

Agenda Item: 9, Presentation
Meeting Date: July 23, 2026

JUL 2026

Delta Independent Science Board Update

Dr. Inge Werner, Chair
Dr. Lisa Wainger, Past Chair



**Delta
Independent
Science Board**

DELTA STEWARDSHIP COUNCIL

Who we are:

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Dr. Inge Werner
Ecotoxicology



Dr. Diane McKnight
Biogeochemistry



Dr. Lisa Wainger
Economics



Dr. Tanya Heikkila
Governance



Dr. Jayantha Obeysekera
Engineering



Dr. Anna Michalak
Engineering



Dr. Kenny Rose
Fisheries



Dr. Steve Lindley
Fish Ecology



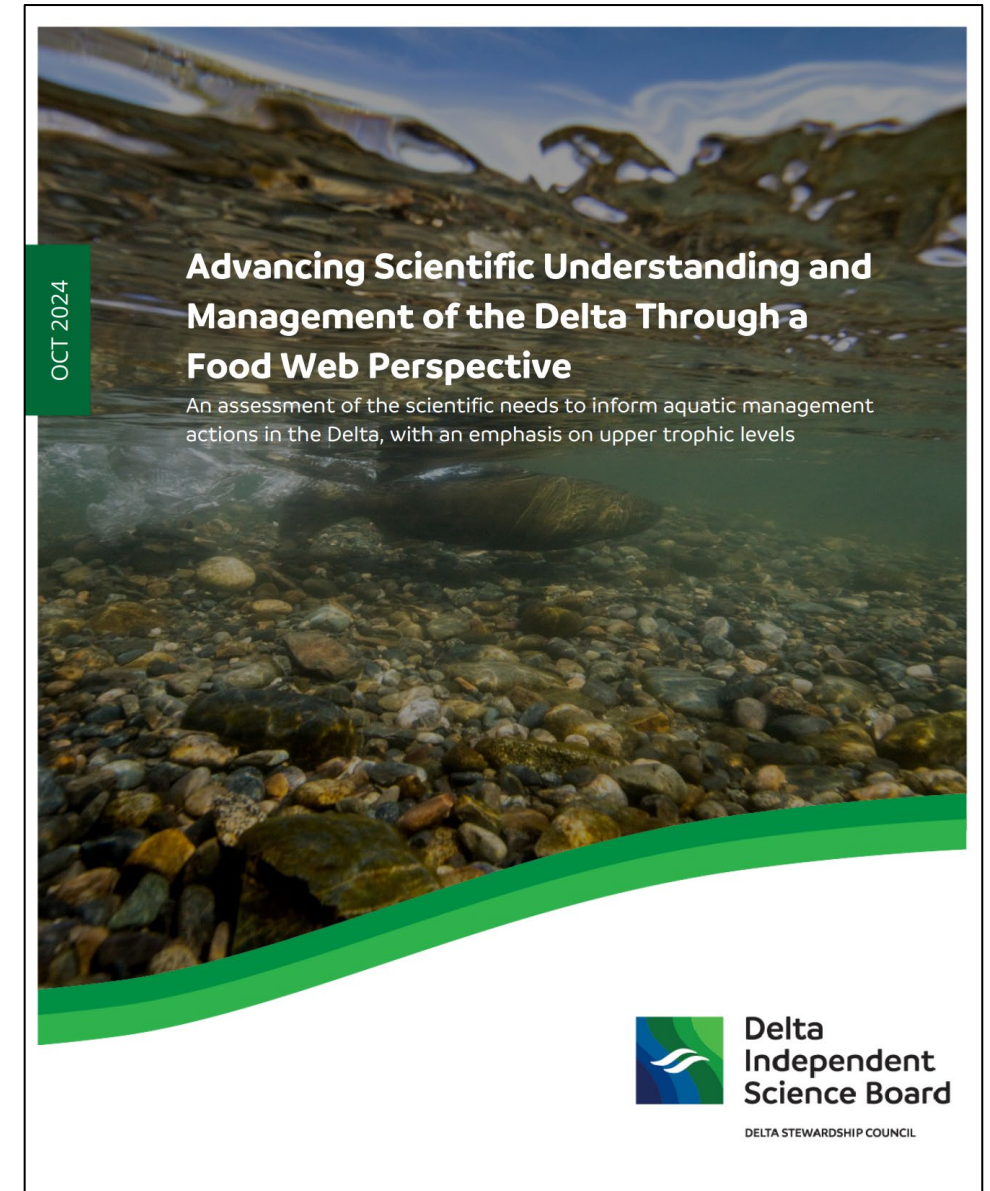
Dr. Cathleen Jones
Geophysics



Dr. Peter Goodwin
Engineering

Our scope:

- Review Delta science by themes.
Past topics:
 - ☐ Water Supply
 - ☐ Water Quality
 - ☐ Levees
 - ☐ Restoration
