perceived as a "heavy lift." Scientific uncertainty is also a persistent challenge, and stakeholders often discussed the Delta ISB in the context of reducing, addressing, or operating in the face of scientific uncertainty.

[7] Interestingly, interviewees representing federal agencies expressed more sensitivity to these arrangements than other stakeholders. They conveyed the perception that they are somewhat outside the central arena of Delta science and management (which they saw as a primarily State enterprise). Some also used the metaphor of "levels" to differentiate the federal from State and local sphere. For example, one stakeholder representing a federal agency commented that State activity has to "rise to a level" that commands federal attention.

The Delta ISB: a part of, yet apart from, the Delta

According to our sources, many stakeholders view the Delta ISB positively and feel it elevates the accountability, credibility, and transparency of Delta science.

In the survey, majorities of respondents felt there is widespread awareness of the Delta ISB among managers and decision-makers (63%) and scientists (77%). Of these respondents, even more pronounced majorities felt there is high regard for the Delta ISB among Delta managers and decision-makers (75%) and Delta scientists (71%) at large. Corroborating these perceptions, in a series of 10 questions eliciting respondents' own evaluations of the Board and its products (see Appendix 4 for full questions), most survey respondents indicated that they do, in fact, have high regard for the Delta ISB. Strong majorities felt the Delta ISB is both essential and unique (Figure 3-4), with little variation between respondents representing different types of organizations (Table 3-3 and Figure 3-5). Survey respondents generally felt Delta ISB reviews are relevant and scientifically rigorous, also indicating that they trust the Delta ISB's scientific findings and that Delta ISB reviews enhance their confidence in science-based decision-making (Figure 3-4). Interviews provided additional detail and context for these evaluations.

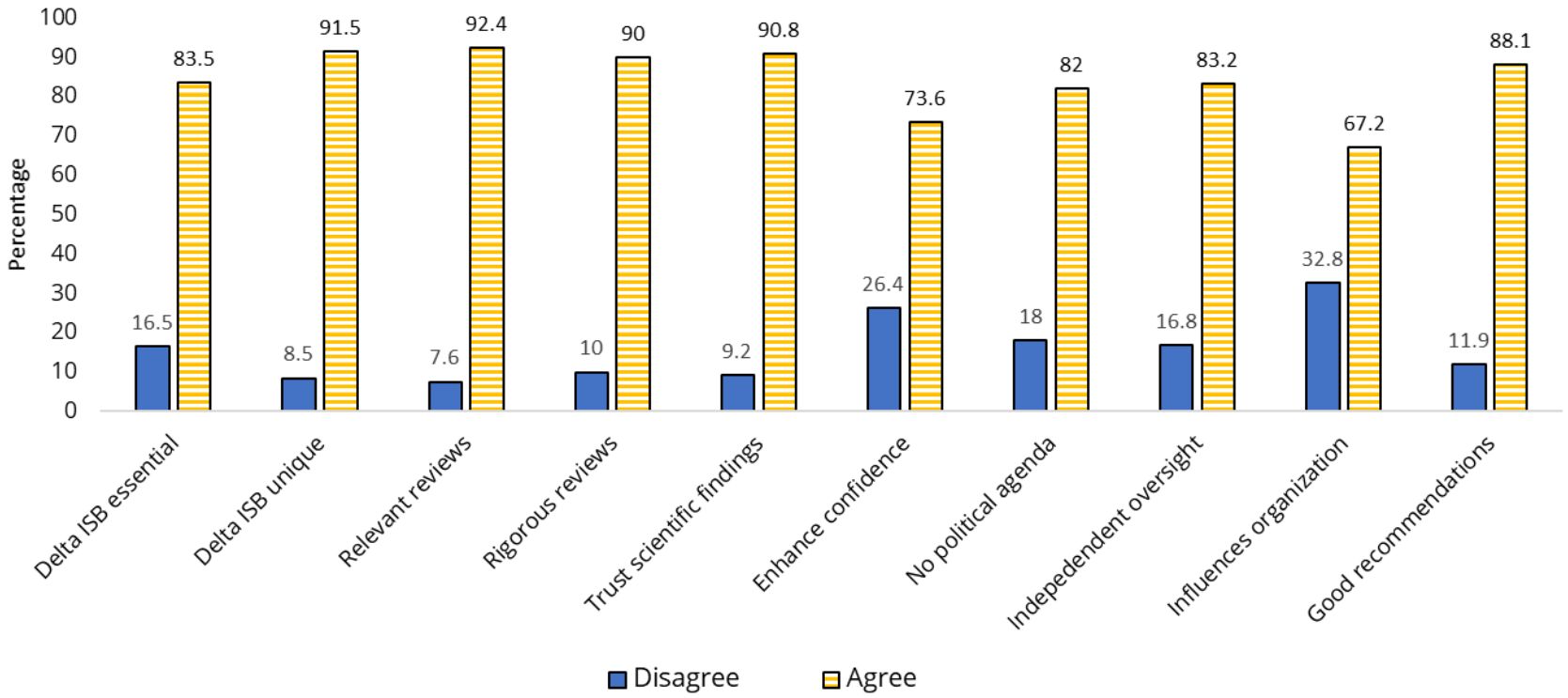

Figure 3-4. Stakeholder evaluations of the Delta ISB and its products. Percentages do not include non-respondents or respondents who indicated "I don't know." See Table 3-3 for the number of respondents who answered each question.

Table 3-3. Stakeholder evaluations of the ISB and its products, by affiliation. The top numbers in each cell are means, with standard deviations in parentheses. Means are calculated from responses recorded on a four-point scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Higher numbers correspond to more positive evaluations. Responses of "I don't know" were treated as missing data, which is why the n varies for each question. The full text of each prompt is in Appendix 4.

Affiliation	Delta ISB Essential	Delta ISB unique	Relevant reviews	Rigorous reviews	Trust	Enhance confidence	No political agenda	Independent oversight	Influence organization	Good recs
Federal	3.38 (.62)	3.44 (.63)	3.38 (.50)	3.19 (.54)	3.20 (.56)	3.07 (.59)	3.23 (.60)	3.27 (.59)	2.63 (.50)	3.36 (.50)
State	3.26 (.72)	3.52 (.50)	3.28 (.51)	3.28 (.70)	3.36 (.60)	3.03 (.82)	3.38 (.72)	3.27 (.77)	3.00 (.77)	3.21 (.70)
Local	3.18 (.60)	3.14 (.86)	3.13 (.64)	3.14 (1.07)	3.00 (1)	3.17 (.98)	2.73 (.79)	2.92 (.76)	2.62 (.77)	2.88 (1.13)
Academic	3.50 (.71)	3.50 (.71)	3.43 (.53)	3.38 (.74)	3.50 (.76)	3.50 (.76)	3.10 (.88)	3.09 (.54)	3.00 (.63)	3.38 (.74)
Environmental	3.00 (1.0)	3.33 (.58)	3.67 (.58)	3.0 (0)	3.0 (0)	3.00 (1)	3.00 (0)	3.00 (0)	2.67 (.58)	3.0 (0)
Private	2.71 (1.25)	2.57 (.98)	3.33 (.82)	3.17 (.98)	3.17 (.98)	3.00 (1.1)	2.60 (1.52)	2.57 (1.27)	2.29 (.95)	2.83 (.75)
Water contractor	3.00 (.63)	3.50 (.55)	3.20 (.45)	3.00 (0)	3.0 (0)	2.67 (.58)	3.20 (.84)	3.29 (.49)	2.29 (.49)	3.0 (0)
Other	3.00 (.93)	3.25 (.89)	3.13 (.99)	3.50 (.76)	3.57 (.53)	3.13 (.99)	3.13 (.83)	3.00 (.93)	2.80 (.92)	3.33 (.82)
Overall	3.22(.76)	3.37 (.69)	3.28 (.60)	3.26 (.70)	3.29 (.66)	3.08 (.81)	3.19 (.80)	3.15 (.76)	2.79 (.75)	3.19 (.70)
n	115	118	92	90	87	87	100	119	125	84

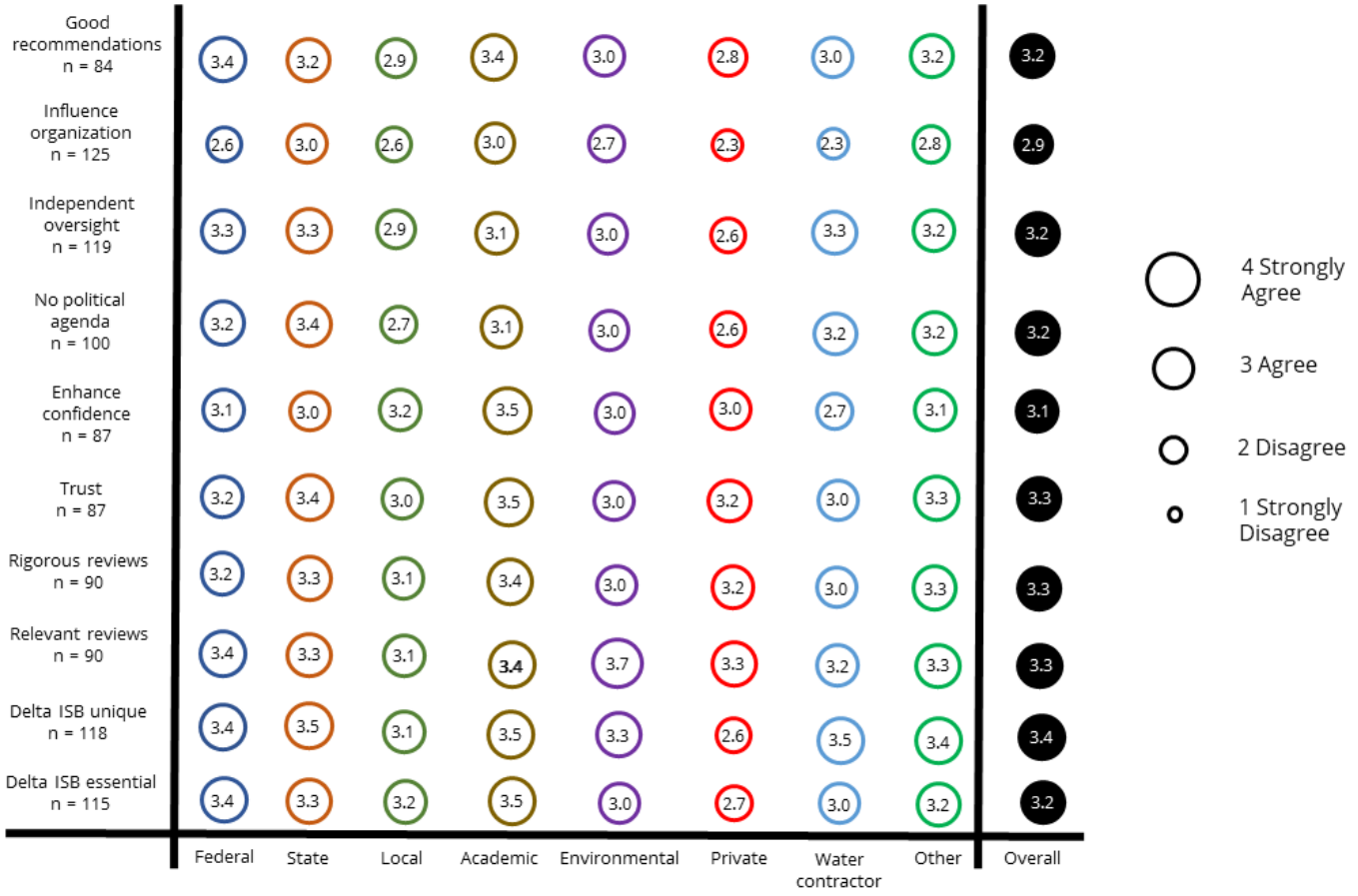

Figure 3-5. Stakeholder evaluations of the Delta ISB and its products by organizational affiliation. This is a visual representation of the information in Table 3-3. Circles represent the average rating on each question for respondents in each organizational affiliation. Circles are scaled to averages, and the legend on the right relates circle sizes to the four ratings used in the survey (1 strongly disagree, 2 disagree, 3 agree, 4 strongly agree). Higher scores and larger circles correspond to more positive evaluations of the Delta ISB. Overall ratings are shown on the far right**.**

In the interviews, two related themes grounded stakeholders' perceptions of the Delta ISB: its independence from the Delta science and management context, and its connections to the Delta science and management context. The Delta ISB is characterized by interviewees as a standing, independent scientific body with statutory authority to provide broad oversight for science in the Delta. While there are many sources of scientific review, the independence of the Delta ISB is what the Board "bring[s] to the table." At the same time, as a standing board with continuity of service and an exclusive focus on the Delta, the Delta ISB is sufficiently informed to review and advise on Delta science and management. As remarked by one interviewee, "I think it also adds value, in that it [the Board] has experience with the issues – so it's not a brand new set of folks coming in each time and having to get up to speed." This recognition of the Delta ISB as an entity that is a part of, yet apart from, the Delta was a central and overarching theme across interviews. For this reason, it anchors our discussion of the benefits, challenges, impacts, and constraints stakeholders perceived around the Delta ISB and its role in the Delta.

Independence

The importance of independent scientific review was widely acknowledged among interviewees, and the Delta ISB is highly valued for providing this function. According to interviewees, the Delta community looks to the Delta ISB to provide and validate best available science, and management based thereon; and generally respects the Board's guidance for improving science, revealing research gaps, and highlighting ways to better address management needs.

Interviews suggest stakeholders understand the Delta ISB's independence being grounded in three interrelated concepts: its status as an external body, its association with impartial science, and its separation from the politics of the Delta.

The Delta ISB is characterized as an **external** group of scientists who provide advice based on their interdisciplinary experience and expertise from systems outside the Delta. This outside perspective, coupled with the national and international reputations of individual Board members, is seen to enhance the credibility of Delta science. In interviews, the sense that Delta scientists have an internal perspective, defined by the issues that most immediately demand attention, was pronounced. As one interviewee stated, "we're totally insiders." Set in sharp relief against this "insider" self-identification, the Delta ISB was portrayed as a group of external experts who connect the Delta with the larger state of science and technology, and highlight practices used in other systems. As noted in an open-ended question by one survey respondent, "Local science has a tendency to be focused on conditions unique to the Delta, whereas the ISB has made an effort to point out parallels with other systems and introduce outside thinking." Some interviewees attributed particular importance to the Delta ISB's external perspective given the constraint of agency scientists, who have limited opportunities to interact with outside, multidisciplinary

experts. By bringing this outside perspective in, the Delta ISB compels locals to consider issues they may be missing; and also helps to keep big-picture, long-term issues (such as climate change) on the local radar, when immediate priorities might otherwise drive those issues to the background.

The Delta ISB is also seen as an **unbiased or impartial scientific presence** that provides honest, objective assessments to assist decision-makers. Some stakeholders expressed the perception that the Delta ISB was formed as an answer and counter to combat science, addressing the bias of agencies that otherwise represent single-interest perspectives. Delta ISB members were at times characterized as scientists, par excellence, and one interviewee described their work as "scientifically pure."

Finally, the independence of the Delta ISB is characterized as **apolitical,** i.e., detached from the fray of competing, often conflicting, values and interests in the Delta. Because the Delta ISB is composed mostly of scientists who do not work in the system, it does not, as described by one interviewee, "have skin in the game, like the rest of us." Because the Delta ISB is perceived to sit and work outside the political structure of the Delta, it can play a mediating role that finds common grounds among the multiple disciplines engaged in disciplinarily or organizationally siloed science. As an independent body, the Delta ISB is seen to have no agenda, retaining a questioning demeanor that seeks all relevant info that bears on scientific questions at hand and brings fresh perspectives.

These themes are derived primarily from interviews, but survey results echoed similar perceptions of the Delta ISB's independence among broader stakeholders. In our sample, over 80% of respondents felt the Delta ISB does not promote specific political agendas, and that it provides independent scientific oversight in the Delta (see Figure 3-4). As stated by one survey respondent, "the ISB is important as an independent and objective voice for science in the always contentious Delta arena."

Connections

While operating as an independent scientific body, the Delta ISB is also recognized as an established and familiar presence in the Delta. In interviews, stakeholders articulated four types of ties that connect the Delta ISB to the Delta science and management context: a legally defined relationship with the Council; the Board's role as a community resource; its longevity as a standing board; and the experience of individual members who compose the Board.

By statute under the Delta Reform Act, the Delta ISB is embedded in a larger **governance structure**, which establishes a reporting relationship between the Delta ISB and the Council. This relationship is perceived by stakeholders to be mutually beneficial. Interviewees representing the Council expressed the sense that the Council is obligated (in practice, if not necessarily legally) to implement Delta ISB recommendations where

possible, especially in Delta Plan amendments and activities of the Delta Science Program. The Delta ISB receives various forms of support from the Council, including staff support and assistance with Delta ISB outreach and communications; although some interviewees felt the Council staff should "highlight more what the ISB is doing." The Council and Delta Science Program, meanwhile, receive Delta ISB review of documents such as the 2017-2021 Science Action Agenda and the Delta Plan amendments, supporting the Council's mandate to utilize best available science.

The symbiosis between the Delta ISB and the Council is widely recognized among interviewees, although it is a point of some ambiguity. One federal interviewee situated the Delta ISB generally within the State system of governance, without directly connecting it to the Council; while another explicitly understood the Delta ISB as "part of the Stewardship Council." Although none of the stakeholders we interviewed questioned the Board's independence,[8] vis a vis its scientific activities, it is also clear that stakeholders recognize its close connections to the Council, which in turn tether the Board to the Delta. However, these tethers are perceived to be largely formal and legal, and do not compromise the Board's detachment from Delta policy and politics. For example, as described by Council-affiliated interviewees, although the Delta ISB's scientific guidance contributed heavily to the Council's legal defense of the Delta Plan, the Delta ISB did not directly engage with policy processes. The Council does not consider policy guidance to fall within the Delta ISB's proper scope of authority and perceives this belief to be shared by the Delta ISB itself: "I think occasionally they've had a recommendation that ventures into policy territory, and they self-police on that pretty well…[but] I don't see that as their role, and I think they generally agree."

In addition to the formal, legalized relationship with the Council, the Delta ISB is regarded more generally as a **community resource**. The Delta ISB is seen to provide a service for all actors and organizations in the Delta, as arbiters of best available science. Because of its position as an established yet fully independent board, the Delta ISB has a broad audience and beneficiary pool: "not just the agencies, but the stakeholder community as a whole." Interviewees also appreciated that the Board is duly responsive to the Delta community. Several interviewees discussed Delta ISB meetings as an approachable community venue for scientific discussion, where stakeholders are genuinely welcomed and heard.

Along with the institutional and community relationships that link the Delta ISB to the Delta context, the Delta ISB has also built familiarity with the Delta as a **standing board**. Unlike other ad hoc review bodies, the continuity and longevity of the Delta ISB allow it to develop deeper familiarity with Delta issues and Delta science. This equips the Board to efficiently

[8] One anonymous survey respondent did express skepticism about the Board's independence in a write-in response.

conduct informed reviews. Further, as a standing board the Delta ISB can stay abreast of the long-term issues that may get pushed aside on a day-to-day basis, keeping them on the collective radar to be addressed as opportunities arise.

