

Advances in Establishing Science-Based Inflow and Outflow Goals in the Sacramento-San Joaquin River Delta

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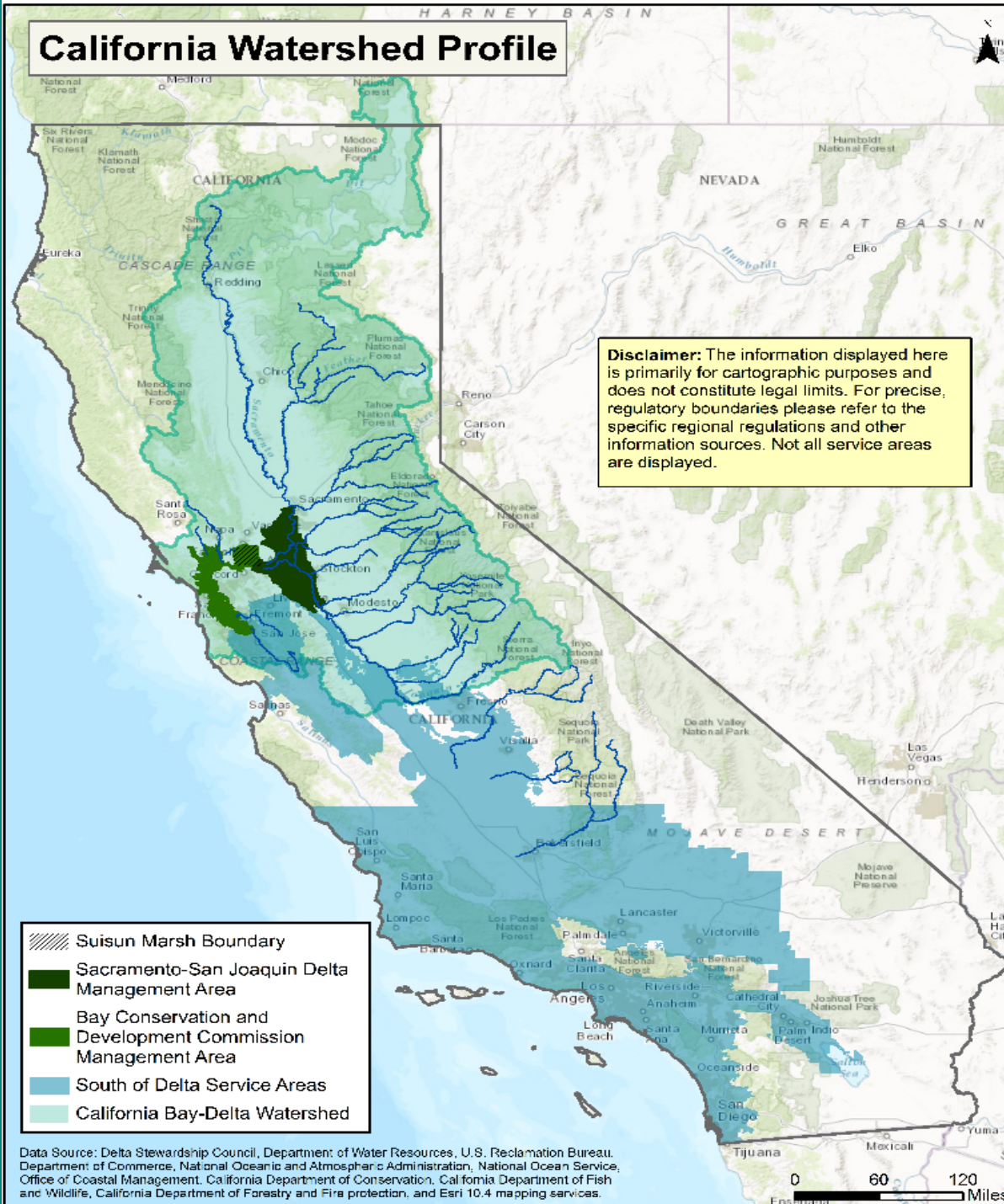
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Delta Science Program
Delta Stewardship Council