- Review agency documents, e.g.
 - ☐ Delta Science Plan
 - ☐ Delta Plan
- Reviews can be self-initiated or requested from the outside
- We do not make or endorse policy decisions



Current Review Activities

Completing Thematic Reviews on

- ☐ Subsidence
- ☐ Emerging Climate Science
- ☐ Decision-making Under Deep Uncertainty
- ☐ Contaminants Monitoring

Scoping Future Reviews

- ☐ Nature-based Solutions
- ☐ Harmful Algal Blooms
- ☐ Structured Decision-making
- ☐ Collaborative Science

Communicating Review Results

- ☐ Publications
- ☐ Conference presentations



Ongoing Review: Contaminant Monitoring with Focus on Risk to Aquatic Ecosystems

Goal 1: Assess existing contaminant monitoring programs

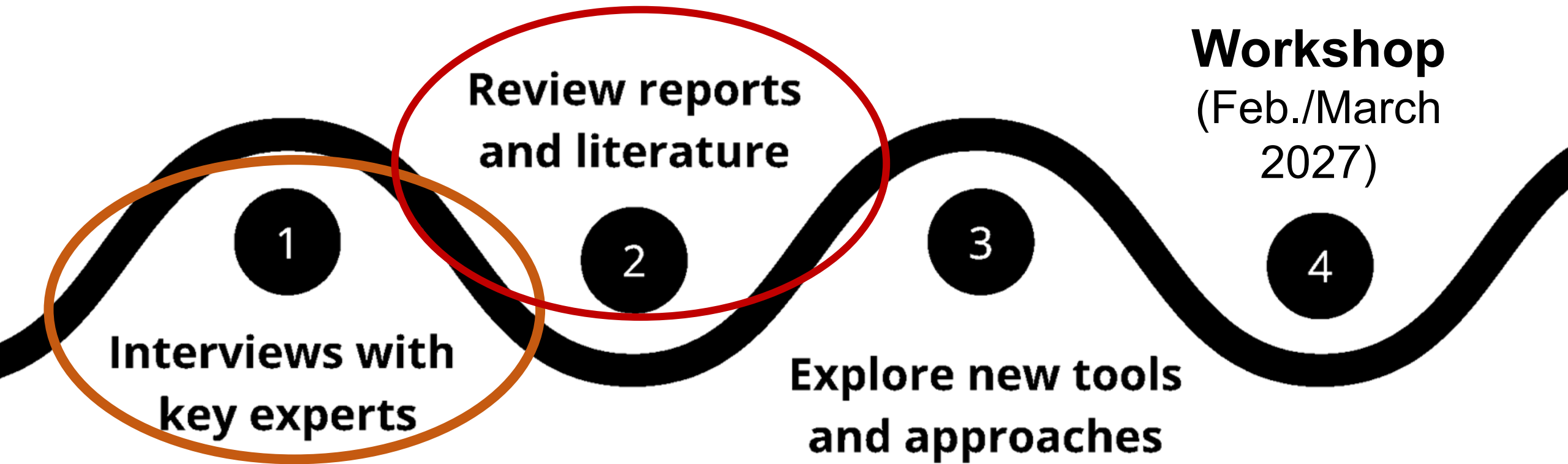
Goal 2: Understand how monitoring informs decision making