The fourth channel by which the Delta ISB is connected to the Delta is in the **composition** of its members. In several interviews, stakeholders expressed appreciation for the Board members who have longstanding experience with the Delta and Delta issues. One interviewee identified this as an important leadership quality that is integral to the utility of the Delta ISB. Another interviewee felt that greater knowledge of the Delta among Board members would ultimately increase the practical value of Delta ISB products.

Independence and connection: a fine balance

Interviewees appreciated the "balance" the Delta ISB must strike to retain its objective, independent stance while also engaging with and within the larger Delta context. Indeed, this balance is viewed as a cornerstone of the Delta ISB's credibility, which was a recurring theme of interviews. However, many of the challenges stakeholders discussed in relation to the Delta ISB suggest there is also an inherent tension between independence and connection. While independence seems to require the Board to maintain a significant degree of distance from Delta "insiders," to avoid forming personal or professional relationships that could lead to bias, familiarity and deep engagement with the Delta and its stakeholders are also seen as essential for the Delta ISB's work to be grounded in and relevant to management needs.

Many stakeholders we interviewed felt the Delta ISB has erred on the side of independence, to an extent that limits the practical utility and ultimately the impact of its work. As described by one interviewee,

> "I know that there were many cases where their thematic reports annoyed other agencies, and they felt like this was a group that doesn't know enough about the Delta to be able to make these kinds of Delta specific recommendations."

Several stakeholders expressed frustration that the Delta ISB is not properly attuned to either the regulatory setting or the practical realities of working in the Delta. These frustrations were most conspicuous in discussions of the Delta ISB as an academic board, and in critiques of its recommendations.

An academic board

For some interviewees, especially those representing State agencies, the perceived "academic" orientation of the Delta ISB creates a disconnect between the Board and the Delta, in ways that limit the benefits and impacts of its reviews.

Stakeholders recognize Delta ISB members as renowned academic scientists, and express respect for their professional contributions to science. However, there was also some

expressed or implied skepticism about the applicability of academic science to what one interviewee described as "implementation space." Several stakeholders suggested that the interests, concerns, and priorities of academic scientists do not necessarily align with the interests, concerns, and priorities that are relevant to managers. The sentiment was expressed by one interviewee who characterized the Delta ISB as "the organization that can think about the bigger picture stuff…while we're down here in the weeds, making sure the stuff in the weeds gets taken care of." While overtly framed as a service, the comment also conveyed an undertone of criticism for the "meta scientific" focus of the Delta ISB on "science writ large," which was characterized as a "luxury" that is inaccessible to local scientists and managers who are "just scrambling to make ends meet on a day to day, week to week basis."

Discussion of specific review products revealed some ambivalence about the applicability of an academic approach to Delta science and management. In some cases, stakeholders think the academic approach works well. For example, one interviewee thought the Delta ISB's "traditional science-y" approach to the review of the draft Delta Plan Ecosystem Amendment (Delta ISB 2020b) was highly effective. In other cases, the perceived academic orientation of the Board may create a gap in understanding and/or communication that limits the relevance of Board reviews. For example, interviewees reflecting on a document review requested by their agency felt the Delta ISB was somewhat naive to the process under review, providing overly detailed, tangential feedback that was not only unhelpful to the organization, but also opened the organization to criticism by outside parties seeking to point fingers and promote their own interests. These interviewees felt some of the specific feedback from individual Board members was "idiosyncratic," betraying a lack of understanding by Delta ISB members of the regulatory context of the product, and the objectives of the review. Interviewees were cognizant that in the politicized issue environment of Delta science and management, critiques or written commentaries from the Delta ISB can be used to advance or contest particular interests, even if they fall outside the scope or intent of the review requested. This example effectively illustrates how the Delta ISB's work is situated within a larger context of Delta governance and Delta politics.

Some stakeholders acknowledged the acute challenge of the Delta ISB's work at the nexus of academic science and science-based management. As described by one interviewee, the Delta ISB is tasked with an "enormous assignment" that involves integrating information from multiple scientific disciplines, and also requires academic scientists to understand and navigate government regulatory systems. More commonly, though, while affirming the importance of retaining independence, interviewees underscored that the Delta ISB's work needs to be better informed by an understanding of the institutional and organizational context of Delta management, including agency structures, regulatory requirements, and practical issues and constraints.

Critiques of Delta ISB recommendations

Interviewees' commentaries on Delta ISB recommendations also expressed tensions inherent to the balance of independence from and connection to the Delta (see also Box 1).

The work of science is primarily descriptive; that is, scientists seek to understand and explain the world and its workings. In making recommendations, however, scientists assume a prescriptive role; that is, they advise or urge particular actions in order to influence the world in some way and for some purpose. In the case of the Delta ISB, we observed a perception that recommendations are proffered to "benefit" or "help" those working in the Delta, as part of the Board's legally defined oversight responsibilities. While it is considered essential that the Board, in this role, remain unaligned with any particular interest – thus retaining its independent, objective, and impartial stance – there is also a perception by some that the helpfulness of the Board's recommendations is limited to the degree that Board members are not informed by in-depth understanding of local issues, needs, and constraints, and focus instead on big-picture, long-term, coordinated science recommendations.

Several interviewees thought the Delta ISB could formulate recommendations that are relevant, practical, and actionable, by more effectively "blending" with the "political and policy landscape" of the Delta. This would require greater engagement with relevant stakeholders, such as program staff and work teams, to produce recommendations for change on time frames that are relevant to stakeholders, and consistent with work already occurring in the Delta. Different interviewees identified opportunities for Delta ISB recommendations to be informed by stakeholder engagement at various stages of a review. Suggestions can be roughly grouped into four categories.

First, some interviewees suggested a **more thorough orientation at onboarding** to acquaint Delta ISB members with the Delta context – especially management and regulatory processes – so they understand the system and have a clearer understanding of whom to involve when they formulate recommendations. Second, several interviewees suggested the **Board should be proactive in approaching and engaging with entities it considers responsible for implementing its recommendations**. Some interviewees suggested identifying and involving responsible entities early in review processes, to understand issues and define the scope of the review based on the information needs they describe. Third, related to the previous idea, some suggested **the Delta ISB should solicit feedback on draft recommendations from responsible parties,** in what one interviewee called "reality-check check-ins," to ensure recommendations are properly calibrated to practical and political realities. Interviewees believed this would help the Delta ISB develop more feasible recommendations, thereby increasing the likelihood that they will be implemented. Fourth, many interviewees recommended **more outreach to help responsible parties understand and implement the final recommendations.**

Each of these tactics would tighten the linkages between the Delta ISB and the Delta, and interviewees acknowledged that this tighter coupling comes with tradeoffs. As noted earlier, deeper engagement with Delta stakeholders also heightens the difficulty of maintaining independence, as relationships become stronger and more sustained. One interviewee also pointed out that the Delta ISB may need to do fewer reviews if it takes the time to gain in-depth understanding from and with stakeholders. However, many interviewees indicated that these risks and tradeoffs may be justified. As explained by one interviewee, for science to be impactful (and to justify the expenditure of resources that support science), scientists (including Delta ISB members) must make recommendations that actually influence agency decisions. This, in turn, requires scientists to understand what is relevant, by dialoguing with managers and policymakers.

Box 1: Relevant recommendations and the issue of values in science

Longstanding scholarly debates center on whether and how it is appropriate for scientists to engage with policy without compromising, or appearing to compromise, their scientific authority. These conversations are rooted in broader philosophical debates on the role of values in science. Modern Western science has conventionally espoused a value-free ideal, in which value neutrality (i.e., the idea that science is not influenced by social, moral, or political values) is viewed as a hallmark of scientific knowledge and a pillar of scientific credibility and trust (Douglas 2009). This view has been both staunchly defended and roundly critiqued (Gunderson 2020). As a counter, some scholars articulate an ideal not of value neutrality but of value transparency, which involves openly acknowledging the values that influence scientists and their outputs (e.g., Delta ISB recommendations), and being explicit about where and how those values exert influence (Douglas 2009).

Broader discourses around science and values provide context that can be used to interpret some of our stakeholder interview commentary. While our data suggest there is widespread awareness of the Delta as a political space populated with diverse, often competing values and interests, our analyses also suggest there is ambiguity and divergence of opinion on how the Delta ISB does and should situate itself within this space.

Many interviewees suggested the Delta ISB should work with target implementers to intentionally craft actionable recommendations, in efforts to increase the likelihood of implementation. By and large interviewees did not reflect on whether or how this type of engagement might create an entry for social or political values to influence the formulation of Delta ISB recommendations, and any implications thereof. A different perspective emerged from one stakeholder interview group.

Box 1 continued

These interviewees felt that decisions to implement or not implement Delta ISB recommendations are ultimately driven by values, and as such they emphasized that "the ISB doesn't need to twist and turn" to get its recommendations implemented, because "it's not their job to change the values of the organizations and the decision-makers who are weighing multiple values and issues when they decide where the money goes."

These interviewees felt the Board should seek to inform but not influence decisions, recognizing Delta decision-making as a political sphere from which the Delta ISB, as a scientific entity, is and should remain detached.

Considering the sensitivities surrounding science in a value-policy sphere, several options for the Delta ISB present themselves. A first option would involve limiting or refraining from engagement and formulating recommendations independently, in efforts to avoid any influence of social and political values. As discussed above, this approach may decrease the perceived relevance and utility of Delta ISB recommendations among stakeholders. A second option would reflect a value transparency approach, which would allow the Board to work with stakeholders, but would also involve explicitly identifying non-scientific considerations (including values) underpinning the resulting recommendations. Some would argue this is a responsible approach that does not jeopardize the Board's scientific authority or objectivity (Douglas 2009), but others might contend that this approach would compromise the Board's scientific credibility (e.g., Lackey 2007). A third option would involve working with stakeholders to develop relevant, actionable recommendations without overtly acknowledging the influence of values or other non-scientific considerations. Depending on the nature of the recommendations and the issues at play, this approach may be non-problematic. In some cases, however, this may represent a disguised form of advocacy whereby value judgments are concealed in the authority and perceived objectivity of science (Pielke 2007; Wilhere 2012). This tactic, which has been called "inadvertent advocacy" when non-intentional, or "stealth advocacy" when intentional, has been critiqued as misleading or even manipulative (Wilhere 2012).

If the Delta ISB aims to exert influence in any way, it is over the usage, conduct, or coordination of science, rather than resource management policies or decisions. However, decisions about science and science governance are inevitably linked with broader social and political values and interests. The Delta ISB aims to provide policy- and management-relevant recommendations but - as demonstrated by findings from our assessment and insights from broader discourses - for scientists, relevance is not necessarily a simple or uncontested concept.

Impacts and influences

In efforts to understand impacts of the Delta ISB, as viewed by stakeholders, we asked survey respondents whether the Delta ISB influences their organization or any collaborative groups in which they participate. A majority of the sample (67%) responded in the affirmative; however, this majority was somewhat modest in comparison to responses on many of the other evaluative questions (Figure 3-4). This suggests that there was a greater mix of opinions about the Board's influence.

Interviews often echoed and clarified the ambivalence conveyed in the survey. For example, many interviewees expressed the view that the Delta ISB has high value but low impact:

> "…generally the value of [Delta ISB] products is high. The impact is perhaps, sometimes, non-existent, in that it tends to influence overall conceptual thinking about issues, but probably doesn't have very much to say about actual implementation, and it doesn't generate money streams anywhere."

Based on our sources, it seems most stakeholders interpreted "impact" as the outcome in which the Delta ISB makes a recommendation that is implemented, leading to observable change. Many interviewees were uncertain about or reluctant to identify Board "impacts," thus defined. Through analysis of interview data, however, it became possible to differentiate "impact" from a variety of other, more diffuse or less direct influences the Board exerts over Delta science and management. As alluded by the remark in the quotation above, that the Delta ISB may "influence overall conceptual thinking," we found that many stakeholders do in fact associate the Delta ISB and its products with a host of influences.

In Chapter 2, we reported on a suite of applications using categories that emerged by tracing citations of Delta ISB products. In this section we report on impacts and other influences using a categorization scheme that reflects stakeholders' views. We begin this section by discussing outcomes of recommendations, as perceived by stakeholders, and conclude the section by discussing other types of influences attributed to the Delta ISB.

Delta ISB recommendations

Delta ISB recommendations represent one input to a complex and dynamic decision space that is defined by a vast interplay of interests and constraints. Depending on where they are located and how they navigate within this space, individuals and organizations may respond to Delta ISB recommendations in different ways, with different outcomes or impacts.

In the inventory (Chapter 2) we differentiated between recommendations in thematic reviews, which entail programmatic or on the ground change (Category 1, "implementation

of recommendations"); and recommendations in agency document reviews, which entail revisions to documents or their scientific content (Category 2, "incorporating feedback"). In interviews, stakeholders tended to discuss both these outcomes under the umbrella of "implementation." For the present chapter, we adopt this vocabulary of "implementation" to reflect stakeholder perspectives.

Based on our interview data, we identified three general pathways a Delta ISB recommendation may follow. We call these direct implementation, indirect implementation, and non-implementation. In this section we explain each pathway and discuss some of the factors that may influence which of these paths a recommendation takes.

Direct implementation

"Direct implementation," refers to any case in which specific, deliberate actions are taken to follow Delta ISB recommendations, and can be understood as an impact (as opposed to an influence, referring to the terminology employed above).

Several stakeholders discussed their organizations' implementation of recommendations in Delta ISB document reviews. Examples include the Delta ISB review of the Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows for the State Water Resources Control Board (Delta ISB 2017g; the reviews of scientific bases for amendments to the Delta Plan (Delta ISB 2020b); and the review of the draft 2017-2021 Science Action Agenda (Delta ISB 2017c). Interviewees expressed generally positive attitudes about the outcomes of these review processes, indicating that implementing the Delta ISB's recommendations improved the products.

There are two general features of document reviews that may facilitate or support direct implementation of recommendations. First, with document reviews implementers are clearly identified (i.e., the entities requesting the review). This removes any confusion around responsibility for implementation, which was identified as a hindrance to implementation in other cases (see below). The requesting entities are also primed to receive and integrate Board feedback. Second, implementing recommendations in document reviews involves incorporating feedback into a revised document, which is generally simpler than the long-term, coordinated actions interviewees tended to associate with other Delta ISB recommendations.

Interviewees rarely discussed direct implementation of recommendations in other types of Board products, and overall, they discussed direct implementation less frequently than indirect implementation and non-implementation.

Indirect implementation

By "indirect implementation," we refer to actions that are congruent with but not specifically undertaken in response to a Delta ISB recommendation. At the initiation of this assessment, we conceptualized implementation as a straightforward outcome – i.e., a recommendation is either implemented, or it is not. However, stakeholder interviews indicated that "implementation" has more nuance than this binary conceptualization implies. "Indirect implementation" is an umbrella term we developed from stakeholder interview data to encompass a range of influences (as opposed to impacts), which could not be deduced from either the inventory or stakeholder survey.[9]

Interviewees described three types of recommendation associated with indirect implementation. First are recommendations to **continue current activities**. Such recommendations are readily "implementable," as they require no deviation from the status quo. Although such recommendations may, at face value, seem redundant or superfluous, interviewees representing both State and federal agencies expressed appreciation for them. As described by one interviewee, "Getting an independent science board to recommend we continue the work we're doing is very valuable." As this interviewee went on to explain, recommendations to continue current activities serve as an indicator of what is being done well, and can also be used to justify ongoing support (budgetary or otherwise) for current activities.

Second are recommendations that **align with current changes in process.** Several interviewees pointed out that Delta ISB recommendations sometimes highlight issues or needs that are already in the process of being addressed. As examples, some interviewees mentioned recommendations for changes to the IEP monitoring program, made in the Delta ISB's review of the IEP.

Third are recommendations that **echo ideas in circulation**. Many issues in the Delta are multi-faceted and challenging to address, and some critical body of support is required to initiate action. In these cases, the Delta ISB contributes momentum to a gradual and incremental process of change in the Delta. As one interviewee stated, "I think it's more a process of, they put another weight on the scale and that adds to the weights by other agencies and eventually tips, and we do something."

For the latter two types of recommendation, interviewees were reluctant to name the Delta ISB as a direct impetus or catalyst for "implementation," but also appreciated the role the Delta ISB plays in moving agendas forward. In this capacity, supporting or contributing to an overall trajectory of change, some stakeholders believe the Delta ISB exerts unique influence. As characterized by one interviewee, "I think [the Delta ISB] can be really

[9] Revealing nuances by qualifying seemingly clean categorizations is a unique strength of qualitative methods.

important for moving the whole Delta community more rapidly than we would otherwise stumble to the same destination."

Interviews suggest there are several general features of recommendations that may foster outcomes we categorize as "indirect implementation," including:

- Falling within the purview of an agency
- Matching agency priorities
- Effective communication to relevant decision-makers
- Leadership support, at times paired with lower-level champions[10]

Overall, our analysis suggests Delta ISB recommendations have a better chance of indirect implementation when they have adequate leadership and logistical support, and when they are consistent with current activities or identified needs.

As described in Methods (Appendix 2), we also asked survey respondents if any recommendations in each of seven thematic reviews had been or would be implemented by their organizations (Table 3-4), and to select reasons explaining why or why not.[11] Echoing many interviewees' insights, the reasons most frequently cited for implementation were 1) recommendations within scope of the organization and 2) alignment with organizational priorities. Other top reasons were recommendations directed to the organization and resource availability (Table 3-5).

[10] Interviewees representing federal agencies emphasized support from D.C.-based leadership. In a similar vein, one survey response provided as an "other" reason for implementation advocacy both at the director level and among work teams.

[11] Survey data does not allow us to differentiate reasons for indirect implementation from reasons for direct implementation, as we referred simply to "implementation" in the questions. When prompted to describe which recommendation(s) had been or would be implemented, respondents provided a mixture of what we have categorized direct and indirect implementations, as well as some that could not be confidently categorized.

Table 3-4. Number of respondents indicating whether their organizations had or had not implemented Delta ISB recommendations, by thematic review. The counts in the column headers refer to the number of people who indicated at least some familiarity with each review. Cell counts do not sum to these totals because some respondents did not answer questions about implementation.

Category	HR (n = 63)	FF (n = 60)	LV (n = 36)	AM (n = 68)	DAP (n = 57)	WQ (n = 33)	IEP (n = 70)
Implementation	10	8	3	16	12	4	13
Non-implementation	6	5	4	5	5	2	8
Don't know	44	43	28	46	39	27	49

Table 3-5. Reasons for implementation and non-implementation. For each review, the percentage of respondents who selected each reason were calculated in reference to the total number of respondents who indicated recommendations were implemented by their organizations (Table 3-4). **Percentages for each reason were then averaged across all reviews.**

Reason for implementation	Average %
Recommendations aligned with existing priorities of organization	65%
Recommendations within scope of organization	55%
Recommendations directed to organization	32%
Available resources for implementation	32%
Delta ISB recommendations generally trusted in organization	23%
Outreach brought recommendations to attention of relevant persons	11%
Other reasons for implementation	9%

Non-implementation

Finally, our assessment also shed light on non-implementation of Delta ISB recommendations.

