Delta Independent Science Board: Recent Accomplishments and Current Activities

Dr. Stephen Brandt
Dr. Elizabeth Canuel
Delta Independent Science Board

Agenda Item 9
August 22, 2019
Statutory Role

• 85280. “...provide oversight of the scientific research, monitoring, and assessment programs that support adaptive management in the Delta through periodic reviews of each of those programs....”

• Review programs by themes and specific science documents (e.g., Delta Science Plan)

• Thematic reviews presented to the Council:
  1) Restoration (2013)
  2) Fish and Flows (2015)
  3) Adaptive Management (2016)
  4) Levees (2016)
  5) Delta as an Evolving Place (2017)
  6) Water Quality (2018)
Overall Purpose

• Evaluate the state and adequacy of the science
  ✓ Recommend forward-looking strategic science priorities
  ✓ Identify gaps
  ✓ Increase scientific credibility
  ✓ Improve research clarity
  ✓ Advance the debate about Delta issues
  ✓ Seek better connectivity between science, management and policy

• Do not make or recommend policy decisions
Overview of Review Process

1. Identify relevant thematic topics
   - Delta Plan Chapter Topics
   - Panels/Discussions

2. Prospectus on topic, goals, methods

3. Draft review for public comment

4. Final review and report to Council

5. Outreach
ISB Products Since July 2018

Reviews:

- Water Quality Thematic Review (July 2018)
- 2019 Delta Science Plan
  - Submitted Report to Delta Stewardship Council (December 2018)
  - Submitted Comment Letter to DPIIC on the Need to Improve Interagency Science (February 2019)

Prospectus:

- Non-native Species (September 2018)

Summary Sheets:

- Habitat Restoration
- Fish and Flows
- Water Quality
**Current Work Plan**

<table>
<thead>
<tr>
<th>Efforts</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan-Mar</td>
<td>Apr-Jun</td>
</tr>
<tr>
<td>IEP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft and Refine Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring Enterprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Supply Reliability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshop &amp; Synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecosystems: Non-native species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshop &amp; Synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPIIC Science Needs Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implications of Rapid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta Lead Scientist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recruitment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Upcoming/Potential Requests:**
- Delta Plan Ecosystem Amendment PMs
- Climate Change Vulnerability Assessment and Adaptation Strategy?
Current Thematic Reviews

Gathering Information:
- Water Supply Reliability
- Delta Monitoring Enterprise

Analyzing and Synthesizing:
- Ecosystems: Non-native Species

Finalizing and Outreach:
- Interagency Ecological Program
Current Thematic Reviews (1)

Gathering Information:
• Water Supply Reliability
• Delta Monitoring Enterprise

Analyzing and Synthesizing:
• Ecosystems: Non-native Species

Finalizing and Outreach:
• Interagency Ecological Program
Delta Monitoring Enterprise

1. Part 1: Inventory of All Monitoring Programs by ESSA Technologies Ltd., cbec, and PAX
   a) What is being collected?
   b) Who is collecting and funding?
   c) Why is it collected?
   d) How it is used in management?

2. Part 2: Delta ISB Review and Recommendations
   a) How can programs be better linked and coordinated?
   b) Are programs meeting the needs of management?
Timeline: Monitoring Review

- **April 2017**: Finished Prospectus
- **November 2017 to July 2018**: Hosted 5 Brown Bag Seminars and Panels
- **December 2018**: Contracted with ESSA, cbec, & PAX to Develop Inventory
- **March 2019**: Inventory Methodology Developed
- **April 2019**: Workshop to Inform Scope of Inventory
- **End of 2019**: Inventory and Final Reports from ESSA
- **Late 2020**: Delta ISB Findings and Recommendations
Monitoring Inventory Framework

**Direct Socio-Economic Drivers**
- Hydrologic alterations
  - Water operations / exports
  - Water storage
  - Water demand
  - Water conveyance / infrastructure
  - Wastewater discharge
  - Stormwater runoff / drainage
- Habitat alterations
  - Levees
  - Dredging
  - Water intakes & fish screens
- Biological resource use
  - Fishing
  - Hunting
  - Forest harvesting
- Human intrusions & disturbance
  - Agriculture
  - Urban development
  - Recreation & tourism
  - Energy
- Transportation & service corridors
  - Roads & bridges
  - Rail lines
  - Docks & ports
  - Shipping channels