Goal 3: Identify opportunities and make recommendations



Photo credits: DWR

Review Approach



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Recent In-Person Meeting (May): Tour of the Echo Water Resource Recovery Facility

- ❑ Tour helped inform the Delta ISB's Contaminants Monitoring Review
- ❑ 57 participants from the public
- ❑ Facility treats domestic and industrial wastewater from 1.6 million customers
- ❑ Recent facility upgrade to tertiary treatment to eliminate ammonia
- ❑ Efforts to re-use methane (energy), treated water (wetlands restoration) and sludge (fertilizer)



Scoping a Review on Nature-based Solutions: New Panel Series



Goal:

Identify what type of review would be most useful for the Delta community through **panel discussions**

Panel (May 26) with State agency leaders identified many needs:

- 1) How do you quantify co-benefits?
- 2) When do you adapt?

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Next Panel on Learning from Other Systems



Louise Conrad
Delta



Eryan Sloane
San Francisco Bay



Cindy Palinkas
Chesapeake Bay



Tracy Collier
Puget Sound



Denise Reed
**Coastal
Louisiana**

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Are Delta future planning scenarios capturing Deep Uncertainty?

Findings from the Delta ISB Review

Presented by
Lisa Wainger, University of Maryland Center for Environmental Science and
the Delta Independent Science Board



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What is *deep* uncertainty?

- **Unpredictability** - Likelihood of future events & outcomes cannot be well-characterized with existing data and models
- Typified by **catastrophic, compounding events**
- Interested parties may disagree on **likelihood of events** and/or **consequences of actions**