The reason for non-implementation most frequently identified by survey respondents was that Delta ISB recommendations were not within the scope of their organization (Table 3-6).

It is perhaps self-evident that recommendations will not be implemented when they fall, or are perceived to fall, outside the purview of an organization. However, an interesting addendum to this finding emerged from interviews, where interviewees often identified themselves categorically as implementers or non-implementers of Delta ISB recommendations. The Council, for example, was perceived as a primary implementing body by many interviewees, including representatives of the Council itself. Indeed, one Council interviewee mentioned the legal statute describing the Council as "the body to which the ISB is making a lot of [its] recommendations." In contrast, representatives of in-Delta organizations and water contracting agencies considered themselves "non-implementers." These stakeholders pay attention to the Delta ISB, and attribute other benefits and impacts to its reviews (as discussed below), but they do not consider their organizations responsible for implementation, except insofar as they participate in or influence other community issues or programs.

Table 3-6. Reasons for non-implementation. For each review, the percentage of respondents who selected each reason were calculated in reference to the total number of respondents who indicated recommendations were not implemented by their organizations (Table 3-4). Percentages for each reason were then averaged across all reviews.

Reasons for non-implementation	Average %
Recommendations not within scope of organization	44%
Recommendations not directed to organization	28%
Other reasons for non-implementation	18%
Resource constraints	12%
Other organizational priorities	6%
Implementation of Delta ISB recommendations not required	5%
Organization already moving in recommended direction	3%
Relevant persons in organization unaware of review	2%
Relevant persons in organization disagreed with recommendations	0%
Delta ISB recommendations not generally trusted	0%

Interviewees representing State and federal regulatory and resource agencies often identified themselves as potentially responsive parties, or implementers, of Delta ISB recommendations. However, these implementing agencies face a host of practical

constraints and limitations that complicate or at times preclude their ability to implement Delta ISB recommendations. Challenges associated with funding, time, and capacity for enacting change were mentioned by several interviewees. Along with these familiar resource limitations, interviews revealed that **several types of Delta ISB recommendations may have a low likelihood of direct or indirect implementation**; namely, those that:

- Require executive- or leadership-level support
- Require multi-agency coordination
- Entail regulatory change[12]
- Seek to enact transformative change, rather than build upon or improve ongoing activities and processes

In general, what are seen as big-picture, long-term science recommendations are considered hard to implement because they are abstract; no single entity is clearly in charge; and they require change on time scales that are misaligned with the time scales on which managers are addressing more immediate needs and concerns. The academic orientation of the Delta ISB, discussed above, was also mentioned specifically in relation to non-implementation. As stated by one interviewee, "in the politically charged and scientifically uncertain nature in the Delta, that academic answer is not always the best solution that leads anyone to implementation."

One interviewee suggested that misguided notions of scientific independence may also underpin non-implementable recommendations. This interviewee noted, as a general observation about independent science boards, that, "there's a tendency to conflate independence or objectivity with milquetoast recommendations," and, "one wouldn't know how to act on [these recommendations] because they emphasize uncertainty or balance." The interviewee went on to suggest the Delta community would be well served if the Delta ISB formulated recommendations that are appropriately attentive to scientific uncertainty, but also provided clear guidance for specific actions. Other interviewees pointed out the importance of identifying financial and/or regulatory "forcing mechanisms" for effecting change. As one interviewee noted, "calling out for additional resources, or not identifying the regulatory mechanisms that could force those additional resources to show up, just leaves that as a recommendation for which there is just no actionable thing to do." The language used to describe Delta ISB recommendations is revealing as well. We heard from several interviewees that recommendations must be "figured out;" for example, as one person remarked of Delta ISB reviews, "it is hard to figure out how to make those

[12] Stakeholders perceive varied challenges in association with regulation-related recommendations. One interviewee felt that regulatory change is associated with a risk that change will amount to tighter regulations overall. In contrast, one survey respondent said a reason for non-implementation was that the recommendations would require regulatory agencies to relax requirements.

connections with implementation on the ground." The ambiguity attributed to recommendations was striking, especially set in relief against other language used throughout interviews suggesting that the Delta ISB is seen as an entity that is meant to "help," "benefit," and "provide support" to the Delta stakeholder community. Interviews suggest that the Delta ISB might more effectively fulfill this service role by formulating recommendations that provide more specificity and are more clearly connected to agency needs.

Interviewees identified the need for a "middle step," between recommendations and implementation on the ground, which generally does not receive the attention it warrants. Although not all interviewees felt this "middle step" was the responsibility of the Delta ISB, some felt the Delta ISB could and should work to bridge the gap from recommendation to implementation. As discussed above, many believed a key element is formulating recommendations that are feasible to implement, through deeper engagement with stakeholders and management processes.

Another bridge to implementation mentioned by several interviewees was identifying not just how recommendations should be implemented, but also by whom. Several interviewees representing potential implementing organizations emphasized that it would be helpful for the Delta ISB to explicitly direct its recommendations to target organizations, i.e., organizations it considers responsible for implementation. By directing recommendations to specific entities or organizations, the Delta ISB may not only alleviate confusion, but also remove opportunities to defer or deflect responsibility to others. As one interviewee commented of Delta stakeholders, "they hear what they like and it makes them smile, and they tend to ignore what they don't like."

Because different stakeholders have different needs, linked to their various organizational missions and professional roles, the Delta ISB may compromise its credibility by making recommendations that are not attuned to these differences. For example, one interviewee representing a federal organization pointed out that some Delta ISB recommendations are inconsistent with the organization's experience; in this case, the call for more stable funding, which, according to this interviewee, has not been an issue in recent years. The interviewee flagged the recommendation as a "shortcut," noting, "maybe they [Delta ISB] haven't fully explored all the relevant information sources, or they're hearing something and passing it on without a lot of reflection." An alternative explanation is that this recommendation was geared toward other audiences that have experienced funding instabilities. Regardless, this example demonstrates that the Delta ISB runs the risk of being perceived as inaccurate or negligent in its reviews when it does not specify the context for its recommendations, including whom they are for or about.

Thus, interviews reveal several reasons why targeted outreach around recommendations may be mutually beneficial for the Delta ISB and its stakeholders. Complementing these

views, among survey respondents, the second most frequently cited reason for non-implementation was that Delta ISB recommendations were not directed to their organization (Table 3-6). This suggests that directing recommendations to target organizations may remove a key barrier to implementation. At the same time, though, we also heard interview commentary to suggest that more targeted recommendations can create unique challenges, without necessarily overcoming other barriers to implementation (see Box 2). Overall, there are numerous considerations to be born in mind if or as the Delta ISB chooses to target its recommendations.

Finally, while stakeholders felt Delta ISB recommendations are at times challenging or even impossible to implement, they still generally felt Board recommendations have merit. As one interviewee noted, "I don't think there are many recommendations that the Delta ISB has made in the past that I'd say were bad ideas." This sentiment was, again, echoed among survey respondents, of whom a pronounced majority (88%) agreed that Delta ISB reviews provide good recommendations, even if they cannot be implemented (Figure 3-4). Delta ISB recommendations were often linked to overall improvements or a sense of progress. Some recommendations are simply outside the realm of possibility or necessity (defined by obligations to funding bodies) of an agency.

Box 2. Delta ISB review of the IEP

Customarily the Delta ISB has conducted thematic reviews on topics that cut across agencies (e.g., habitat restoration or water quality). Breaking somewhat with this norm, in 2019 the Delta ISB published a review of the Interagency Ecological Program. The Interagency Ecological Program is a consortium of nine State and federal agencies in the Delta, with the mission "to provide and integrate relevant and timely ecological information for management of the San Francisco Bay-Delta ecosystem and the water that flows through it" (About the IEP). The IEP serves as a space for collaboration, but each member agency retains its own rights, responsibilities, and decision-making authority, including authority for decisions about allocation of resources toward activities labeled "IEP."

We highlight this review as a case study for two reasons. First, the Delta ISB's review of the IEP was discussed in most stakeholder interviews, and several interviewees participated in the review process. Multiple interviewees perceived that there is high interest in this review in the Delta community and, of the thematic reviews included in our survey, more respondents indicated some familiarity with the review of the IEP than any other (Figure 3-6). Second, over the years, the Delta ISB has discussed shifting its approach, such that the Board would focus its reviews on specific scientific programs in the Delta, rather than crosscutting thematic areas. Of its reviews since 2010, the review of the IEP is the product that most closely demonstrates this strategy. Therefore, it is instructive to consider how the review has been received, to gain insights into both potential benefits and potential pitfalls of this approach.

Box 2 continued

Among interviewees, opinions of the review were mixed. One interviewee felt it was probably the most impactful of the Delta ISB's reviews, and another felt the effort was timely and potentially a great benefit to the IEP. However, several interviewees were overtly critical of the review, on grounds that it failed to provide constructive or novel guidance and conveyed unrealistic expectations for the IEP. Further, some commentary in interviews suggests there may be sensitivity in the IEP around what is perceived as unwelcome and unnecessary involvement by the Delta ISB, which resulted in recommendations that were either untenable or redundant with recommendations that had already been made through internal review processes, and in some cases were already being carried out when the Delta ISB released its review. This sensitivity may be exacerbated by a lack of clarity around the motivations and purpose for the review. As one interviewee noted, speaking from the perspective of the IEP, "I actually don't even know why we had the ISB review."

Thus, while the IEP review has evidently garnered interest, it has also generated controversy and some contention.

Reflections from interviewees suggest that difficulties similar to those described as precluding implementation of Delta ISB recommendations in other thematic reviews were also at play in the IEP review. Interviewees in one group largely attributed challenges in implementation to what one individual characterized as the "insanely complex" governance of the IEP. They commented that it is challenging to maintain the IEP in its current form, which makes recommendations that advise any sort of re-organizing difficult to imagine, let alone address. One interviewee emphasized the need and desire among IEP scientists for guidance in the conduct of on the ground science. In this person's opinion the Delta ISB does not usually provide the required degree of specificity in its recommendations, being directed rather to the "10,000 foot level" of directors. These interviewees dismissed the notion that decisions made at such a high level translate easily to change on the ground. Stated simply, "it's still a tough business to get a directive decision that actually means what you want it to mean on the boat."

Communication and outreach were also highlighted as impediments to implementation. One interviewee shared that there are many, not necessarily consistent, interpretations of the Delta ISB's recommendations among IEP scientists and managers. In part this may reflect a lack of clear guidance or direction from the director level, which in turn may reflect difficulties with outreach, which were compounded by the onset of the COVID-19 pandemic. While some interviewees lauded the Delta ISB's communication at IEP directors' meetings, one person conveyed that, in their experience, the actual IEP directors often do not attend these meetings. This interviewee felt that the Delta ISB did not actually reach the IEP directors through this venue, which, in this person's opinion, resulted in "a great difficulty in being able to provide any coherent response by IEP to the recommendations."

Box 2 continued

One of the interviewed Delta ISB members also felt they hadn't reached the directors, stating, "If we had had the chance to meet with the directors, as they requested, I think that really would have made that review much, much more valuable."

Finally, the overarching critique that the Delta ISB recommendations are not grounded in an accurate understanding of the practical and material constraints confronting scientists and managers in the Delta arose specifically in relation to the IEP review. To reiterate, the opinion expressed was that the practical value and impact of Delta ISB recommendation is limited to the extent that they are not fully informed by a deep understanding of Delta stakeholders' lived experiences.

In summary, our assessment suggests that programmatic reviews may share challenges in common with thematic reviews, including the difficulty of implementing recommendations in a context of organizational complexity and distributed decision-making authority; communication; and Board engagement with local issues. Further, this case study of the IEP review suggests there may be unique challenges associated with more targeted reviews; not least of which are the difficulty of maintaining goodwill and providing desired and necessary support for target organizations with a constructive end product. While there may be good reasons for the Delta ISB to take a more targeted approach to reviews and/or recommendations, our assessment suggests deliberate measures would be required to achieve intended outcomes and maintain positive relationships with Delta stakeholders.

Other influences

As noted above, implementation of recommendations was an impact of particular interest to stakeholders (and, indeed, to this assessment). However, interviews revealed that numerous other types of influence are also attributed to the Delta ISB. Some of these are related to Delta ISB recommendations, yet distinguishable from either direct or indirect implementation. We have categorized these other influences into four types: scientific contributions, community responses, stakeholder support functions, and directing attention.

Scientific contributions

Interviewees often discussed the scientific value of Delta ISB products. Delta ISB reviews are perceived to increase and enhance understanding of the overall state of science in the Delta. For example, one interviewee expressed that, "there are examples of shifts we've made or leaps we've made in our understanding of issues of Delta science that should be attributed to the ISB."

Interviewees also discussed the Delta ISB's role highlighting scientific uncertainties and knowledge gaps. In particular, interviewees acknowledged that Delta scientists may have a tendency to overlook key uncertainties when local assumptions or norms become ingrained. The Delta ISB was characterized as bringing a critical external perspective, which reveals and calls into question such local norms and assumptions. For example, one interviewee commented that the Delta ISB's levees workshop and resulting review highlighted flaws in the Delta Risk Management Strategy dataset produced by the Department of Water Resources, which at the time was widely used to estimate seismicity effects on levees (CDWR, 2009). The Delta ISB, according to this interviewee, revealed errors in that dataset and contended that an alternative dataset was more accurate.

Community responses

Aside from implementing recommendations, interviewees identified a variety of ways in which Delta stakeholders may respond to Delta ISB reviews, other than by implementing recommendations. Reviews may instigate specific activities, such as workshops or symposia, studies, or planning processes. Also included in this category are less tangible and more diffuse community responses, such as dialogue and reflection. Several interviewees mentioned that Delta ISB products spark discussion in the community and influence how people view scientific issues. Interviewees described how they discuss Delta ISB products in various venues, including internal staff meetings, collaborative work groups, and scientific coordination groups (e.g., the Delta Regional Monitoring Program). Along with reading Delta ISB reviews, participating in Delta ISB surveys and interviews as part of the Delta ISB review process can stimulate discussion among stakeholders.

It is noteworthy that discussion and reflection were types of influence mentioned by a range of interviewees across agencies. As stated by one interviewee representing a federal agency, "almost everybody reads what the ISB puts out and talks about it."

Stakeholder support functions

Another type of influence to emerge from interviews is what we call "stakeholder support functions." Interviewees named a range of ways in which the Delta ISB supports, advances, or improves Delta stakeholders' products, processes, or programs. In providing these support functions to inform stakeholder outputs, the Delta ISB indirectly influences Delta science and management.

For example, the Delta ISB provides a support function by scientifically informing stakeholders' views and positions. Several interviewees mentioned that the Board's reviews of the Bay-Delta Conservation Plan/California WaterFix Environmental Impact Report/Environmental Impact Statement (EIR/EIS) documents were used by different stakeholders to formulate their policy positions; and more generally served as resources to the in-Delta community.

Delta ISB feedback is another important support function. As discussed above, the Delta ISB provides formal, written feedback in document reviews, and stakeholders generally discussed incorporation of this feedback as examples of (direct) implementation of Delta ISB recommendations. But interviewees pointed out that the Delta ISB provides feedback in other settings as well, including public Delta ISB meetings and informal, interpersonal interactions. Multiple interviewees emphasized the value of these informal types of feedback.

Affirmation is another impact that falls under the umbrella of stakeholder support functions. When the Delta ISB echoes findings or priorities identified by local scientists and managers, the convergence of opinion serves as validation. For example, stakeholders in one interview group shared that their confidence increased when the scientific topics they had identified as research priorities were also identified as priority research gaps in the Delta ISB's water quality review. Delta ISB affirmation of Delta science or science-based management activities provides credibility and can also be cited to support continuation of current activities and justify budget requests.

More generally, and beyond validating specific findings, activities, or proposals, some interviewees felt that the Delta ISB elevates Delta science overall: "it lends credibility to the entire Delta science enterprise to have a group like that standing long-term."

Directing attention

The final category of influence refers to the outcome in which the Delta ISB directs attention or encourages consideration of scientific issues within the Delta. Examples include drawing attention to the importance of rigorous and systematic adaptive management protocols in the adaptive management review; and drawing attention to what one interviewee characterized as the "uncertainties and difficulties" of the EIR/EIS process in the Bay-Delta Conservation Plan/California WaterFix review. The Board can potentially exert profound influence by capturing the attention or directing the consideration of agency heads. As explained by one interviewee,

> "…they [the Delta ISB] bring national and international credibility to a question of, 'why aren't you spending more money on doing X, Y, or Z, when you know that doing A, B, or C depends upon the answers you get when you ask the questions X, Y, or Z?' And that doesn't tend to come as meaningfully from people like me inside than it does from outside."

This interviewee felt that the Board has the ability to direct decision-makers' attention in ways that local scientists and managers lack; a perception that was echoed by people in other interview groups as well.

Interviewees felt the Delta ISB is especially well-positioned to keep big-picture, long-term scientific issues, such as climate change, in the foreground. The Delta ISB's letter to DPIIC

advocating greater attention toward science addressing rapid environmental change was cited several times as an example. Interviewees clarified that Delta scientists and managers are not naïve to these issues but, given other immediate priorities, lack the capacity to address them. The Delta ISB is viewed as a rare entity that is unencumbered by practical management constraints and priorities. As such, stakeholders look to the Board to keep non-immediate but still urgent needs, such as climate change, in play until they can be addressed. As described by one interviewee, "a longstanding board can keep on kind of ringing that bell and saying, 'Well, here's an aspect that needs to be taken care of, but we haven't seen much progress. So we're going to remind you.'"

In addition, one group of interviewees suggested the Delta ISB can force stakeholders to consider issues differently when their opinions diverge:

> "Of course, we feel very happy when they [the Delta ISB] agree with us. But if we're not in agreement with them, then we really have to think about it. It makes us reflect, just because we do view them as unbiased, and it would be different than if we had a disagreement in opinion with another organization within the Delta."

As discussed above, stakeholders receive credibility and affirmation when the Delta ISB echoes their findings or decisions. This example demonstrates that there are also important impacts when stakeholders are not aligned with the Delta ISB, suggesting more generally that the Delta ISB's reviews represent a standard that stakeholders use to assess or evaluate their own findings or priorities.

Outreach and communication

Formally, the Delta ISB is linked to the Delta by way of its legislative mandate, but in practice the Board builds and sustains connections with stakeholders through outreach and communication. While effective outreach and communication are seen to be critically important, they are also seen as deeply challenging for the Board, as they are for stakeholders across the Delta.

The communications landscape

People occupying specific positions in the Delta have specific interests, concerns, and constraints, all of which direct their baseline levels of interest and attention to various issues and actors - including interest in and attention to the Delta ISB.

Even among the relatively small number of stakeholders we interviewed, there was notable variability in how people described their general attunement to the Delta ISB. For example, one individual representing a State agency remarked that, "it's not like I or [the organization] necessarily is tracking everything the ISB is doing overall." In contrast, an interviewee representing an in-Delta organization commented that, "we look quite eagerly to see what the ISB says in their reviews." Our observation is that stakeholders' baseline

levels of attention to the Delta ISB vary as a function of their organization and role therein; and that specific Delta ISB activities and products also command different levels of attention, depending on their scope. Being aware of the complex topography of interest and attention in the Delta might support more efficient and effective communication, outreach, and engagement by the Delta ISB.