**Environmental Drivers / Conditions**
- Hydrology & hydrodynamics
  - Surface water / flow
  - Groundwater
  - Stage
  - Velocity
  - Direction
  - Tides
  - Residence time
  - Waves
  - Flood
  - Drought
- Landform & natural disturbance
  - Land elevation
  - Subsidence
  - Sea level rise
  - Seismicity
  - Wildfire
- Nutrients, energy & food web
  - Nitrogen / ammonia
  - Phosphorous
  - Carbon
  - Chlorophyll A / B
  - Detritus
  - Primary productivity
  - Harmful algal blooms (HAB)
  - Phytoplankton
  - Zooplankton
- Sediment
  - Suspended sediment
  - Bedload
  - Deposition
  - Erosion
- Water quality
  - Salinity
  - Water temperature
  - Dissolved oxygen
  - pH
  - Turbidity
  - Hg & methyl mercury
  - Polychlorinated biphenyl (PCB)
  - Polycyclic aromatic hydrocarbons (PAH)
  - Hydrocarbons
  - Flame retardants
  - Endocrine disruptors
- Management Actions
  - Lead
  - Cadmium
  - Copper
  - Zinc
  - Arsenic
  - Selenium
  - Constituent of emerging concern (CEC)
  - Insecticides
  - Rodenticides
  - Herbicides
  - Fungicides
  - Pyrethroids
  - Microplastics
  - Nutrients
  - Fecal coliform
  - E. coli
  - Other discharge contaminants

**Habitats**
- Tidal wetlands
  - Mudflats
  - Saltwater / freshwater marshes
  - Intertidal / transition zones
  - Above-highwater refugia
- Channelized
  - Main channels
  - Sloughs
  - Backwater
- Aquatic vegetation
  - Submerged
  - Floating
- Floodplain
  - Seasonally flooded
  - Open water
  - Managed ponds
- Terrestrial
  - Forests
  - Non-forested vegetation
  - Delta islands
  - Pacific flyway

**Species**
- Fish
  - Chinook Salmon
  - Steelhead
  - Green Sturgeon
  - White Sturgeon
  - Delta Smelt
  - Longfin Smelt
  - Sacramento Sillitail Pelagic fish
- Mammals
  - Salt marsh harvest mouse
- Birds
  - Non-resident / overwintering birds
  - Waterfowl
  - Shorebirds
  - Gulls
- Amphibians & reptiles
  - Giant garter snake
  - California tiger salamander
- Invertebrates
  - Insects
  - Mollusks
  - Crustaceans
- Invasive / non-native species
  - Striped bass
  - Nutria
  - Water hyacinth
  - Brazilian waterweed
  - Spongeplant
  - Giant reed
  - Yellow star thistle

**Agenda Item 9**
Monitoring Review Topics

• Purpose of monitoring programs, types, and theoretical underpinnings
• Science and scientific rigor of monitoring
• The role of monitoring in the context of adaptive management
• Inventory
• Suggestions for improvement of monitoring
  • Weak fields/strong fields
  • Meeting management needs
  • Performance measures
• Recommendations and to whom
Current Thematic Reviews (2)

Gathering Information:
• Water Supply Reliability
• Delta Monitoring Enterprise

Analyzing and Synthesizing:
• Ecosystems: Non-native Species

Finalizing and Outreach:
• Interagency Ecological Program
Ecosystems Review Purpose

Review the science on non-native species, their effects on Delta ecosystems, and how to control or adapt to them.
Timeline: Ecosystems

- **August 2018**: Finished Prospectus
- **November 2018**: Workshop/Panel: Broad Concepts
- **March 2019**: Workshop/Panel: Key Delta Issues
- **April to June 2019**: Follow up Analysis and Report Outline
- **September 2019**: Initial Draft
- **March 2020**: Complete Report for Public Comment
- **Summer 2020**: Report Finished/Outreach
Main Topics in Report

1. Introduction: Non-native species in the Delta
2. Science related to the “invader”
3. Assessing impacts of the “invader”
4. Science related to the dynamic Delta
5. Ecosystem restoration
6. Science related to non-native species in the context of ecosystem management
7. Management considerations, conclusions, and key recommendations
Science Related to “the” invader

1. Prediction of invasions
2. Habitat suitability in the context of individual invader requirements
3. Invader life history characteristics
4. Routes and corridors
5. Detection
6. Eradication
7. Control
8. Monitoring and Assessment
Management Related to Invader: Conceptual Model