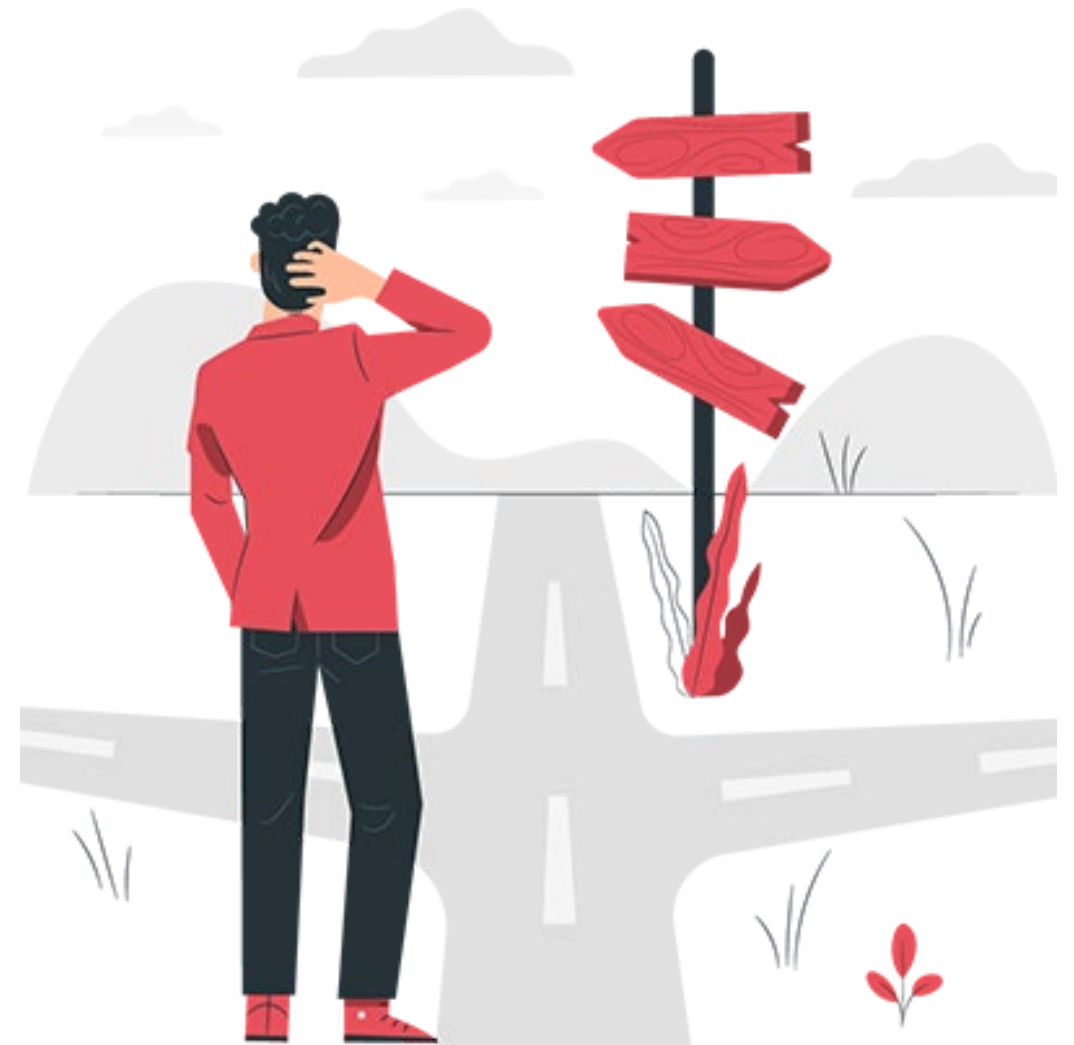


What makes decision making under deep uncertainty (DMDU) different?

	Traditional Planning	Adaptive Planning with DMDU
Core assumption	The future is knowable (predictable from past behavior)	The future is deeply uncertain (marked by non-linear change)
Strategy	Predict then act	Monitor and adapt
Goal	Optimized for the predicted most likely future	Robust across many plausible futures

Scenarios are a common tool of uncertainty analysis

- Scenarios are used to anticipate and prepare for change and/or establish a desired vision
- A known weakness - cognitive biases can cause people to overlook disruptive possibilities
 - Status quo bias
 - Groupthink
 - Optimism bias



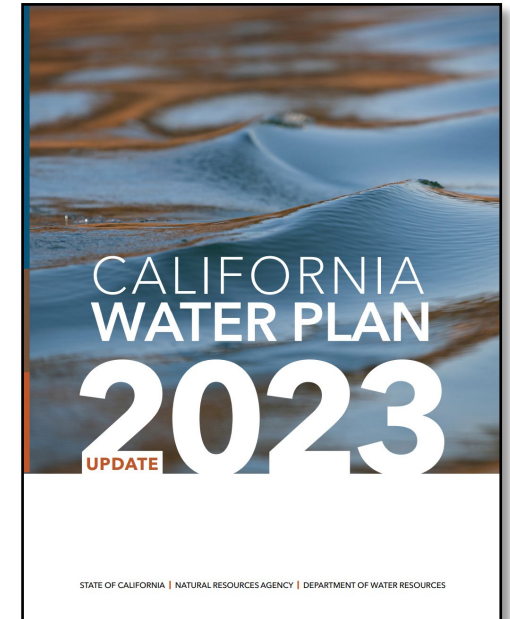
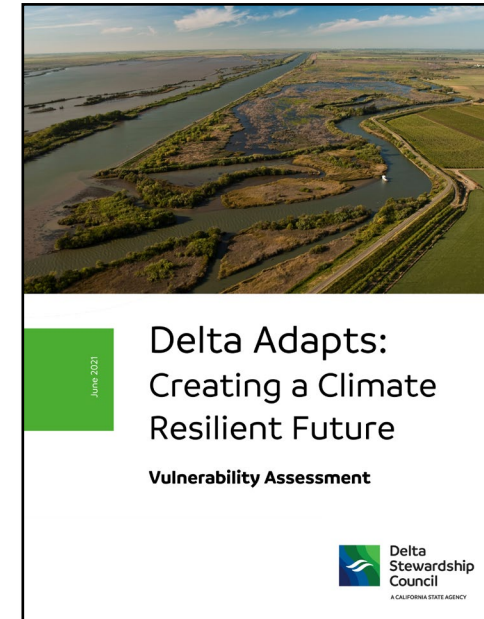
Delta ISB Review