Governance responsibilities and relationships in the Delta may also influence outreach and communications in subtle or overt ways. In interviews we heard how the ability to capture attention is interwoven with complex networks of accountability and implicated in larger Delta politics. This is illustrated effectively by examining two stakeholders' descriptions of their agencies' responses to the Delta ISB's reviews of the Bay-Delta Conservation Plan/California WaterFix EIR/EIS documents. One interviewee representing a State permitting agency, which is also a responsible party under the California Environmental Quality Act, noted that the organization felt "a need to be responsive to those reviews as best as possible." In this case, the regulatory role and purview of the agency created a direct channel of accountability that required the agency to proactively pay attention to the Delta ISB's work. In a second example, in an interview with Delta water contractors, one interviewee described how the communities they serve showed acute interest in the Delta ISB review of the Bay-Delta Conservation Plan/California WaterFix documents. This, in turn, raised awareness of the review with the water contracting agency's governing board, which in turn required agency staff to be more attentive. Thus, the Delta ISB review drew the agency's attention across levels of the organizational hierarchy because its community stakeholders demonstrated interest in a particular product.

Delta science is communicated in a highly political environment, and several interviewees suggested it is important for the Delta ISB to understand and consider how its reviews and recommendations are used to advance or resist various interests. For instance, one interviewee asserted that the Delta ISB's reviews are prone not only to selective attention but also to "manipulation and mis-characterization," unless the Board takes proactive measures to ensure the message intended is the message heard. In short, although the Delta ISB acts independently and is itself politically unaffiliated, it operates and communicates at the interface of science and policy, which requires deft navigation.

Current outlets and additional outreach opportunities

Survey respondents indicated that they hear about Delta ISB activities in numerous venues, but most commonly via the Delta Stewardship Council listserv (Table 3-7). The next most common source of information listed was colleagues or supervisors, a finding echoed in several interview groups, where word of mouth was identified as an important communication channel. Oftentimes certain individuals serve as key informants, regularly attending Delta ISB meetings and reporting back to their organizations or relevant work groups.

Table 3-7. Stakeholder sources of information about the Delta ISB, by organizational affiliation. Cell values represent the count of respondents in each affiliation who indicated they use each source of information, with totals and the percentage of the total sample using each source displayed in the final column. Cell counts do not sum to totals because some respondents did not provide a current affiliation. Respondents were asked to select all sources of information they use. N = 155.

Source	Federal	State	Local	Academic	Environmental	Private	Contractors	Other	Total
Council listserv	15	26	6	5	1	4	5	8	73 (47%)
Other listserv	1	4	1	2	0	1	0	1	11 (7%)
Facebook	0	1	0	1	0	0	0	0	2 (1%)
Instagram	0	0	0	0	0	0	0	0	0 (0%)
Linkedin	0	1	0	0	0	0	0	1	2 (1%)
Twitter	1	1	0	2	0	2	0	0	6 (4%)
Public meeting announcement	3	14	4	2	0	2	1	0	26 (17%)
Colleague/supervisor	4	18	2	4	1	1	2	3	36 (23%)
Council website	4	16	4	0	0	2	1	5	32 (21%)
Other website	0	2	0	1	0	1	0	0	4 (3%)
Other	2	7	0	1	0	0	0	1	11 (7%)

Nonetheless, **a majority of survey respondents (62%) felt current Delta ISB outreach is not generally effective**. Interviews provided additional insights into the perceived (in)effectiveness of Delta ISB communications around meetings, reviews/products, and recommendations, and highlighted avenues for improvement.

Given the sheer volume of communications flowing regularly through the Delta, effective outreach is an undisputed challenge. In this context, it may be that ineffective outreach is the norm. As characterized by one interviewee: "I wouldn't say [the Delta ISB is] any less effective than anyone else's outreach. There's just a lot of outreach, so it's hard to keep track." Communication is not necessarily the singular responsibility of the Delta ISB. Some stakeholders actively follow the Delta ISB. Others do not, yet they expressed the sense that they should, suggesting they see it as their responsibility to track entities and activities of interest in the Delta. However, while communication is certainly a two-way street, it is also within the Delta ISB's power to increase interest and attention by enhancing or expanding its outreach efforts. Opportunities related to meetings, reviews and other products, recommendations, and strategic communications were highlighted in interviews.

Interviewees indicated that **meetings are generally accessible**, particularly in an online format. Indeed, some felt Delta ISB meetings are more open and attentive to the public than other public meetings (including Council meetings). However, one interviewee expressed concern that Delta ISB meetings are not reported to the Council.[13] This person felt that communication between the Delta ISB and the Council can and should be improved, perhaps by incorporating regular updates into the Delta Lead Scientist Report. Others suggested diversifying venues to reach broader audiences. As one survey respondent wrote, "I've certainly always appreciated the briefings or summaries at various meetings, but people at those meetings are a small subset of those who need to understand the evolving science." Delta residents and tribal governments were also named as particular groups with whom the Delta ISB should more proactively engage, although specific venues were not mentioned.

Many interviewees also urged **more communication around reviews and other products**. As observed by one interviewee, "at times the ISB product…can just kind of get added to the pile of a lot of other reviews and documents. And it sometimes makes it difficult for that product to stand out from everything else that's going on." Survey data indicates current outreach is somewhat effective in promoting products, but also suggests room for improvement. On average approximately 44% percent of respondents had at least some familiarity with any one review. Respondents reported the greatest familiarity with the Delta ISB review of the IEP, and the least familiarity with the levees and water

[13] In the past, the Delta ISB reported monthly or quarterly to the Council. Currently, the Board presents an annual work plan overview to the Council, with additional major updates provided on an as-needed basis.

quality[14] reviews (Figure 3-6). On average slightly more than half of the respondents (55%) who were familiar with any review indicated they had read the actual review in whole or in part, while on average 28% of respondents reported having read a summary of a review; 35% reported learning about a review at a public presentation; and 14% reported learning about the review from a colleague or supervisor (Figure 3-7).

[14] Interestingly, the water quality review received more public comments than any other review and was also the most downloaded thematic review. This discrepancy suggests that these audiences differ from the respondents who chose to complete our Delta ISB assessment survey.

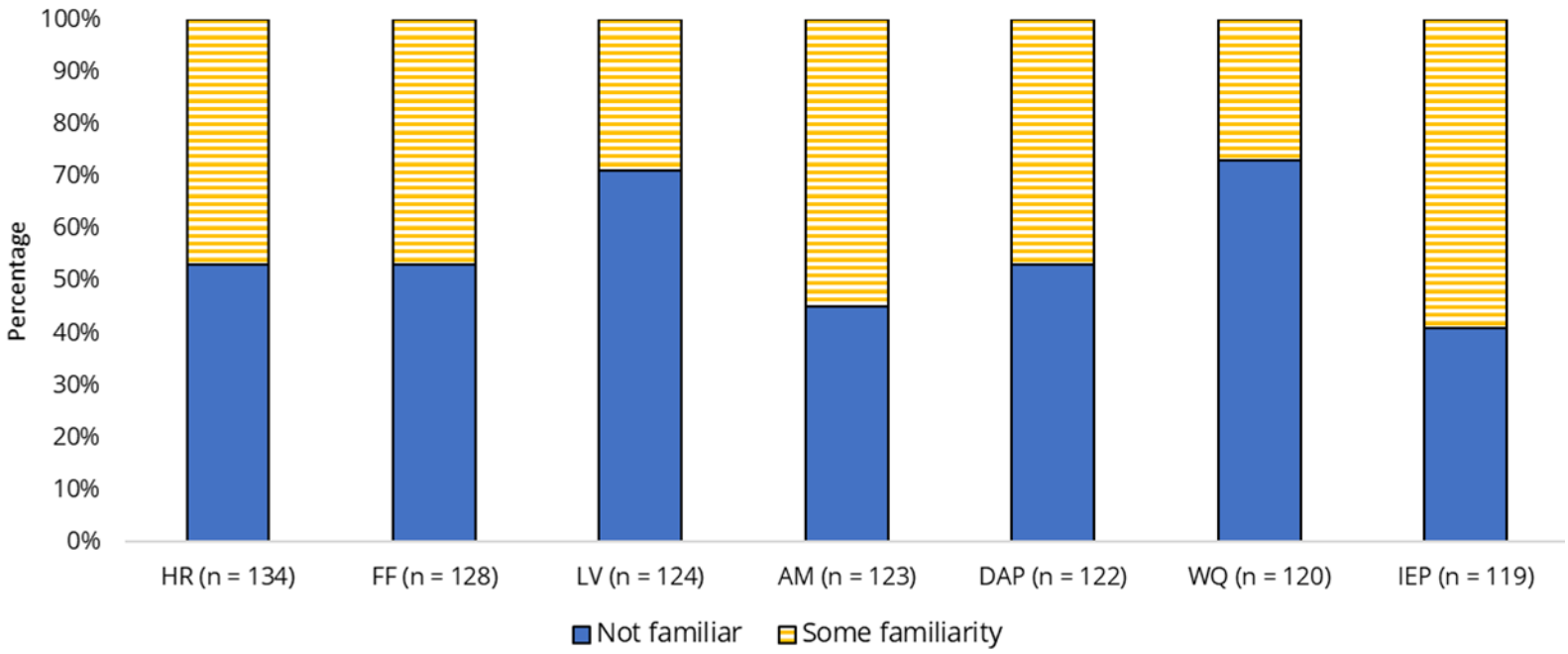

Figure 3-6. Familiarity with Delta ISB reviews. Percentages are shown in relation to the total number of people who responded to questions about familiarity with each review (reported at the foot of each bar). Abbreviations correspond to reviews as follows: HR habitat restoration, FF fish and flows, LV levees, AM adaptive management, DAP Delta as an Evolving Place, WQ water quality, IEP review of the Interagency Ecological Program.

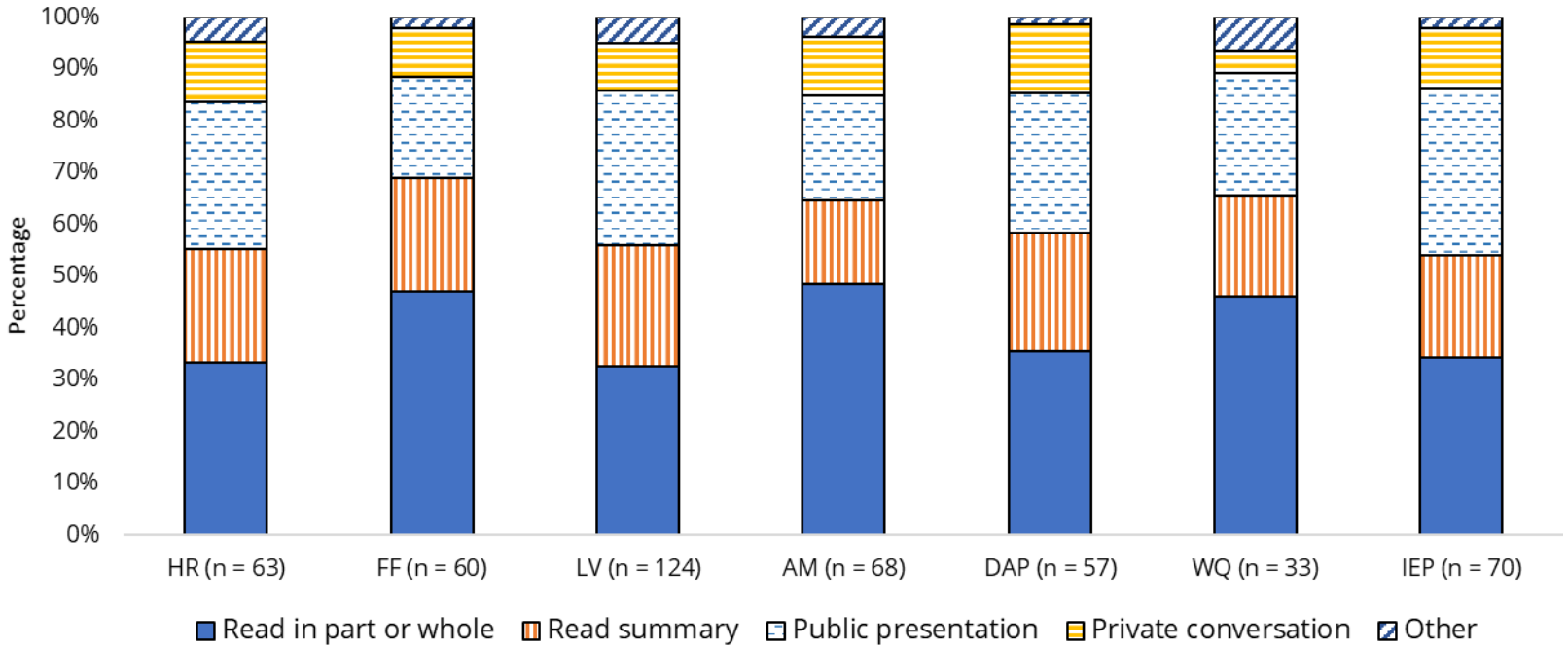

Figure 3-7. Sources of familiarity with Delta ISB reviews. Percentages are shown in relation to the total number of people who reported at least some familiarity with each review (reported at the foot of each bar). Because respondents selected all sources that apply, total percentages exceed 100%. This figure depicts relative rather than absolute percentages. Examples of "other" sources of familiarity with reviews include working at Council-Delta Science Program, literature review and synthesis activities, Maven's Notebook, contributing to information used in the review, the Delta ISB website, reference to the report in other science reviews, and other Council activities (DLIS online tool, Delta Plan). Abbreviations correspond to reviews as follows: HR habitat restoration, FF fish and flows, LV levees, AM adaptive management, DAP Delta as an Evolving Place, WQ water quality, IEP review of the Interagency Ecological Program.

At the same time, on average more than half of respondents (56%) indicated no familiarity with the seven thematic reviews listed in the survey. To reach more people, several interviewees suggested a more prominent roll-out upon initiation and/or completion of a review. Discussion in one interview group highlighted the value of seeing products announced in multiple forums, and outside of the Delta ISB's own meetings, to spark their interest and draw their attention to reviews. Although interviewees commended the Delta ISB's processes for soliciting public input on its products, several urged greater transparency around the selection of review topics and the internal stages of writing and Board review, before the product is released for public comment.

Many stakeholders also emphasized the need to **target specific audiences to raise awareness and/or support implementation of Delta ISB recommendations**. Interviewees mentioned both the challenge and the importance of communicating effectively with directors, executives, and policymakers, emphasizing the value of concise messaging in appropriate venues. As one interviewee explained, busy people probably will not take the time to read, let alone respond to written reports and recommendations. DPIIC was highlighted as an effective forum for raising awareness and communicating final recommendations; and also for discussing draft recommendations before they are finalized, to increase agency awareness and buy-in.

It is also noteworthy that substantial proportions of respondents reported only slight awareness of the Delta ISB (Figure 3-1). Further, for the 10 questions soliciting evaluations of the Board, on average nearly a quarter (22%) of respondents answered "I don't know." This suggests there may be opportunity not only for improved communications specifically around Board products, but also improved communications about the Board and its role in the Delta.

Considering the Board's wide variety of communication needs and audiences, one interviewee suggested the **development of an overall communications strategy** for the Delta ISB. Given the complexity and political sensitivity of Delta science and management, it is telling but perhaps unsurprising that stakeholders would encourage deliberate and strategic outreach. While some generalized outreach is clearly effective, particularly for motivated audiences who are already following the Board's activities, the Delta ISB is vying for attention in a crowded field. Intentional engagement with target audiences may more effectively ensure meaningful messages are reaching relevant audiences.

Larger visions

We conclude this chapter by sharing some aspirational ideas that stakeholders articulated as possible or desirable roles for the Delta ISB. These are revealing not only in how people envision the Board specifically, but also in the sense that they convey broader visions for

Delta science and management. These visions focused around three areas: scientific uncertainty, scientific synthesis, and scientific coordination.

The idea that the **Delta ISB could serve in a role that systematically addresses uncertainty** came up in multiple interviews. Interviewees envisioned the Delta ISB spearheading a more structured approach to addressing the many scientific uncertainties in the Delta. For example, interviewees in one group suggested the Delta ISB could use surveys to identify scientifically controversial issues, and subsequently provide explicit guidance on studies that would fill gaps in understanding. Beyond reviewing and validating best available science, these stakeholders also urged a more proactive role for the Delta ISB, in steering the Delta community toward targeted studies that increase scientific understanding and reduce key uncertainties. Several stakeholders also expressed the view that the Delta ISB tends to avoid the most controversial issues in the Delta. These individuals urged the Delta ISB to engage with scientific controversy more readily, as controversial issues are also often the most critical issues needing to be addressed.

Another theme to emerge from one interview was the Delta ISB's current and potential role in **scientific synthesis, especially for non-scientific audiences**. Speaking on syntheses for policymakers, one interviewee in this group felt the Board is already effective at distilling core points from complex science into digestible takeaways. However, another felt the Delta ISB might beneficially manage a formalized synthesis process, perhaps publishing syntheses for policy makers in a regular and centralized publication format. Another interviewee highlighted the value of scientific synthesis for people living and working in the Delta, who need science to support their activities as well. This respondent urged the Board to increase use of social science to understand local issues and concerns, and then provide useable, synthesized science to locals as a resource. The Delta ISB already engages in scientific synthesis in its thematic reviews, which are written to provide broad oversight and support adaptive management in the Delta. Consistent with this charge, these interviewees pointed to more specific audiences (i.e., local Delta residents) with specialized synthesis needs that could be met by the Delta ISB.

Finally, some stakeholders commented on the notion that the Delta ISB could **stand at the helm of a more coordinated Delta science enterprise**. As written by one survey respondent, "[the] ISB can help to move us toward 'one Delta, one science,' but we are a long ways off." As an independent yet established, familiar board, the Delta ISB may be uniquely situated to coordinate science in the system from an informed, politically neutral position. The lack of clear vision for Delta science emerged as a theme in interviews as well, and especially with stakeholders representing federal organizations. For example, one person reflected that

> "…we may need a heavier hand by the ISB in walking us through the course of developing a science enterprise. I think it's hard for us to step out of our individual agency roles and agree to that. If there's an independent party where we can kind of

> plug in, that might be something we could try – but that would be maybe less of a review function, and more of a leading us/dragging us function."

This perhaps reflects the perspective of people who are at once actors within the system and yet, as self-described, are somewhat removed from the State sphere of management and decision-making, and therefore able to view the system from an outside perspective as well. As one interviewee explained, "I think there was a vision with the Delta Reform Act about the ways that the State and feds could interact, and I don't know that that's fully come to fruition." Although this interviewee did not necessarily think it is the Delta ISB's role to lead in this endeavor, neither did the person rule it out.

These visions are illuminating, not only because they shed light on perceptions of the Delta ISB, but also to the extent that they bespeak broader hopes for science and management in the Delta. By examining stakeholder perceptions of the Delta ISB, we also gain a deeper understanding of the system itself, since these stakeholders are, after all, actors within the system. The actions, concerns, challenges, and visions they articulate will drive the system into future, as the Delta ISB continues to navigate its own distinct yet intersecting course as an entity apart from – yet a part of – the Delta.