Management Actions

- Threat Assessment
  - High
    - Prevention
      - Yes, Continue Prevention
    - No
      - Eradication
        - Yes
          - Continue Prevention
        - No
          - Control
            - Yes
              - Continue Control
            - No
              - Adaptation
Science Related to the Invader: Conceptual Model
Recommendations

1. **How should management actions be directed? Where to do what?**
   a) When to eradicate an invader; when to control; when to accept?
   b) How to prioritize actions on which invaders or ecosystems using what criteria?
   c) How does consideration of non-native species and their effects enter into the adaptive management process?

2. **Fundamental Science Needs**
Current Thematic Reviews (3)

Gathering Information:
• Water Supply Reliability
• Delta Monitoring Enterprise

Analyzing and Synthesizing:
• Ecosystems: Non-native Species

Finalizing and Outreach:
• Interagency Ecological Program
Delta ISB Chair: Elizabeth Canuel

- Faculty Member at Virginia Institute of Marine Science/William & Mary (25 years)
- Member of the Delta ISB since 2010
- Expertise: Carbon Cycle; Biogeochemistry
- Research:
  - How have human activities altered the delivery of carbon
  - Climate impacts on carbon
  - Food resources for aquatic organisms
Delta ISB: Forward Looking

- IEP Review – Recommendations
- Delta ISB – Transitions in membership
- Upcoming reviews
IEP Review: Update

Review Process

• Interaction with IEP
• Consideration of prior reviews of IEP
• Experiences of the Delta ISB members in science organizations
• Brief review of how science is organized across other large ecosystems
• Review of IEP documents
• Insights reached through responses to a questionnaire and in-depth interviews with IEP participants and other stakeholders
IEP Review: Findings (1)

What IEP Does

1. To support adaptive management of the Delta both now and in the future, the core monitoring and reporting functions of IEP must be continued.

2. To sustain the decades-long dataset developed by IEP, the value of long-term data in coping with rapid environmental changes should be promoted through powerful and consistent statements and examples.
IEP Review: Findings (2)

What IEP Does

3. To broaden the constituency of IEP, **data management should be improved by enhancing the accessibility of the IEP website and data portals and assessing stakeholder needs and uses of information.**

4. To integrate improved monitoring technologies into existing programs, a **standing committee within IEP should continually assess new monitoring methods, phasing out those that are no longer appropriate while taking care to cross-calibrate data from former and revised methodologies.**
IEP Review: Findings (3)

What IEP Does

5. To provide the mechanistic understanding needed to address the Delta’s environmental problems, additional resources should be obtained to augment monitoring with the experimentation and synthesis needed for effective adaptive management and to guide both short- and long-term management and decision-making in the Delta.

- Climate change and extreme events
- Impacts of non-native species
- Restoring native species and communities
IEP Review: Findings (4)

How IEP Works

6. To ensure that IEP continues to serve its multiple partners and stakeholders, **IEP should undertake a formal, transparent assessment to develop a consistent set of goals that define its mission and activities in addressing the diverse management needs of the Delta.**
How IEP Works

7. To develop a new and clear sense of direction, IEP Directors, staff, funders, and stakeholders should engage in in-depth discussions of IEP’s organization and operations, including alternative organizational structures.

8. To be strategic, efficient, and effective, IEP should prioritize its activities to justify additional funding and partnerships and/or reallocate resources among existing activities.
Current & Changing Membership

Dr. Stephen Brandt
Fish & Food Webs

Dr. Elizabeth Canuel
Biogeochemist

Dr. Tracy Collier
Fisheries/Toxicology

Dr. Joe Fernando
Engineer

Dr. Tom Holzer
Geologist

Dr. Jay Lund
Engineer

Dr. Richard Norgaard
Economist

Dr. Vince Resh
Ecologist

Dr. John Wiens
Landscape Ecology

Dr. Joy Zedler
Botany/Wetlands
Future Reviews

• All current reviews should be completed or have a public draft in circulation when original members retire in August 2020.

• Topics
  • Emerging issues/challenges in environmental science?
  • Specific emerging issues/challenges specific to the Delta ecosystem?
  • Revisit topics identified at our last retreat

• Timing
  • Engage new members
  • Identify expertise needed. This will help with recruitment/onboarding of new Delta ISB members
Questions?