Research Questions

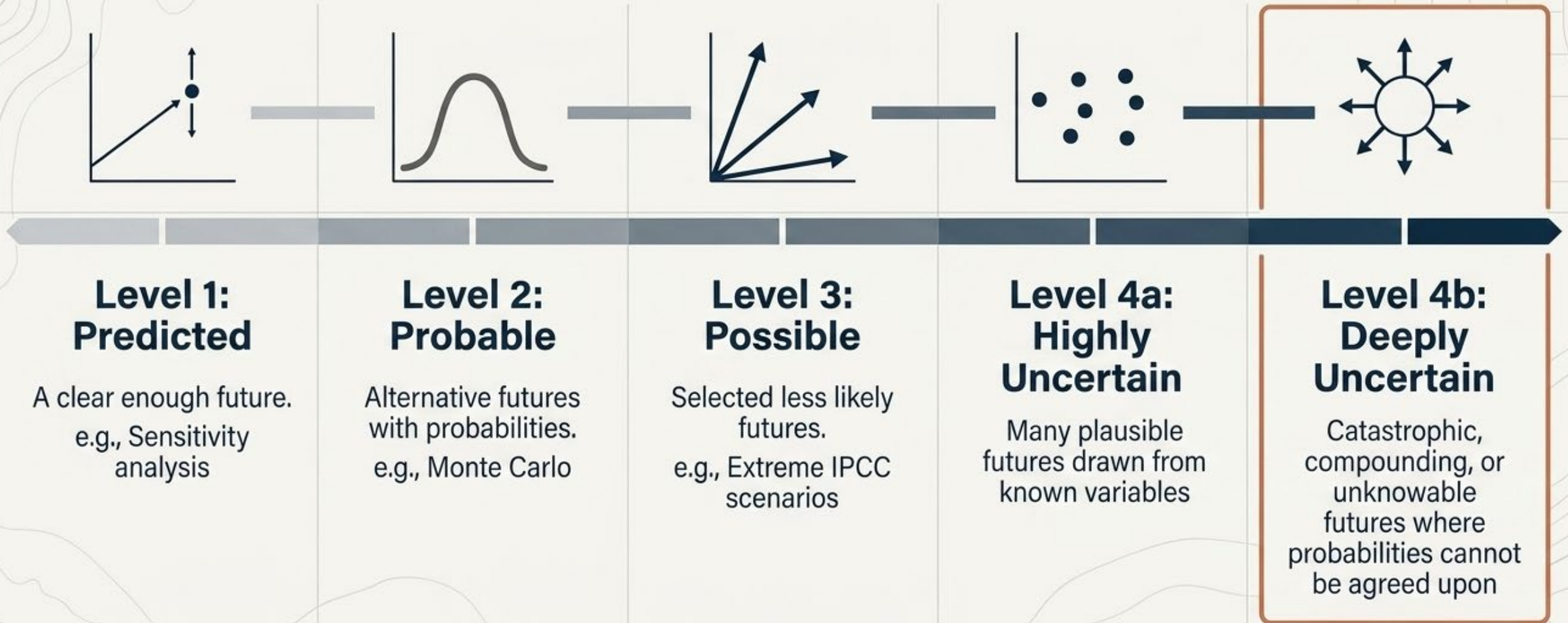
- How do scenarios account for uncertainties?
- Did groups seek to mitigate cognitive biases?
- How are scenarios used to support decision making?