Chapter 4: Delta ISB Members' Perspectives

Introduction

Findings in Chapters 2 and 3 are drawn from information reported by sources external to the Delta ISB, including documented applications of Delta ISB products and stakeholder surveys and interviews. To complement this external view of the Board, the current chapter conveys perspectives of individual Board members by compiling reflections, insights, and ideas shared by past and ongoing Delta ISB members in interviews. (See Appendix 5 for Delta ISB member interview questions.)

Capturing perspectives of individual Delta ISB members in a 10-year retrospective is valuable for at least two reasons. First, it is important for public transparency to have a clear understanding of how Board members who served from four to 10 years envision the Delta ISB's role, view the ways the Board does its work, and perceive the Board's impacts in the Delta. As an independent scientific board, the Delta ISB has considerable latitude in defining its own role, scope, and processes. At the same time, as a body operating by statute under the Delta Reform Act, the Delta ISB is accountable to the public entities affected by its activities. It is important to document Board members' definitions of and expectations for the Delta ISB, especially as Board membership, priorities, and approaches evolve over time. Doing so provides context for members of the public to engage with and evaluate the Delta ISB and its work.

Second, interviewing Delta ISB members helps capture institutional memory, which is the knowledge of what works and what does not work in organizational programs and policies (El Sawy et al. 1986). Preserving and using institutional memory is important for effective management; as argued by Corbett et al. (2018), "The ability of the civil service to act as a reservoir or institutional memory is central to the pragmatic task of governing." To this end, we included as part of our assessment an objective to elicit and record the experiences of individuals who have served on the Delta ISB, many of them in its formative years; recognizing that these Board members have valuable insights into the Delta ISB's process as it has evolved through time. Documenting this history, and how and why Board processes developed as they did, provides useful guidance for the new Board and Council support staff as they continue Delta ISB work planning efforts.

Our intent for this chapter is to represent the range of experiences and opinions expressed by different Board members, both for purposes of transparency and institutional memory capture. Therefore, rather than synthesizing interview data by emphasizing common themes and points of convergence, we attempt to both summarize perspectives widely shared by Delta ISB members, and also represent views expressed by only one or two Board members. Although the Delta ISB functions as a collective entity, we hope to convey

that it is also a collection of diverse individuals bringing unique, interdisciplinary, and at times individually idiosyncratic perspectives to the service of the Board.

Findings in this chapter are based on interviews with recently retired and ongoing Delta ISB members in the fall of 2020. We first describe our methods, then discuss findings based on individual Delta ISB member perspectives about the purpose of the Board; the impact and value of its body of work; perceptions about how the Board is seen by others; their opinions on impactful or valuable individual reviews or products; and thoughts on reviews to repeat. We next summarize Delta ISB members' advice on performing reviews, including selecting what to review, methods and approaches for executing the reviews, writing, and Board endorsement of the reviews. Finally, we present Board members' thoughts on outreach and tracking for Delta ISB products and recommendations.

Methods

Between October and November 2020, Lauren Hastings (LH) and Chelsea Batavia (CB) interviewed 11 recently retired and continuing Board members. Seven were former Delta ISB members (Brian Atwater, Elizabeth Canuel, Tracy Collier, Richard Norgaard, Vincent Resh, John Wiens, and Joy Zedler), and the other four were ongoing members (Steve Brandt, Harindra Fernando, Tom Holzer, and Jay Lund). Interview questions prompted Delta ISB members to reflect on the purpose, value, and impact of the body of work produced by the Delta ISB; how Board members feel the Board is viewed by managers and policymakers as well as scientists; and whether Board members think any individual thematic reviews or other products have been particularly impactful and/or valuable, and why. Additional questions elicited Board members' descriptions of and feedback on the review process as it has evolved over the Delta ISB's first 10 years.

Interviews typically lasted slightly more than an hour. All were recorded and transcribed for purposes of analysis.

Interviews were analyzed by LH following what Saldaña (2013) describes as a structural coding approach, in which relevant interview content is sorted into pre-defined categories corresponding to key questions or topics of interest. The categories used for this analysis corresponded closely to the interview questions, and include:

- Purpose of Delta ISB
- Value and impact of Delta ISB overall
- Value and impact of specific Delta ISB reviews
- Perceptions of Delta ISB by scientists and managers
- Commentary on specific Delta ISB reviews or review types
- Suggestions to improve Delta ISB review process (broken into stages)
- Advice on outreach for Delta ISB activities and products

- Thoughts on tracking implementation and/or impacts of Delta ISB recommendations

After relevant content from each interview was summarized, key points and ideas were distilled, and occurrences of these points and ideas across all interviews were counted. These results are reported qualitatively in the findings below.

The decision to use this analytical procedure, rather than the emergent coding procedure used to analyze stakeholder interviews in Chapter 3, was driven primarily by the tradeoff between time-investment and information gain. Because the categories used to query the data are pre-determined, structural coding is generally less time-intensive than emergent coding approaches (which, as described in the previous chapter, involve multiple iterative cycles of coding, organization/integration, and synthesis). Using a structural coding approach allowed us to systematically yet efficiently identify, compile, and summarize findings that pertain to questions of interest to this assessment.

Findings

Views on the purpose, impact, and value of Delta ISB body of work.

In general, Delta ISB members felt the overall purpose of their body of work is to evaluate the science applied to management and policy in the Delta, identify gaps, and make recommendations to improve the quality of science. Several members referred to the Delta Reform Act[15] as identifying the Board's purpose. Like stakeholder interviewees, many Board members saw the independence of the Delta ISB as central to its purpose and specifically mentioned the importance of the independent external perspective of the Board. One Delta ISB member felt the Board's "willingness to exert its independence…garnered trust and respect in both the science and management sides of the Delta enterprise." Another member observed that the Board's independence was a common topic when stakeholder attendees would chat with members during coffee breaks at Board meetings. The same individual noted that Board members were careful that their comments reflected their scientific judgements rather than external pressures.

In the introduction to interview questions about the impact and value of Delta ISB work, we provided definitions for each term: "For the purposes of this project, 'impact' refers to the consequences or results of Delta ISB reviews, whereas 'value' refers to their importance or significance." Over the course of interviews, it became evident that the line between impact and value is often ambiguous and not necessarily agreed upon. Rather than insisting on our definitions, we allowed Board members to reflect on both impact and value in

[15]The Delta Reform Act states that the Delta ISB will provide oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Delta through periodic reviews of each of those programs. (California Water Code 85280 (a)(3)).

whatever connotations were meaningful to them. Some accepted our definitions, and some elaborated their own meanings. For example, one Board member articulated, "Impact – relates to the actions; value – are those actions worthwhile," whereas another defined, "Impact – are things changing as a result; value – even if they aren't changing, could be a useful thing for people to know."[16]

Several Delta ISB members pointed out that the impacts of the Board's work are challenging to quantify and have not yet been measured for the Board or its reviews. As such, many were reluctant to discuss specific impacts. Nevertheless, many Board members noted, anecdotally, that the Delta ISB's work had made various impacts in the Delta. Examples included that the Delta ISB "got the people to work together with less fighting," "provided a forum," and "provided greater understanding for decisionmakers." Some Board members also pointed out that impact varied across reviews, as discussed later in this report. In addition, Board members expressed conflicting opinions about the impact of the review of the Bay-Delta Conservation Plan/California WaterFix environmental documents, which was described as a major undertaking. Two felt the time spent on the Bay-Delta Conservation Plan/California WaterFix reviews limited the Board's overall impact. In contrast, another member noted it was the one review the Delta ISB had repeated, presenting an opportunity for the Board to see evidence that changes were made based on its review.

Board members generally found it easier to reflect on the value of the Delta ISB. Many Board members mentioned the primary value of the Board is its existence as a high-level, well-respected, independent, and scientific oversight body. Delta ISB members thought that the existence of the Board increased confidence among stakeholders because a high-level body is providing scientific oversight and making sure the science is being done in a rigorous way. Some Board members mentioned that the Board elevates credibility and trust by vetting the efforts and processes in the Delta. In addition, the Delta ISB helps make Delta science less parochial because it brings the broader perspectives of a diverse Board with national and international experience and expertise. Other comments on the value of the Board included: filling a niche the agencies do not; having both a constructively disruptive influence, as well as a smoothing influence; and generating a lot of good ideas.

Beliefs about how the Board is seen by others

In addition to asking Board members how they see themselves as a board, we also asked them how they think the Board is seen by others in the Delta, including managers, policymakers, and scientists. Almost all Delta ISB members felt the Board is viewed favorably by the scientific community, noting the connection they have as scientific

[16] This Board member later clarified their view that value could be high even if people do not use a product, but the impact would be low.

colleagues. Most Delta ISB members also felt they were viewed favorably by managers and policymakers, although a few Delta ISB members were either unsure or thought they might be perceived less favorably by managers and policymakers than scientists. We did not ask explicitly about perceptions by stakeholders, but several Delta ISB members said they felt positively received by the stakeholder community as well, based on feedback they heard from public comments and interviews, as well as side conversations during Delta ISB meeting breaks.

Impactful/valuable individual reviews or other products

One Board member commented that the most worthwhile reviews were also the reviews that generated the most controversy among Board members – i.e., when there was both strong internal opposition and strong internal support for doing those reviews. The examples mentioned were Delta as an Evolving Place (which was controversial because it focused on social science, whereas prior reviews had focused on natural science); the rapid change letter (2019) and memo (2020) (which were not considered equally important by all Board members, some of whom assumed the topic would be addressed elsewhere); and the IEP review (which was originally not prioritized, as some felt it was programmatic, not thematic, and could be covered under the monitoring enterprise review). Interestingly, these reviews were all commonly mentioned by other Delta ISB members as the most valuable and/or impactful Board products, although no other Delta ISB members felt these reviews generated internal controversy.

By far, the reviews most frequently mentioned by Delta ISB members as having impact were, in order: the Delta as an Evolving Place review, the rapid change letter (2019) and memo (2020), and the adaptive management review.

Delta as an Evolving Place

The Delta as an Evolving Place review was considered impactful because the Delta ISB was the first group to publicly state that social science was missing in the Delta. Board members expressed that the review "clearly changed the whole direction of what people were talking about" and "changed the course of expenditures and expectations in the Delta." Chapter 2 of this report documents Council responses to the Delta as an Evolving Place review, including convening the Social Science Task Force, which produced *A Social Science Strategy for the Sacramento-San Joaquin Delta*, and the addition of three priority social science actions to the 2017-2021 Science Action Agenda.

Rapid change letter and memo

The rapid change letter (2019) and memo (2020) were spurred by the Delta ISB's review of the draft Delta Science Plan update (Delta ISB 2018a), in which the Board commented that forward-looking science was lacking. As described by one Delta ISB member, the letter and

memo were about the philosophy of doing science in a rapidly changing world. Both highlight the need to be more anticipatory in the Delta science enterprise. The Delta ISB member continued by saying that there is always the need for long-term, deep understanding of a system. However, in these times of rapid change, that must be balanced against being responsive to the situation and taking advantage of opportunities, such as episodic floods, droughts, and other crises, so we can understand the responses and quickly incorporate them into our scientific knowledge base.

The Delta ISB's focus on rapid change consisted of two tracks, one resulting in a letter to DPIIC in February 2019 and the other in a memo to DPIIC and the Council in April 2020. The 2019 letter led to active planning from DPIIC in conjunction with the Delta ISB members to convene the Science Needs Assessment workshop, which was held in October 2020. At the time of this writing, a report from that workshop is in preparation. The 2020 memo resulted in a peer-reviewed essay entitled, "Preparing Scientists, Policy-Makers, and Managers for a Fast-Forward Future" (Norgaard et al. 2021).

Adaptive management review and publication

The adaptive management review was considered useful because it highlighted a lack of consensus about what adaptive management meant and how it could be used. The review also pointed out some of the challenges of and barriers to working in an adaptive management framework; for example, the need to be nimble, the challenges with permitting processes, and the lack of a strong community that was familiar with adaptive management. The review was felt to be a resource for the community to use in its efforts to continue improving adaptive management in the Delta.

Based on the citations in the inventory described in Chapter 2, the Delta ISB's adaptive management review report with companion journal article was the most cited Delta ISB product: 32% of scientific citations in Category 5 of the inventory were of the review and 12% were of the journal article for a total of 44% of all scientific citations. In addition, according to the inventory, the Delta ISB's adaptive management review was cited by adaptive management plans for several recent restoration projects in the Delta.

Other mentioned reviews

Many Board members felt the IEP and monitoring enterprise review have potential for high impact, but they felt it was too soon to know what those impacts would be. At the time of the interviews, the IEP review had just been completed and some initial outreach to IEP participants had occurred. Some outgoing Board members were concerned that additional planned outreach to directors for the IEP review might not go forward and expressed hope that it would continue after their departure from the Board.

The initial phase of the monitoring enterprise review (Component 1) was completed when the pandemic hit in spring 2020. The second phase of the review was on hold at the time of the Delta ISB member interviews in fall 2020, and some outgoing Board members expressed concern that it would not be finished. One member noted that if the monitoring enterprise review were not completed, it would be their "biggest disappointment of the last 10 years." The effort has since been renewed and a draft report was released for public comment on October 12, 2021.

Reviews to repeat

When asked which, if any, of the thematic reviews Delta ISB members recommended doing again, most said the habitat restoration review. They gave two primary reasons: 1) the Delta habitat restoration arena had changed substantially over the past 10 years (e.g., the Bay-Delta Conservation Plan was split into WaterFix and EcoRestore), and 2) the Delta ISB had substantially refined its approaches for performing reviews since habitat restoration, the Board's very first thematic review, was completed in 2013 (i.e., the process for the habitat restoration review did not include a prospectus or questionnaire).

Advice by review stage

Recognizing that current and past Delta ISB members have in-depth experience that can help inform Board activities going forward, we asked Board members to provide suggestions for conducting future reviews. To elicit feedback systematically, we divided the review stages into four categories: choosing what to review, methods, writing the review, and Delta ISB endorsement of the review. In general, for all stages, most members felt that the processes developed by the Delta ISB over the last 10 years worked well and had improved during that time, but they also had suggestions for further improvement.

Choosing what to review.

Current processes for selecting review topics by seeking input from agencies and stakeholders through personal conversations, surveys, panels, and public comments on draft topic lists were considered helpful, but a majority of Delta ISB members suggested seeking more input from the stakeholder community and/or from higher level decision-makers to help determine what might be most helpful to them. For example, one Delta ISB member recommended that all Board members should know the state of Delta science, understand the system, and meet the people in the community. This person felt listening to community members should be given precedence over the specific interests of Board members, while keeping in mind that the Board needs to have the background and capacity to undertake the reviews. Several Board members also emphasized the importance of interacting regularly with the Delta community, including through in-Delta meetings and site visits, to learn what the community, managers, decision makers, and

scientists need. One Board member also suggested asking questions such as, "What reviews are needed by the Delta community, considering that reviews may take two or more years?" or "What are the problems and areas of scientific controversy?" One Delta ISB member summed it up as, "Focus on what needs to be fixed."

Several Board members mentioned the strategy the inaugural Board initially developed in 2010 to select thematic reviews that cover the five policy chapters of the Delta Plan: Ecosystem Restoration, Water Supply Reliability, Water Quality, Delta as an Evolving Place, and Risk Reduction. However, none stated this approach should necessarily continue to be the primary way to select future reviews. One Delta ISB member suggested the Board should establish guidelines for picking topics. Another thought the Board should change its approach and review agency science plans.

Several Board members noted that they had attended local conferences and workshops, such as the Bay-Delta Science Conference and the annual IEP Workshop, as well as workshops sponsored by the Delta Science Program. They found these events helpful for learning about the current state of Bay-Delta science, and about current areas of uncertainty and research interest. Members noted that these events can also be sources of ideas for future reviews and encouraged continued participation by Delta ISB members.

The Delta ISB held focused Board retreats in June 2015 and July 2017 to assess Delta ISB operations and discuss how the Delta ISB could improve its effectiveness. At these retreats, Board members discussed the review topics and regional issues that should be the focus for future efforts. Science and policy leaders from the region were invited to participate in a panel discussion.[17] Although both retreats shared the overall purpose of improving review methods, there were some minor differences between the two. The 2015 retreat focused primarily on Delta ISB processes and their effectiveness, while the 2017 retreat focused on identifying future review topics. The 2015 retreat helped facilitate discussion that resulted in formalizing the development of a prospectus as part of the Delta ISB's operating guidelines. The 2017 retreat resulted in the development of summary sheets for its thematic reviews and helped launch new reviews of the IEP, non-native species, and water supply reliability.

Methods.

Almost uniformly, Delta ISB members thought it is beneficial to use a suite of methods for reviews, including questionnaires, interviews, and panels, and that the specific methods used should be customized for each review. Questionnaires were deemed valuable for getting good graphics (water quality and IEP review), obtaining quotes (adaptive

[17] An informal survey was sent to key individuals in advance of the Delta ISB meeting in 2015 and 2017.

management review), and for allowing anonymity, leading to more candid responses than someone addressing the Board publicly (IEP review). However, a couple of members acknowledged that there is an art to preparing questionnaires and felt Delta ISB questionnaires had not always been well written.

Interviews were considered effective for getting valuable first-hand information from the people on the ground, although some noted as a downside that they take more time than other approaches. Several Delta ISB members thought it was especially helpful to get all members involved in at least some of the interviews, so they could directly hear the perspectives of interviewees. Some members believe that this allowed for greater understanding and buy-in from the entire Board for the recommendations drafted by the review's lead authors.

Panels were considered efficient approaches for gathering information, although they were not believed to reveal as much as in-person interviews. Some noted a benefit of panels is that they allow for Delta ISB members to meet individuals involved in various activities subject to the Board's review.

Several Delta ISB members recognized that it was helpful to have consultant support for certain types of reviews. To date, two reviews (the water quality review and the monitoring enterprise review) have been supported by consultants. The water quality review was supported by a single individual who had recently retired from a State agency job and had considerable experience in water quality issues. The monitoring enterprise review was supported by a group of private scientific consulting firms through a competitive request for proposals. Board members considered the value of the consultants' work to include local knowledge of issues and individuals, in the case of the water quality review; and greatly increased capacity beyond the Board's ability to do the detailed data collection, analysis, and presentation of current efforts, in the case of the monitoring enterprise review. However, Delta ISB members also emphasized that consultants are not appropriate for all reviews, especially considering the time and money involved in a large consultant contract. One Board member pointed out, as a limitation, that once a consultant contract was in place, the scope could not readily be changed to accommodate revised approaches.

Some Board members mentioned that starting with a prospectus submitted for public review, which became part of the operating guidelines in 2015, is a good way to ensure relevance to the scientific and management communities but cautioned there should be a time limit for finalizing the prospectus to allow more time to work on the review itself. Another Delta ISB member suggested that the Board should refer to the prospectus periodically to see if the lead authors are following the outlined approach or deviating from it and make conscious decisions about modifying the plan. To illustrate why this is important, this Board member recalled that the prospectus for the non-native species review included interviews, but the draft product available at the time of the interview did

not, resulting in a product that ended up being more of a literature review than an empirical assessment.

Some members questioned how much effort should be allocated to literature reviews as components of thematic reviews, wondering how they are used and how important they are, and feeling they have less potential for impact. One member said they were hoping literature reviews would be a tool for the community, but that there is a danger of spending a lot of time on a literature review, which may be a high-quality scholarly work, but may also be less important to the needs of the Delta. Several Delta ISB members specifically mentioned the non-native species review, which had an extensive literature review, saying "a huge amount of time and effort went into the literature review," but the review process did not include enough "talking to the community."[18]

Writing the review and Board endorsement of the review

Most of the Board members felt the approach of utilizing lead authors for writing the review works well. However, there was some critical discussion of how lead authors and roles are determined. The current approach is for the chair to solicit individual volunteers to lead each review, then the individuals who are leading the review work out who does what in terms of writing the prospectus, literature review, and/or the Delta ISB review; developing the questionnaire and/or interview questions; conducting interviews; and analyzing results. One member felt there was lack of clarity about roles and responsibilities among the lead authors, which caused frustration and led to wasted time and effort. Some Board members noted that they became aware over time who among them were the better writers, and that some were better able to complete their work in a timely manner than others. The approach of having members choose what thematic reviews to lead based on their expertise and time availability led to some members participating in more reviews than others, but that was not considered to be a problem. One member noted that participation in leading reviews depended in part on other commitments (e.g., some Delta ISB members were retired and had fewer commitments than those who were employed full-time). The model of being compensated by the number of hours worked was effective because the workload across the Board members varied considerably.

While the current approach of a few lead authors is considered efficient, in that it allows for multiple reviews to occur concurrently, several Delta ISB members mentioned that, as a result, the rest of the Board is less familiar with the content and rationale behind

[18] This was the perception conveyed, even though the Delta ISB held two public workshops for this review. Note that there were no interviews conducted for this review. The non-native species review had been released as a public draft at the time of the interviews. It was released as a final draft in May 2021.

recommendations. A few Delta ISB members felt that original recommendations from lead authors were modified to be less bold ("watered down") when vetted by the full Board and suggested it may not be essential to reach full Board consensus on every recommendation. Others felt it is critical to get to consensus on recommendations. One idea for improving full Board understanding and buy-in of recommendations was to include more, and potentially all members in interviews, as was done for the IEP review. Another idea was to circulate earlier review drafts to all members.

Some members suggested more consideration of the use of "minority reports," or other approaches to reach consensus that do not significantly modify the lead authors' original recommendations. As an example, a minority report was prepared for the Board's 2018 review of the Delta Science Plan, which later resulted in the rapid change letter to DPIIC in 2019 on the Urgency & Opportunities for Improving Delta Interagency Science & Technical Integration.

Advice on Outreach and Tracking

Finally, we asked Delta ISB members to discuss the amount and type of outreach and implementation tracking that occurs for Board products, as well as who they think should be responsible for different aspects of this work.

Outreach

Delta ISB members felt it was important to do outreach and mentioned numerous current outreach approaches, including presentations to the Council and DPIIC, web postings and listservs, summary sheets, panels at Delta ISB meetings, conference presentations, and scientific publications. At the same time, Board members also broadly recognized a need to improve outreach to extend the reach and impact of the Delta ISB's work.

Nearly all Delta ISB members interviewed recommended more direct interaction with relevant agency and stakeholder representatives to convey report findings, saying they believe presentations only to the Council and DPIIC are not sufficient. An example provided by several members was the panel convened at a Delta ISB meeting to discuss the potential for implementation of the water quality review's recommendations. Another suggestion was scheduling time for direct communication between report authors and target audiences. As mentioned previously, some outgoing Board members were concerned that additional planned outreach for the IEP review to directors might not go forward and expressed hope that it would continue after their departure from the Board.

Outreach ideas that are not currently used included setting up a Delta ISB blog, developing lead author videos, doing outreach to web bloggers and organizations that could help spread the word (e.g., the Water Education Foundation), hosting receptions to announce releases of Delta ISB products (if allowed), and writing op-ed articles. One member also

suggested improving the Delta ISB web interface to make it more "attractive," and to provide access to Delta ISB products on other entities' websites as well.[19]

Several Board members felt that the relative roles of Delta ISB members, Council staff, and Delta Science Program staff were unclear for outreach and communication, noting that it is critical for the Board to have help from the Council and the Delta Science Program. Board members suggested that discussions with Council and Delta Science Program staff focused on identifying ways to improve Council support for Delta ISB outreach would be helpful.

Several Board members felt the Council should go beyond improving communication to achieve awareness of Delta ISB reviews, and more actively promote implementation of Delta ISB review recommendations given that by statute the Council is the primary recipient of all Delta ISB reviews,[20] and given the Council's role in connecting science to management and policy via Council and DPIIC meetings as well as direct communication with agency representatives. Several members noted that the Council has the resources to promote Delta ISB products and could do more to encourage others, including legislators, to look at Delta ISB products. One felt the Council has the "weight and authority" to "push forward" Delta ISB reviews, while the Delta ISB itself does not.

Although most Delta ISB members thought that it was important to get help from the Council in promoting Board products, one member thought there should be a wall between the Delta ISB and Council if the Delta ISB is to remain independent and felt the Delta ISB should do its own promoting.

Tracking

One Delta ISB member noted that the Board occasionally hears from stakeholders about how its reviews are perceived or used, but generally Board members acknowledge that their impacts have not been systematically tracked or assessed (until the present report). Delta ISB members uniformly felt that tracking implementation of Delta ISB recommendations is an important activity that should be done; however, they also felt tracking was not within their purview, and rather should be done by Delta Science Program or other Council staff. Many Board members also felt that they were not getting sufficient updates from Council staff on implementation status and noted that they would appreciate more direct input on how the Council itself has responded.

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[19] That Board member also noted it is important that all Delta ISB products are available on the Council's Delta ISB website. Many Delta ISB products were not available on the Delta ISB website at the time of the interviews during the fall of 2020, because they were undergoing remediation for digital accessibility.

[20] The Delta Reform Act of 2009 states, "The Delta Independent Science Board shall submit to the council a report on the results of each review, including recommendations for any changes in the programs reviewed by the board." (California Water Code 85280 (a)(5))

Summary

Along with our objective to document Delta ISB products and their applications (Chapter 2), and to represent the perceptions of Delta stakeholders (Chapter 3), it seemed appropriate to provide an opportunity for members of the Delta ISB to assess themselves. Therefore, we conducted interviews with 11 individual Delta ISB members, who have served between four and 10 years on the Board since its initiation in 2010.

Generally, these Delta ISB members felt the purpose of the Board's body of work is to evaluate the science applied to management and policy in the Delta, identify gaps, and make recommendations to improve the quality of science. Delta ISB members were largely positive about the Board's role in the Delta and the significance of its work, but they also shared critical commentary and suggestions, recognizing potential to improve upon the Board's processes and increase the impact of its products.

These reflections round out our assessment of the Delta ISB by providing insights into how members of the Board characterize their own contributions to Delta science. Capturing these impressions and input is important to preserve some of the institutional memory that has been accumulated over the first decade of Board activity. Findings reported here and throughout this report enhance the transparency of the Board, create a basis for more informed engagement by stakeholders, and will also inform the Delta ISB's activities and engagement going forward.

Chapter 5: Conclusion

The objectives of this assessment were to document Delta ISB products and their applications since 2010, and to understand the Board's impacts and the value attributed to its work over that time period. We pursued these objectives by employing a triad of approaches: an inventory of Delta ISB products and their documented citations (Chapter 2); interviews with key informants and a survey of broader Delta stakeholders (Chapter 3); and interviews with past and continuing Delta ISB members (Chapter 4).

In this concluding chapter we distill some overarching findings from the full report. Directed to a general readership, these are major takeaways that synthesize points of convergence between our three approaches. Subsequently, we highlight findings that we feel merit further consideration specifically by the Delta ISB and the Delta Stewardship Council.

Overarching findings

The Delta ISB is recognized as an important source of independent scientific oversight and review in the Delta. Stakeholders see the Delta ISB as an objective, apolitical entity, and a scientific resource to the entire Delta community, and emphasized the value of having a standing independent science board. Board products are widely regarded by stakeholders as scientifically rigorous and relevant to Delta science and management. Many Delta ISB members saw the independence of the Delta ISB as central to its purpose and specifically mentioned the importance of its independent external perspective.

After ten years, the Delta ISB has an established yet evolving process for conducting reviews within the scope of its regulatory mandate. Most Board members we interviewed felt that the processes developed by the Delta ISB over the last ten years worked well and have improved during that time. They also recognized opportunities for further improvements at various stages of review, including how to select review topics, what methods to use for doing the reviews, how to write reviews and get Board endorsement of them, and how to conduct effective outreach for completed products.

Delta ISB products are used in a variety of ways, but most often in policy and management applications. According to our inventory analysis, there have been 195 citations of Delta ISB products in 137 unique documents. In addition to policy and management applications, Delta ISB products frequently provide program support and are used as scientific citations or for other informational purposes. Incorporation of feedback on agency document reviews and implementation of recommendations in thematic reviews are well documented by citations in the inventory.

"Implementation" of Delta ISB recommendations is nuanced, and not always direct. Direct implementation occurs when intentional action is taken to follow a Delta ISB recommendation. This may include coordinated action, programmatic response, or on the ground change to implement recommendations in thematic reviews or call to action letters, or through incorporating feedback from agency document reviews into the reviewed document. Citations in our inventory document multiple examples of direct implementation of Delta ISB recommendations in thematic reviews. Stakeholder interviewees discussed several examples of direct implementation of recommendations from agency document reviews, but no examples of implementation of recommendations from thematic reviews. However, interviewees revealed that recommendations in thematic reviews are sometimes taken up through more indirect processes when they provide momentum, leverage, or justification for current, planned, or proposed activities.

A range of outcomes and influences beyond "implementation of recommendations" are associated with the Delta ISB and its products. Delta ISB members felt that, in addition to producing reviews, letters, and memos, the Board also provides value to the community as a forum that enhances scientific understanding and credibility, sparks discussion, and generates ideas. Interviewed stakeholders described several ways the Board positively influences the science, management, and policy landscape of the Delta as well. These include increasing scientific understanding, prompting community responses, providing various types of support for stakeholders, and directing attention to important issues (see Chapter 3 for examples). Perspectives in interviews were corroborated by the inventory, which revealed many applications of Delta ISB products other than direct implementation of Delta ISB recommendations.

Many stakeholders felt increased engagement would improve Delta ISB reviews and increase the likelihood that recommendations will be implemented. Stakeholders described a suite of challenges that may inhibit implementation of Delta ISB recommendations. These include a lack of specificity in the recommendations, a perceived lack of clarity as to who is responsible for implementing them, and a lack of guidance about how they should be implemented. Many stakeholders encouraged the Board to better familiarize itself with the management and regulatory context of Delta science to better inform reviews and support the formulation of practical and actionable recommendations. Many Board and stakeholder interviewees felt that greater engagement with stakeholders at various stages of the review could increase the likelihood that the final product and recommendations are aligned with agency needs, interests, and capacities, and therefore more likely to be implemented.

A note on findings from different approaches

There are many clear points of convergence between information gathered by our three approaches. For example, Board interviewees named adaptive management as one of the

Delta ISB's most impactful reviews. This finding is corroborated by the inventory, which showed adaptive management is the most cited thematic review; and the stakeholder survey, which suggests relatively high familiarity with the adaptive management review.

However, there are also some findings that may appear difficult to reconcile. For example, Delta ISB members also named the review of Delta as an Evolving Place as one of the Board's most impactful products. The inventory shows a moderate number of citations for this review, but a majority of survey respondents had no prior familiarity with it. Findings of this sort should not be surprising. As we learned through interviews with stakeholders, interest and attention are often highly specialized in the Delta. Because certain people are more attuned to certain activities and information, based on their organizational mission and professional role, they are more likely to emphasize different impacts and influences. It also makes sense that individual views would not perfectly mirror findings of the inventory analysis. The inventory documents verified citations of Delta ISB products, whereas "impact," as assessed in this report, is a matter of perception. Depending on one's perspective, a product that is cited a small number of times, yet leads to programmatic change, may be considered more (or less) impactful than a product cited dozens of times as a scientific reference.

Overall, our three approaches provide unique and complementary insights that, in combination, are intended to provide a well-rounded assessment of the Board.

Findings for consideration by the Delta ISB

Stakeholders conveyed largely positive attitudes about the Board and expressed affirmations for its products and other contributions to the Delta. Although it may at times be difficult to identify concrete outcomes resulting from Delta ISB reviews, stakeholders recognize a range of ways in which the Board exerts positive influence in the Delta. Even when Delta ISB recommendations are not directly implemented, they are generally perceived as deserving of consideration. Beyond direct implementation, Delta ISB recommendations can provide validation or justification for current, planned, or proposed activities, and these outcomes are widely valued by stakeholders.

Some stakeholders felt the Board has erred on the side of maintaining too much independence and urged the Delta ISB to better familiarize itself with the realities of Delta science and management. Stakeholders identified the importance of conducting reviews and formulating recommendations that are well-informed by an understanding of the regulatory context for Delta science, as well as the practical issues and constraints facing managers and scientists. This is especially important if the Board's aim is to provide relevant and actionable recommendations.

Outreach and communication were widely identified as areas for improvement. While stakeholders listed several effective aspects of Delta ISB outreach, including the

accessibility of public meetings and solicitation of and responsiveness to public comments, they also highlighted opportunities for improvement. Stakeholder interviewees suggested that targeted outreach and/or an overall communications strategy may enhance the effectiveness of Board outreach and communication. Nearly all interviewed Board members recommended more direct interaction with relevant agency and stakeholder representatives to convey report findings. Although many Board members and stakeholder interviewees felt Council and DPIIC meetings are effective venues for communication with decision-makers, many felt outreach should extend beyond presentations in these two forums. Interviewees in both groups felt the Delta ISB could raise awareness of its products by presenting in many different venues when the products are released.

Some felt the Board could seek more input from the stakeholder community when selecting topics for review. Although Board processes currently incorporate public participation, both Delta ISB members and stakeholders felt more could be done to inform topic selection. Interviewees suggested this could be done by interacting regularly with the Delta community, including scientists, managers, decision-makers, and other stakeholders, to hear what might be most helpful to them. Other suggestions included having in-Delta meetings and site visits, as well as learning about Delta regulatory and management systems and the state of Delta science.

Some stakeholders encouraged engagement with target implementers as recommendations are formulated as a way to increase the likelihood that Delta ISB recommendations will be implemented. Commentary in several stakeholder interview groups revealed a desire for Board recommendations to be more practical, actionable, and relevant to Delta stakeholders. To this end, one suggestion was for the Board to do "reality check check-ins" with target implementers as recommendations are being formulated, to ensure the final recommendations are crafted with responsible parties' current activities and constraints in mind. However, increasing the likelihood that its recommendations will be implemented was not universally endorsed as a goal for the Board. Some stakeholders felt that, as an independent scientific board, it is the Delta ISB's role to formulate recommendations based on its scientific expertise, but decisions about whether to implement or not involve value judgments made through policy processes, in which the Board should not engage nor seek to influence.

Findings for consideration by the Council

Interviews with both stakeholders and Delta ISB members revealed encouragement for greater and more deliberate interaction between the Delta ISB and the Council. Several stakeholders felt that Board activities should more regularly be reported to the Council, and perhaps DPIIC. Many Board members also felt that they were not getting sufficient updates from Council staff on implementation status and noted that they would appreciate more direct input on how the Council itself has responded to Board products. In addition, interviews with both stakeholders and Board members suggest there is a lack of clarity about the relative roles of Delta ISB members, Council staff, and Delta Science

Program staff in outreach and communication. Many Board members emphasized that it is critical for the Board to have help from the Council and Science Program in these areas.

Several board members felt the Council, which is by statute the primary recipient of all Delta ISB reviews, should go beyond improving communication to raise awareness of Delta ISB reviews, and more actively promote implementation of Delta ISB review recommendations. Several members noted that the Council has the resources to promote Delta ISB products and could do more to encourage that others, including legislators, look at Delta ISB products. One felt the Council has the "weight and authority" to "push forward" Delta ISB reviews, while the Delta ISB itself does not.

Tracking implementation of Delta ISB recommendations was identified as a gap that should be filled. Board members were often reluctant to discuss the "impact" of their work because no systematic process was in place to track implementation of their recommendations prior to this assessment. Delta ISB members uniformly felt that tracking implementation of Delta ISB recommendations is an important activity that should be done to a greater extent. However, they also felt tracking was not within their purview, and should instead be done by Delta Science Program or other Council staff. To some extent we were able to track implementation retroactively through our inventory, but our analysis revealed limitations to this approach. For instance, not all implementation activities are cited in writing. We were also unable to verify several examples that were provided in anonymous stakeholder survey responses, and therefore could not include some potentially meaningful responses to Board products in the inventory.

Final remarks

Writing about scientific assessment organizations – which arguably include entities such as the Delta ISB – Keller (2010) observes,

> "When political and economic interests are at stake, scientific credibility frequently rests on the perception that an assessment is politically neutral. At the same time, for an assessment to be relevant to decision making, the assessment must speak to policy makers' questions and concerns. This creates a difficult balancing act for organizations producing science assessments in that they must attempt to be both credible and relevant in order to link scientific information to policy decision making."

Our assessment suggests that the Delta ISB currently performs this "difficult balancing act," with the tension of credibility and relevance identified by Keller (2010) echoed in the paired themes of independence and connection, as discussed in this report. The Board walks a fine line as a part of, yet apart from, the Delta.

Operating within a complex, often contentious socio-political system, the Board's niche is defined dually by its function in providing independent science, and its sustained connections with the Delta. Many Delta ISB members shared that they wrestle with the tension inherent to this niche, and their reflections were echoed by commentary from stakeholders. However, while the difficulty of balancing independence and connection was widely appreciated, there were diverging opinions about how the Board should achieve this balance. Some emphasized the pre-eminent value of preserving scientific independence and accept, as a tradeoff, that the Board must limit its involvement with the stakeholders whose programs it reviews. Others felt the Board should interact more with the Delta community, especially to produce recommendations that are informed by an in-depth understanding of Delta issues, concerns, and constraints.

It is clear from our assessment both that the Board has high scientific credibility in the Delta, and that its work is relevant to many audiences. Whether the Board could enhance the relevance of its work by increasing its engagement with Delta stakeholders—and how it could do so without compromising its authority as an independent, impartial scientific body—are important and intellectually rich considerations for Delta ISB members. These considerations and relevant discussions could inform Board's approach going forward, as new and continuing members define their work together and plan for the future.

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Appendix 1: Inventory of Delta ISB Products and Citations

The inventory developed for this review is in Excel format (.xlsx) and is available for download at https://deltacouncil.box.com/s/ncsdqmx5iyhj1knz1lfy9285l9p5mgpg. Quality assurance and control is ongoing. If you see anything missing or errors, please contact disb@deltacouncil.ca.gov.