Methods

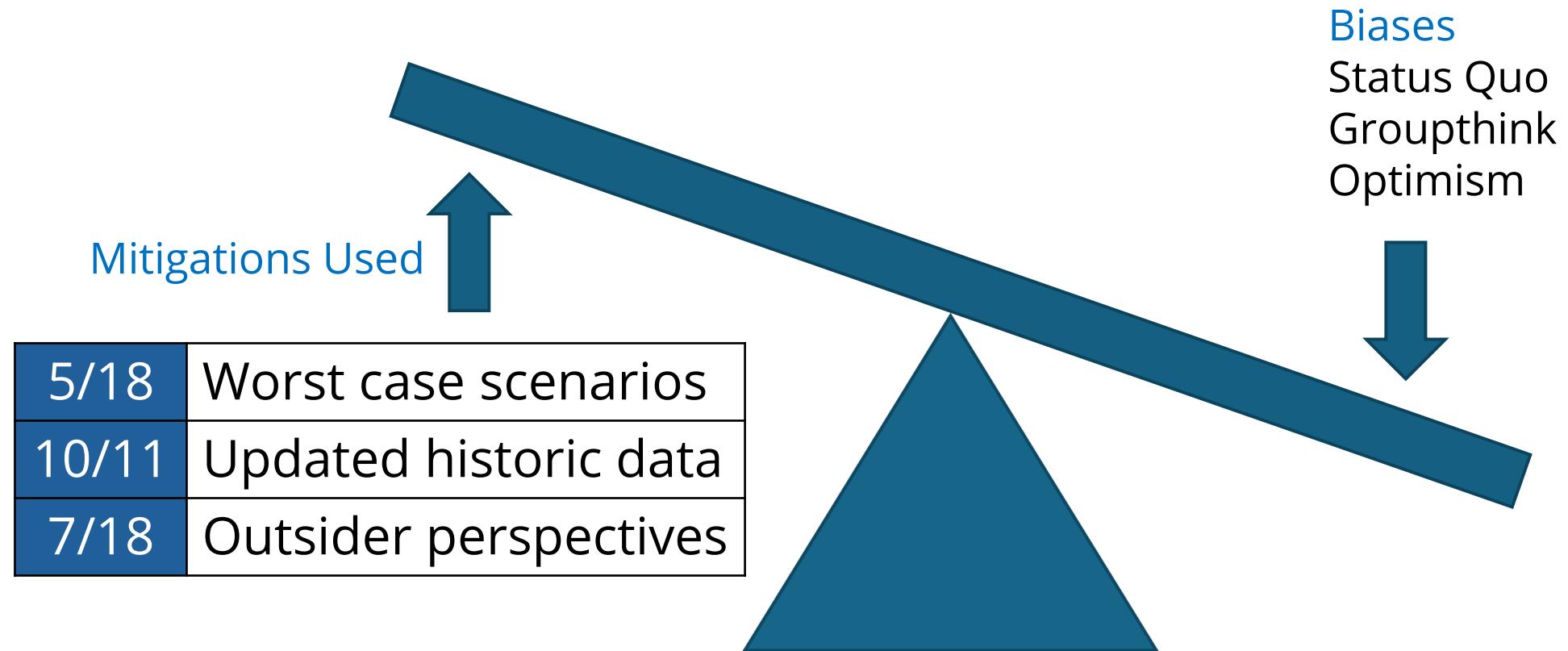
- Analyzed 18 documents (2016-2023) where scenarios were developed in and around the Delta
- Interviewed scenario developers and end users



The Spectrum of Uncertainty: From predictions to the unknowable

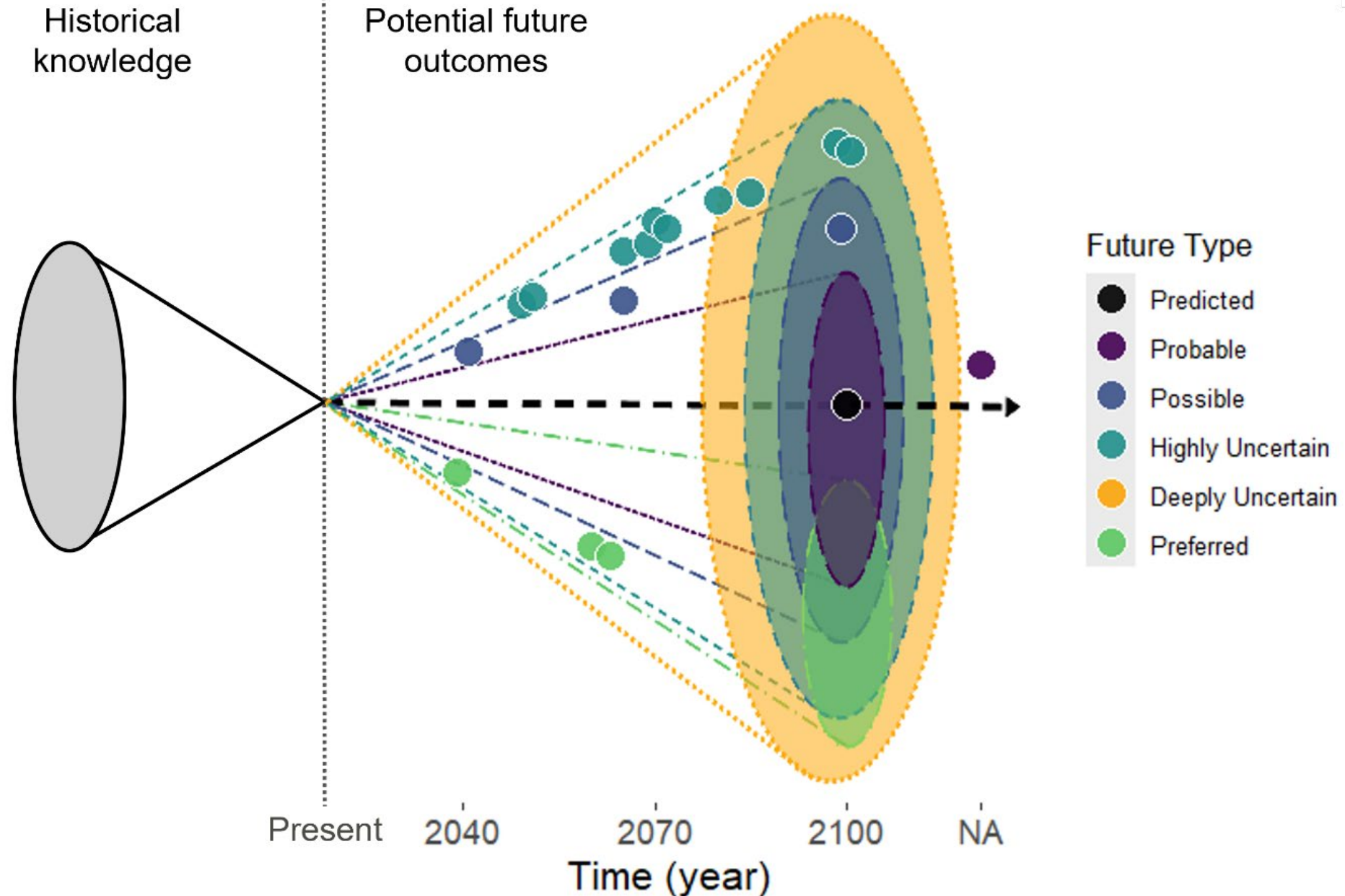


Modest effort towards mitigating cognitive biases



Results

*Scenario distribution
within the cone of
uncertainty by end year*



Results Summary

Most studies explored high uncertainty, but none explored deep uncertainty

- Risks with poorly understood probabilities were sometimes omitted

More could be done to mitigate cognitive biases

- Updating historic data was typical
- Engaging the public (or other agencies) to broaden perspectives was atypical

Decision makers could be better engaged early in scenario development

- Potential end users identified important omissions in scenarios

Not all decisions will benefit from DMDU, but this systematic approach to exploring uncertainty has benefits