The inventory consists of four worksheets, which includes:

- **Delta ISB Products:** This spreadsheet provides a list all Delta ISB products completed to date and can be searched by year and product type (e.g., thematic reviews, Delta Plan reviews, etc.). It also provides a reference on which products were part of this assessment. Many of these products are also available on the Delta ISB's products webpage: https://deltacouncil.ca.gov/delta-isb/products
- **Delta ISB Outreach:** Table 1-4 provides a high-level overview of the Delta ISB's outreach activities to share the finding and recommendations of completed thematic reviews. The inventory provides specific details on outreach activities, including presentation dates and links to presentation recordings (if available).
- **Delta ISB Recommendations:** This provides a list of all of the recommendations from Delta ISB reviews. These were compiled to provide easy access on what the Delta ISB has recommended to help with this assessment. It is searchable by thematic review.
- **Delta ISB Applications:** This was used for the Chapter 2 analysis on the application of Delta ISB products. It can be searched by the category type for this review (implementation, incorporating feedback, program support, policy and management applications, scientific citation, and informational). However, it only contains verifiable uses. Some unverified uses are listed below.
    - the Delta ISB's habitat restoration review was used to inform the Suisun Marsh Habitat Restoration and Management Plan;
    - the Delta ISB's fish and flows review helped inform various research projects;
    - the Delta ISB's adaptive management review was used by the California Parks and Recreation, Division of Boating Waterway's Aquatic Invasive Plant Control Program;
    - the recommendations from the Delta ISB's Delta as an Evolving Place were utilized to inform the restoration design of the Franks Tract Futures and the Franks Track Ecosystem Restoration Framework;

- the Delta ISB's water quality review was used to help direct monitoring activities and monitoring design for the Delta Regional Monitoring Program; and
- the Delta ISB's IEP review had been cited in contract agreements and used in discussions on funding.

Appendix 2: Methods for Assessing Stakeholder Perceptions

To assess stakeholder perceptions of the Delta ISB we used a mixed-methods approach, collecting data by both interviews and a questionnaire-based survey.

Interviews

We conducted 12 semi-structured group interviews, each with one to four people, between November and December 2020. In total 26 stakeholders were interviewed. Interviewees represent state and federal management agencies; in-Delta groups; scientific collaboratives; and water contracting organizations. The full list of organizations is as follows:

- California Department of Fish and Wildlife
- California Department of Water Resources
- California State Water Resources Control Board
- Central Delta Water Agency
- Delta Protection Commission
- Delta Stewardship Council
- Interagency Ecological Program
- MBK Engineers
- Metropolitan Water District of Southern California
- National Marine Fisheries Services – National Oceanic and Atmospheric Administration
- Regional San
- Santa Clara Valley Water District
- State Water Contractors
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service

Interviewees were selected as key informants known to interface or have interfaced with the Delta ISB and/or its products. The interview protocol (i.e., list of questions) was developed by the project team to gather rich, in-depth data from these individuals, based on their experience and familiarity with the Delta ISB (see Appendix 3). Questions were designed to elicit both subjective perceptions and evaluative attitudes about the Delta ISB and its products, as well as descriptive information about usage of Delta ISB products, implementation of Delta ISB recommendations, and sources used to track Delta ISB activities.

Interviews were conducted by LH and typically lasted approximately one hour. CB also attended interviews to observe and take notes. All interviews were recorded and transcribed for purposes of analysis.

The process used to analyze interviews follows established methods of qualitative content analysis (Cho and Lee 2014). Interviews were analyzed by CB using an emergent coding approach in which themes were drawn directly from the data. "Coding" is a tool of qualitative analysis in which keywords or themes ("codes") are attached to segments of text, allowing the analyst to sort qualitative data into meaningful categories and evaluate relationships between them (Cho and Lee 2014). In a first round of "open coding," codes were assigned line-by-line to transcribed interview text to capture ideas or themes contained in each line. After completing open coding of all transcripts, several topical areas of interest were identified, and relevant text was categorized into these topical areas in a second round of coding. In a third and final round of coding, text within the topical areas was coded for more specific themes and sub-themes, in an iterative process that allowed themes to be elaborated, added, and/or refined throughout the coding process. Results were summarized in outlines, notes, and/or tables, depending on the topical area. Findings reported below synthesize and interpret these summaries from the third round of coding.

The findings presented in the report are driven by the objectives of this assessment and grounded in interview data, but the subtle contours and characteristics of themes, and the connections drawn between them, are also inevitably shaped by the interests and experiences of the analyst. This subjectivity is not considered a weakness or flaw of qualitative research, but an integral aspect of the research itself (Charmaz 2003). However, several strategies are commonly employed in qualitative research to address and minimize the influence of subjective bias. In this assessment, we triangulate qualitative data with both quantitative survey data and inventory data that address overlapping topical areas, allowing results of qualitative analysis to be partially corroborated from other sources (Maxwell 2013). We also circulated the draft of the report for comment by interviewees, a form of member checking, in which interviewees are given the opportunity to review findings to confirm accurate representation of their views (Maxwell 2013). Finally, the analyst (CB) engaged in self-reflexive exercises (notetaking, personal reflection, and discussion with the project team) to regularly and proactively ensure that the analysis and write-up are substantiated by data.

Survey

To efficiently assess perceptions of the Delta ISB among a broader set of stakeholders, we also distributed an online survey to 20 Delta-focused email listservs, including:

- California Water and Environmental Modeling Forum Delta Happenings (Delta Protection Commission weekly email)

- California Water Quality Monitoring Council
- Central Valley Project Improvement Act Science Integration Team
- Collaborative Science and Adaptive Management Program/Collaborative Adaptive Management Team
- Delta Interagency Invasive Species Coordination Team
- Delta Levees and Habitat Advisory Committee
- Delta Nutrient Stakeholder and Technical Advisory Group
- Delta Plan Interagency Implementation Committee Delta Agency Science Workgroup
- Delta Protection Advisory Committee
- Delta Stewardship Council listserv
- Delta Tributaries Mercury Council
- Estuarine Ecology Team
- Interagency Adaptive Management Integration Team
- Interagency Ecological Program Directors, Coordinators, Science Management Team, Stakeholder Group, and Project Work Team chairs
- Interagency Modeling Steering Committee
- Interagency Telemetry Advisory Group
- Remote Imagery Collaborative
- Sacramento River Science Partnership
- Suisun Management Plan Principals/Adaptive Management Advisory Team

Recognizing that our sample would likely be biased toward individuals who are interested or invested in the Delta ISB, the survey was accompanied by an email announcement that specifically invited individuals who are unacquainted with the Delta ISB to participate, in efforts gain a rough sense for overall awareness of the Delta ISB in the Delta. We also sent personal outreach emails to select individuals who are known to have longstanding experience in the Delta, but who could not be interviewed due to limited time and staff capacity.

We received a total of 174 responses.

The questionnaire began by eliciting background information about respondents' roles and organizational affiliations. Next came a screening question, in which respondents indicated their awareness of the Delta ISB (Figures 3-1 through 3-3 in the main report). Respondents who indicated no awareness of the Delta ISB (11%) were directed to the end of the survey. Responses on subsequent questions reflect the perspectives of individuals with at least some minimal awareness of the Delta ISB.

The rest of the questionnaire captured stakeholders' evaluations of the Delta ISB, its products, and its outreach. Survey respondents were also asked up to four questions about each of seven Delta ISB reviews: habitat restoration, fish and flows, levees, adaptive

management,[21] Delta as an Evolving Place, water quality, and the review of the Interagency Ecological Program. The questions were structured as follows:

> Question #1: Respondents indicated their level of familiarity with the review. If they indicated no familiarity they proceeded to question #1 for the next review. If they indicated some familiarity they proceeded to question #2 for the current review.
>
> Question #2: Respondents listed any known citations of the review.
>
> Question #3: Respondents indicated if their organizations (past or current) have implemented or plan to implement any recommendations in the review. If they responded "I do not know," they proceeded to question #1 for the next review. If they knew any recommendations had been or would be implemented by their organization(s), they proceeded to question #4a; and if they knew no recommendations had been implemented by their organization(s), they proceeded to question #4b.
>
> Question #4a: Respondents selected up to three reasons from a defined list to explain why recommendations were or would be implemented. An option for "I don't know" and a write-in option were also available.
>
> Question #4b: Respondents selected up to three reasons from a defined list to explain why recommendations were not or would not be implemented. An option for "I don't know" and a write-in option were also available.

The full questionnaire is provided in Appendix 4.

We piloted the survey with a small group of staff in the Delta Science Program and one former Delta ISB member. Feedback from the pilot was incorporated into the final questionnaire, which was designed and administered using the online survey platform Survey Monkey. The survey was distributed in December 2020. All data analysis was conducted in Microsoft Excel and SPSS (v.27)

Methodological limitations

The findings discussed in this section provide important insights into perceptions of the Delta ISB among stakeholders in the Delta. However, these findings cannot necessarily be generalized to Delta stakeholders at large. Interview methods are not conventionally used to collect representative data. In the current assessment, interviewees were selected because of established relationships or interactions with the Delta ISB, and therefore the interview sample is purposefully biased toward individuals who are interested in and attentive to the Delta ISB.

[21] Included thematic review and journal article (Wiens et al. 2017).

Survey results also cannot necessarily be generalized. Our survey data represents a convenience sample of individuals who choose to subscribe to listservs managed by our colleagues and other contacts. To achieve a representative sample of all Delta stakeholders would require randomized sampling, which was beyond the scope of this assessment. Survey results also cannot necessarily be generalized across the population of all listserv subscribers. Assuming all individuals on the largest distribution list are also registered on at least one other email distribution lists provides an estimated minimum survey distribution to 14,000 people. Assuming every email address on every listserv was unique, and summing the total number of email addresses across all 20 listservs, provides an estimated maximum survey distribution to 19,981 people. We expect the actual distribution number falls toward the minimum end, based on the reasonable assumption that most people subscribe to multiple listservs. With this population size, results representing the perspectives of all listserv subscribers would require a sample of approximately 400 respondents, assuming maximum response variance and with a 5% margin of error (Salant and Dillman 1994). We did not achieve this size with our sample of N=174. It was not within our scope to assess whether meaningful differences of opinion exist between respondents and non-respondents or to weight the sample accordingly.

As such, results reported below represent the perspectives of our specific sample, but do not necessarily reflect the views of any larger population of Delta stakeholders.

Appendix 3: Stakeholder Interview Protocol

Below is the protocol (i.e., list of questions) used to guide interviews with Delta ISB stakeholders. Questions were provided to interviewees in advance of the interview.

Assessment of Delta ISB Recommendations

Interview Questions for Stakeholders

November 2020

Thank you for agreeing to participate in this interview. Today we'll be asking you questions about your perceptions of the Delta Independent Science Board (or Delta ISB) and your engagement with their written products. Information collected from these interviews will be aggregated and analyzed using qualitative methods. Data collection and analysis will continue through December 2020 and results will be presented in a final report, a draft of which is tentatively scheduled for completion by early February 2021.

Participating in this interview is completely voluntary, and if you prefer not to participate you are free to decline. You are also free to skip any questions or discontinue the interview at any time once it is in progress. Interviews will be recorded and transcribed for purposes of analysis. Personally identifiable information will not be included in any publicly available reports, but please be aware that the interview recording and transcript are subject to retrieval under the Public Records Act.

By proceeding with the interview, you indicate your consent to participate and to be recorded.

~~~~~~

Throughout the interview there will be several questions asking you about the Delta ISB in relation to "your organizations." By "your organizations" we mean all of the organizations and collaborative groups with which you have been affiliated since 2010. We will refer to "your organizations" for the sake of brevity. Do you have any questions about that?

1. Please describe the main ways you interface or have interfaced with the Delta ISB or its products.
    a. Have others in your organizations interfaced with the Delta ISB or its products in different ways? If so, please describe how.
2. Would you say the Delta ISB plays a *unique* role in the Delta science and management community? Why or why not?
~~~~~~

3. Would you say the Delta ISB plays an *essential* role in the Delta science and management community? Why or why not?

4. For these next couple questions, I'm going to ask you to reflect on impact and value. As a rule of thumb, when I ask about impact, I'm referring to consequences or results; and when I ask about value, I'm referring to importance or significance. The distinction between impact and value may sometimes seem blurry, and it's ok if there's redundancy in your answers. Do you have any questions about impact and value before we continue?

    a. Thinking about the overall body of work the Delta ISB has produced – including thematic reviews, document reviews and letters to agency heads - what impacts, if any, would you say that body of work has had on your organizations?

        i. [Follow-up if not already covered]: Are there any specific ISB products you consider particularly impactful for your organizations? If so, please name them and explain their impacts.

    b. What, if anything, would you say is the value of the Delta ISB's overall body of work for your organizations?

        i. [Follow-up if not already covered]: Are there any specific Delta ISB products you consider particularly valuable for your organizations? If so, please name them and explain why you consider them valuable.

5. One of the objectives for this project is to gain a clearer understanding of when, how, and why ISB recommendations have been implemented. Can you recall instances in which your organizations implemented Delta ISB recommendations? If so, please describe the recommendations and explain <u>how</u> and <u>why</u> they were implemented.

    a. [if answer is "yes" and if not already covered] Who was responsible for deciding to implement the recommendation?

6. We're also interested in understanding why the Delta ISB's recommendations are not implemented. Would you say ISB recommendations have ever been relevant to your organizations' activities, yet were <u>not</u> implemented by the organizations?

    a. [Follow-up if not already covered] Please share any reflections about why your organizations might not have implemented ISB recommendations in these cases.

7. How, if at all, do you think the Delta ISB could improve its reviews or recommendations? This can include choice of topics, methods, how the reports or recommendations are written, or anything else that comes to mind.
    a. Can you think of anything the Delta ISB could do differently with its reviews to increase the likelihood that your organizations would implement relevant recommendations?
8. How do you usually become aware of Delta ISB activities?
    a. Overall, would you say outreach and communication about Delta ISB activities are effective? Why or why not?
    b. How, if at all, do you think the Delta ISB's outreach could be improved?
9. Are there any other thoughts you'd like to share about your experience with the Delta ISB?

Appendix 4: Stakeholder Survey Instrument and Summaries of Results

Below we provide the questions included in the questionnaire-based survey, along with summary statistics of all questions included in the analysis.

December 2020

Thank you for participating in this survey about the Delta Independent Science Board (Delta ISB)!

Taking this survey is voluntary, and you are free to skip questions you prefer not to answer. However, please note that, for technical reasons, questions marked with an asterisk (*) must be answered in order to advance in the survey. If at any time you no longer wish to complete the survey, you are free to exit. You also have the option to begin the survey, exit, and return to complete it later – your responses will be saved.

Responses from this survey will be analyzed statistically and results will be reported in the aggregate. We will not include any personally identifying information in the final report. However, please be aware that individual survey responses are subject to retrieval under the Public Records Act. In the survey you will not be asked to provide information that directly identifies you (such as name or email address), but we will ask for information about your current and past organizational affiliations in the Delta. In some cases, it may be possible for you to be personally identified from this information. We encourage to you skip any question(s) you are uncomfortable answering.

By proceeding with the survey, you indicate your consent to participate.

Characteristics of the sample

Question 1

Choose the option that best describes your primary role in the Delta [scientist, engineer, regulator, planner, manager, executive, student, communicator, consultant, other (please specify).].

Results

The largest proportion of the sample (n = 72, 41.4%) self-identified as scientists. Self-identified managers were the next largest group (n = 25, 14.4%), followed by respondents who self-identified as “other” (n = 24, 13.8%). This group included several landowners or Delta residents, along with individuals occupying a variety of other roles.

Question 2

What organization do you currently work for? If you are retired, select the most recent organization.

- California State University system (please specify university below)
- University of California system (please specify university below)
- Other university (please specify university below)
- CA Department of Fish and Wildlife
- CA Department of Food and Agriculture
- CA Department of Parks and Recreation
- CA Department of Water Resources
- CA Natural Resources Agency
- California Water Commission
- Central Valley Flood Protection Board
- Delta Protection Commission
- Delta Stewardship Council
- Sacramento-San Joaquin Delta Conservancy
- San Francisco Bay Conservation & Development Commission
- State Water Resources Control Board
- Regional Water Quality Control Board (please specify below)
- Other state agency (please specify below)
- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- U.S. Department of Fish and Wildlife Service
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. National Oceanic and Atmospheric Administration Fisheries
- Other federal agency (please specify below)
- Environmental organization (please specify below)
- Local government (please specify below)
- Local reclamation district (please specify below)
- Local water district (please specify below)
- Private organization (please specify below)
- State of federal water contractor (please specify below)
- State Water Contractors
- Other (please specify below)

Results

Aggregated into organizational types, the sample breakdown is as follows: State (36.8%, n = 64), federal (16.7%, n = 29), other (10.3%, n = 18), local (9.8%, n = 17), universities (8%, n =

14), water contractors (5.7%, n = 10), private organization (4%, n = 7), and environmental organization (1.7%, n = 3). 12 people (6.9%) did not answer the question.

Organizational representation was highest from the California Department of Water Resources (11.5%, n = 20), followed by respondents who selected "other" (10.3%, n = 18), the California Department of Fish and Wildlife (8.6%, n = 15), the Delta Stewardship Council (5.7%, n = 10), and the University of California system (5.2%, n = 9).

Full results available upon request.

Question 3

Please select any other organizations you have worked for since 2010. Check all that apply. [same options as Question 2]

Results

This question was not summarily analyzed.

Familiarity with the Delta ISB

Question 4

Which of the following best describes you?

- I've never heard of the Delta Independent Science Board (Delta ISB).
- I've heard of the Delta ISB but don't have a clear understanding of what it does.
- I've heard of the Delta ISB and am familiar with the work it does, but I have not interacted with it directly.
- I have occasionally interacted with the Delta ISB and/or its work.
- I have frequently interacted with the Delta ISB and/or its work.

Results

The largest group of respondents, representing roughly a third of the sample (35.6%, n = 62), indicated that they have interacted occasionally with the Delta ISB or its work. Roughly a quarter of the sample (23%, n = 40) have heard of the Delta ISB and are familiar with its work, but have not had direct interactions. 17.2% (n = 30) have heard of the Delta ISB but have no clear understanding of its activity; and 13.2% (n = 23) reported frequent interactions with the Delta ISB or its work. Approximately 11% of the sample (n = 19) had not heard of the Delta ISB. These respondents were directed to the end of the survey after answering this question.

Evaluations of the Delta ISB overall

Questions 5-9

The next questions will ask you about the Delta ISB, referring to the Board itself as a scientific body. Indicate the extent to which you disagree or agree with each statement. [1-5 strongly disagree to strongly agree, separate option for don't know]

Question 5. The Delta ISB plays an essential role in the Delta.

Question 6. The Delta ISB plays a unique role in the Delta.

Question 7. The Delta ISB influences the activities of my organization and/or the collaborative group(s) in which I actively participate.

Question 8. The Delta ISB does not promote specific political agendas.

Question 9. The Delta ISB provides independent scientific oversight in the Delta.

Results

A strong majority of informed respondents (i.e., excluding responses of "I don't know") felt that the Delta ISB plays an essential role in the Delta, with 83.5% agreeing or strongly agreeing (n = 96). Informed respondents reported similarly high levels of agreement that the Delta ISB plays a unique role (91.6%, n = 108), that it does not promote specific political agendas (82%, n = 82), and that it provides independent scientific oversight (83.2%, n = 99). A smaller majority of informed respondents agreed that the Delta ISB influences their organizations or collaborative groups (67.2%, n = 84).