Reveals vulnerabilities early in planning



Expands which uncertainties are explored



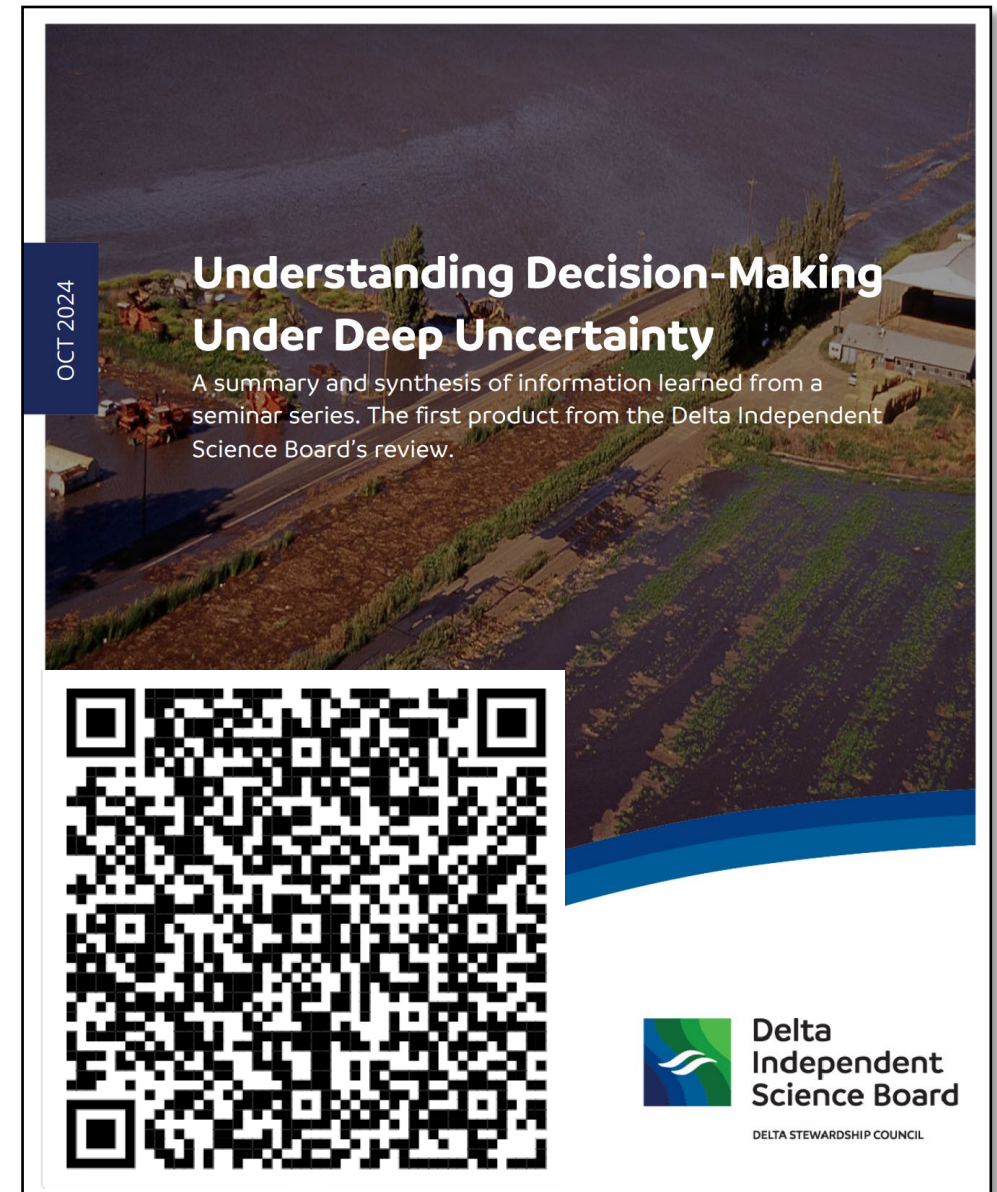
Integrates diverse views without forcing consensus



Reveals management options that help with planning, speed recovery & support adaptation, over many plausible futures

What is next?

- Findings from the review will soon be published in the San Francisco Estuary and Watershed Sciences journal
- Working to provide practical recommendations in a future perspective piece
- Our seminar synthesis report provides accessible information about DMDU and its benefits



Thank you!

If you want to learn more...



Read seminar synthesis report to learn about DMDU



Email disb@deltacouncil.ca.gov with comments and questions