Perceived awareness of and regard for the Delta ISB

Questions 10-11

Question 10. There is widespread awareness of the Delta ISB among Delta managers and decision-makers. [1-5 strongly disagree to strongly agree, separate option for don't know]

[proceed to question 10a. if agree or strongly agree; proceed to question 11 if disagree or strongly disagree]

Question 10a. The Delta ISB is well regarded by Delta managers and decision-makers.

Question 11. There is widespread awareness of the Delta ISB among Delta scientists. [proceed to question 11a. if agree or strongly agree; proceed to question 12 if disagree or strongly disagree]

Question 11a. The Delta ISB is well regarded by Delta scientists.

Results

63.3% of informed respondents (n = 69) agreed that there is widespread awareness of the Delta ISB among Delta managers and decision makers; and of these, 75.4% (n = 52) felt the Delta ISB is well regarded among these groups.

77% of informed respondents (n = 87) agreed that there is widespread awareness of the Delta ISB among Delta scientists; and of these, 71.3% (n = 62) felt the Delta ISB is well regarded among this group.

Questions about specific reviews and recommendations

Questions 12-17

In the next set of questions, we will ask about your familiarity with several completed Delta ISB reviews. By "familiar" we mean 1) you have read some or all of the review; 2) you learned about the review's content in a presentation or conversation; and/or 3) you are aware of some use(s) of the review (e.g., initiatives pursued in response to recommendations in the review, citation of the review).

Even if you are not familiar with any of these reviews, your responses are extremely valuable to us, so please answer these questions.

You will be asked to answer up to four questions for each of the following reviews:

- Habitat Restoration (2013)
- Fish and Flows (2015)
- Levees (2016)
- Adaptive Management: report (2016) and/or journal article (2017)
- Delta as an Evolving Place (2017)
- Water Quality (2018)
- Interagency Ecological Program (2019)

[questions 12-16 repeated for each product one at a time]

Question 12. How, if at all, did you become familiar with Review (year)? Select all that apply. If you are not familiar with this review, select "I am not familiar with this review."

- I am not familiar with this review. [proceed to next review if this option selected]
- I read some or all of this review.
- I read a summary sheet of this review.
- I learned about the content of this review from a public meeting, panel, or presentation.

- I learned about the content of this review in a conversation or private meeting.
- I learned about the content of this review in some other way (please specify).

Question 13. To your knowledge, has Review (year) been cited or mentioned in a written document (such as a report or comment letter)? Please check one box.

Question 14. To your knowledge, have recommendations in Review (year) been implemented by any organization(s) you have worked for since 2010, and/or any collaborative group(s) in which you have actively participated since 2010? (For brevity, we will refer to these as "your organizations.") Please check one box.

- I do not know if any of my organizations have implemented any of the recommendations in this review. [proceed to next review if this option selected]
- I know my organizations have not implemented any of the recommendations in this review. [proceed to question 15 if this option selected]
- I know at least one of my organizations has implemented or intends to implement at least one of the recommendations in this review (please describe the recommendation to the best of your ability). [proceed to question 16 if this option selected]

Question 15. From the list below, select the most important reasons (up to three) that best explain why recommendations from Review (year) were not implemented by any of your organizations. If you do not know why recommendations were not implemented by any of your organizations, select only "I do not know."

- Recommendations not within the scope of my organizations
- Recommendations not directed to my organizations
- My organizations have or had other priorities
- Implementation of Delta ISB recommendations not required for regulatory compliance
- Resource constraints (time, money, staff capacity, etc.) prevented implementation
- Relevant persons in my organizations unaware of the review
- Relevant persons in my organizations disagree(d) with recommendations
- Delta ISB recommendations not generally trusted in my organizations
- My organizations were already moving in the direction recommended by the Delta ISB
- Other (please specify)
- I do not know

Question 16. From the list below, select the most important reasons (up to three) that best explain why a recommendation or recommendations from Review (year) was/were implemented by one (or more) of your organizations. If you do not know why recommendations were implemented, select only "I do not know."

- Recommendation(s) directed to my organization(s)
- Recommendation(s) within the scope of my organization(s)
- Recommendation(s) aligned with existing priorities of my organization(s)
- Availability of resources (time, money, staff capacity, etc.) for implementation
- Outreach brought recommendation(s) to attention of relevant persons in my organization(s)
- Delta ISB recommendations generally trusted in my organization(s)
- Other (please specify)
- I do not know

Question 17. As a reminder, you were asked questions about the following reviews. If you have cited ISB reviews that were not included in the list above, or otherwise mentioned them in writing, please use this space to list those reviews and where you cited or mentioned them

Results

Overall, there was least familiarity with Levees (71% unfamiliar) and Water Quality (73% unfamiliar). 47% of respondents were familiar with Habitat Restoration, Fish and Flows, and Delta as Place. A slight majority of respondents (55%) was familiar with Adaptive Management, and a more pronounced majority (59%) was familiar with IEP.

Detailed information about each review is provided below.

Habitat restoration

Out of 134 people who responded:

- 71 (53%) indicated they are not familiar at all with this review
- 63 (47%) indicated at least some familiarity with it. Of these:
  - 26 (41%) read the review in part or whole
  - 17 (27%) read a summary
  - 22 (35%) saw it presented publicly
  - 9 (14%) learned of it in a private conversation
  - 4 (6%) were familiar with it in some other way.[22]

Of the 63 people who indicated at least some familiarity with the review:

[22] These counts do not sum to the total because respondents were asked to select all modes of familiarity that applied to them.

- 10 said their organization had implemented at least one recommendation
- 6 said their organization had not implemented any recommendations
- 44 did not know if any recommendations had been implemented
- 3 did not respond

Fish and flows

Out of 128 people who responded:

- 68 (53%) indicated they are not familiar at all with this review
- 60 (47%) indicated at least some familiarity, including
    - 39 (65%) who read the review in part or whole
    - 18 (30%) who read a summary
    - 16 (27%) who saw it presented publicly
    - 8 (13%) who learned of it in a private conversation
    - 2 (3%) who were familiar with it in some other way

Of the 60 people who indicated some familiarity with the review:

- 8 said their organization had implemented at least one recommendation
- 5 said their organization had not implemented any recommendations
- 43 did not know if any recommendations had been implemented
- 4 did not respond

Levees

Of the 124 people who responded:

- 88 (71%) indicated no familiarity with this review
- 36 (29%) indicated at least some familiarity. Of these:
    - 14 (39%) read the review in whole or in part
    - 10 (28%) read a summary
    - 13 (36%) saw it presented publicly presented;
    - 4 (11%) learned of it in a private conversation
    - 2 (6%) were familiar with it in some other way.

Of the 36 people who had some familiarity with this review:

- 3 indicated their organization had implemented at least one recommendation
- 4 said their organization had not implemented any recommendations
- 28 people did not know if recommendations had been implemented
- 1 person did not respond

Adaptive management

Of the 123 people who responded:

- 55 (45%) indicated no familiarity with the review

- 68 (55%) indicated at least some familiarity with it. Of these:
    - 50 (74%) read the review in whole or in part
    - 17 (25%) read a summary
    - 21 (31%) saw it publicly presented
    - 10 (17%) learned of it in a private conversation
    - 4 (6%) were familiar with it in some other way.

Of the 68 people who had some familiarity with this review:

- 16 said their organization had implemented at least one recommendation
- 5 said their organization had not implemented any recommendations
- 46 did not know if recommendations had been implemented
- 1 did not respond.

Delta as an Evolving Place

Of the 122 people who responded:

- 65 (53%) indicated no familiarity with the review
- 57 (47%) indicated at least some familiarity with the review. Of these:
    - 29 (51%) read the review in whole or in part
    - 19 (33%) read a summary
    - 22 (39%) saw the review presented publicly
    - 11 (19%) learned about it in a private conversation
    - 1 (2%) was familiar with it in some other way.

Of the 57 people who had some familiarity with the review:

- 12 said their organization had implemented at least one recommendation
- 5 said their organization had not implemented any recommendations
- 39 did not know if recommendations had been implemented
- 1 did not respond

Water quality

Of the 120 people who responded:

- 87 (73%) indicated no familiarity with the review
- 33 (27%) indicated at least some familiarity with the review. Of these:
    - 21 (64%) read it in whole or in part
    - 9 (27%) read a summary
    - 11 (33%) saw the review presented publicly
    - 2 (6%) learned about it in a private conversation
    - 3 (9%) were familiar with the review in some other way.

Of the 33 people who had some familiarity with the review:

- 4 said their organization had implemented at least one recommendation
- 2 said their organization had not implemented any recommendations
- 27 did not know if recommendations were implemented

Interagency Ecological Program

Of the 119 people who responded

- 49 (41%) indicated no familiarity with this review
- 70 (59%) indicated at least some familiarity with it. Of these:
    - 35 (50%) read the review in whole or in part
    - 20 (29%) read a summary
    - 33 (47%) saw the review presented publicly
    - 12 (17%) learned about it in a private conversation
    - 2 (3%) were familiar with it in some other way

Of the 70 people who had some familiarity with the review:

- 13 said their organization had implemented at least one recommendation
- 8 said their organization had not implemented any recommendations.
- 49 did not know if recommendations were implemented

Reasons for implementation and non-implementation

The reasons selected for implementation and non-implementation by informed respondents are shown by review in Tables A-1 and A-2. Reasons most commonly cited for implementation were alignment with organizational priorities (on average, selected by 65% of respondents), followed by recommendations directed to the organization and resource availability (both, on average, selected by 32% of respondents). The reason most commonly cited for non-implementation was recommendations not within organization scope (on average, selected by 44% of respondents) and recommendations not directed to the organization (on average, selected by 28% of respondents). Percentages are provided for summary purposes only and should be interpreted with care due to the low counts.

Table A-1. Reasons for implementation identified by survey respondents, by review. Cell values represent the count of respondents who selected the reason for each review. Review abbreviations are as follows: HR habitat restoration, FF fish and flows, LV levees, AM adaptive management, DAP Delta as an Evolving Place, WQ water quality, IEP review of the Interagency Ecological Program.

Reasons for implementation	HR	FF	LV	AM	DAP	WQ	IEP	Total
Recommendations directed to organization	1	2	2	4	2	1	7	19
Recommendations within scope of organization	7	4	2	11	6	1	7	38
Recommendations aligned with existing priorities of organization	9	6	1	12	7	2	10	47
Availability of resources for implementation	1	3	2	4	2	1	5	18
Outreach brough recommendations to attention of relevant persons	1	1	0	2	2	1	0	7
Delta ISB recommendations generally trusted in organization	2	0	0	3	3	4	0	12
Other reason for implementation	1	1	0	2	0	1	0	5

Table A-2. Reasons for non-implementation identified by survey respondents, by review. Cell values represent the count of respondents who selected the reason for each review. Review abbreviations are as follows: HR habitat restoration, FF fish and flows, LV levees, AM adaptive management, DAP Delta as an Evolving Place, WQ water quality, IEP review of the Interagency Ecological Program.

Reasons for non-implementation	HR	FF	LV	AM	DAP	WQ	IEP	Total
Recommendations not within scope of organization	1	2	3	2	1	1	4	14
Recommendations not directed to organization	0	1	1	1	2	1	3	9
Organization had other priorities	0	0	0	0	1	0	2	3
Implementation of Delta ISB recommendations not a regulatory requirement	0	0	0	1	0	0	1	2
Resource constraints prevented implementation	0	1	0	1	1	0	2	5
Relevant persons in organization unaware of review	0	0	0	0	0	0	1	1
Relevant persons in organization disagreed with recommendations	0	0	0	0	0	0	0	0
Delta ISB recommendations not generally trusted in organization	0	0	0	0	0	0	0	0
Organization already moving in direction recommended	0	1	0	0	0	0	0	1
Other reason for non-implementation	0	0	0	2	1	1	1	5

Questions about Delta ISB reviews overall:

Questions 17-21

Please indicate the extent to which you disagree or agree with each of the following statements. [1-5 strongly disagree to strongly agree, with separate option for "I don't know"]

Question 17. Overall, Delta ISB reviews provide information that is relevant to the Delta management community.

Question 18. Overall, Delta ISB reviews enhance my confidence in science-based decision-making in the Delta.

Question 19. Overall, Delta ISB reviews are scientifically rigorous.

Question 20. Overall, I trust the scientific findings reported in Delta ISB reviews.

Question 21. Overall, I think ISB reviews provide good recommendations, even if they cannot be implemented.

Results

Pronounced majorities of informed respondents agreed or strongly agreed that Delta ISB reviews provide relevant information (92.4%, n = 85), enhance their confidence in science-based decision-making (73.5%, n = 64), that they are rigorous (90%, n = 81), and that they trust Delta ISB scientific findings (90.8%, n = 79). A strong majority of informed respondents (88.1%, n =74) also felt Delta ISB recommendations are generally good, even if they cannot be implemented.

Questions about outreach and communication

Questions 22-23

Question 22. Current outreach effectively promotes awareness of ISB reviews in the Delta management community.

Question 23. How do you usually hear about Delta ISB activities? Check all that apply. [DSC listserv, other listserv, Facebook, Linkedin, Instagram, Twitter, announcements at public meetings, colleagues/supervisor, DSC website, other website (please specify), other (please specify)]

Results

A majority of informed respondents (61.7%, n = 50) generally disagreed that current outreach effectively promotes awareness Delta ISB reviews.

The most commonly selected mode of communication was the DSC listserv, followed by colleague or supervisor, announcements at public meetings, and the DSC website:

- DSC listserv (47%, n = 73)
- Other listserv (7%, n = 11)
- Facebook (1%, n = 2)
- Linkedin (1%, n = 2)
- Twitter (n = 6, 4%)
- Announcements at public meetings (n = 26, 17%)
- Colleague or supervisor (n = 36, 23%)
- DSC website (n = 32, 21%)
- Other websites (n = 4, 3%)
- Other (n = 11, 7%)
- No survey respondents heard about the Delta ISB on Instagram.

Examples of "other" sources of information about the Delta ISB include Delta ISB meetings, Bay-Delta Science Conference, Delta eNews, Maven's Notebook, delivering tours of the Delta to the Board, SWRCB WaterBoards, work group meetings, and the SWRCB lyris listserv.

General comments

Question 24

Question 24. If you would like to share any additional thoughts about the Delta ISB or its reviews, please write them here.

Results

Results available upon request.

Appendix 5: Delta ISB Interview Protocol

Below is the protocol (i.e., list of questions) used to guide interviews with past and continuing Delta ISB. Questions were provided in advance of the interview.

Assessment of Delta ISB Recommendations

Interview Questions for Delta ISB Members

Fall 2020

Background and disclosures – please read

The purpose of this interview is to provide information for a project being led by Lauren Hastings, with support from Edmund Yu and Chelsea Batavia. The goal of the project is to assess the value and impact of ISB reviews and recommendations produced over the last ten years. For the purposes of this project, "impact" refers to the consequences or results of ISB reviews, whereas "value" refers to their importance or significance. A key component of this project involves assessing value and impact as perceived by members of the ISB itself, by conducting in-depth interviews with each of you. Other components of the project include interviews with representatives of regional stakeholder groups, and an online survey distributed widely to the broad Delta science and management community.

Information collected from various individuals will be aggregated and analyzed using statistical and qualitative methods. Data collection and analysis will continue through December 2020. Results will be presented in a final report, a draft of which is tentatively scheduled for completion by the end of January 2021.

Participating in this interview is completely voluntary, and if you prefer not to participate you are free to decline. You are also free to skip any questions or discontinue the interview at any time once it is in progress. Interviews will be recorded and transcribed for purposes of analysis. Personally identifiable information will not be included in any publicly available reports, but please be aware that the interview recording and transcript are subject to retrieval under the Public Records Act.

By proceeding with the interview, you indicate your consent to participate and to be recorded.

Interview questions

1. We're going to start the interview by asking questions about Delta ISB review documents and processes. Since its inception in 2010, the Delta ISB has produced 7 thematic reviews, 15 Delta Plan reviews/comment letters, 8

reviews/comment letters on Bay-Delta Conservation Plan/California WaterFix/Delta Conveyance Project, 7 Delta Science Strategy reviews, and 36 other reviews/products.

   a. What do you see as the overall purpose of the body of work produced by the ISB?

   b. What do you consider to be the *impact* of this work as a whole?

   c. What do you consider to be the *value* of this work as a whole?

2. Overall, how do you think the Delta ISB is perceived by managers and policymakers in the region? How do you think it is perceived by scientists?

3. Now thinking about specific products, would you say any individual thematic reviews or other products have been particularly *impactful*? And how so?

   a. Why do you think that is?

4. Would you say any individual thematic reviews or other products have been particularly *valuable*? And how so?

   a. Why do you think that is?

5. Now we'd like to hear how you think the Board could improve its reviews. I'm going to ask you about different stages of review, and for each I'd like you to share any comments or recommendations you have for that stage.

   a. Choosing what to review

   b. Methods: Over the years the ISB has used different methods to conduct reviews – approaches like literature review, attending conferences and workshops, hosting panels at ISB meetings, distributing questionnaires, holding interviews, and hiring consultant support (like Val Connor and ESSA). Which methods work you say worked especially well, which worked less well, and why?

      i. Follow up probe [if relevant] If you had a chance to do one thematic review over again, which one would it be, and why?

      ii. Follow up probe [if relevant] How, if at all, would your methods differ, and why?

   c. Writing the review

      i. Follow up probe [if relevant]: For many of your reviews, different components of information gathering were completed by a subset of the

Board. Can you tell me a little more about the processes that were used to collate the various types of information gathered by different Board members, and share any thoughts about how those processes could be improved?

d. ISB endorsement of the review

e. Outreach; and by "outreach" I mean activities the Board uses to raise awareness of its reviews and promote implementation of its recommendations. This includes presentations at Council or DPIIC meetings, or follow-up panel discussions with stakeholders at ISB meetings.

   i. Follow-up probe [if this info was not already covered] In general, what role do you think the ISB should play in promoting implementation of its recommendations? What role should the Council, Delta Science Program, or others play?

6. Now we're going to switch gears; in the last question we were talking about *promoting* implementation of ISB recommendations, and now I'd like to talk about *evaluating* implementation of ISB recommendations. There were Delta ISB discussions early on in 2012/2013 about going back to a completed thematic review in the future, which could provide a follow-up assessment of how Delta ISB recommendations were addressed. To date, this has not been done. In 2017 and 2019 there were thoughts to revisit the habitat restoration review, which was completed in 2013, but this did not make the priority list for future reviews. However, as part of the Delta Lead Scientist Report and Council Chair/Executive Officer Report, the Council occasionally provides an update on activities that are responsive to Delta ISB recommendations. Do you feel the reports from the Lead Scientist and Council have been sufficient in helping you understand how your recommendations have been addressed?

   a. Are there alternative or additional processes you would recommend either the Board itself or others should use to track the implementation of ISB recommendation? If so, please describe those processes.

7. We're just about done for today, but before ending we wanted to ask: Do you have any general or specific suggestions for us as we continue with this ISB assessment project?

8. Are there any other thoughts you'd like to share about your time on the Board, or comments on Board reviews?