California Watershed Profile



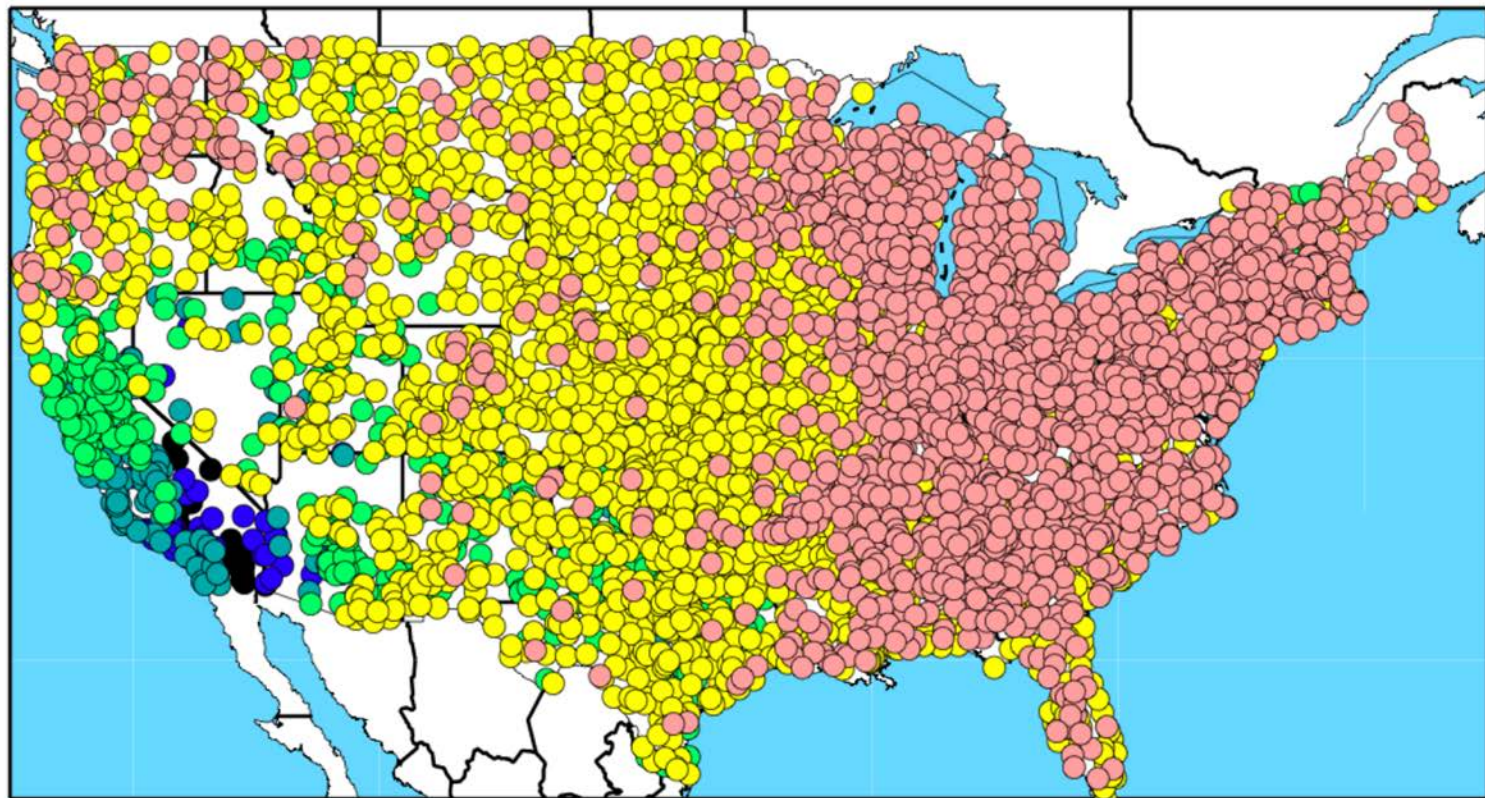
Disclaimer: The information displayed here is primarily for cartographic purposes and does not constitute legal limits. For precise, regulatory boundaries please refer to the specific regional regulations and other information sources. Not all service areas are displayed.

-  Suisun Marsh Boundary
-  Sacramento-San Joaquin Delta Management Area
-  Bay Conservation and Development Commission Management Area
-  South of Delta Service Areas
-  California Bay-Delta Watershed

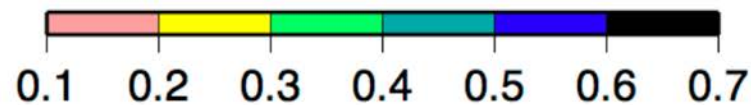
Data Source: Delta Stewardship Council, Department of Water Resources, U.S. Reclamation Bureau, Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Coastal Management, California Department of Conservation, California Department of Fish and Wildlife, California Department of Forestry and Fire protection, and Esri 10.4 mapping services.

0 60 120 Miles

COEFFICIENTS OF VARIATION OF TOTAL PRECIPITATION, WY 1951-2008

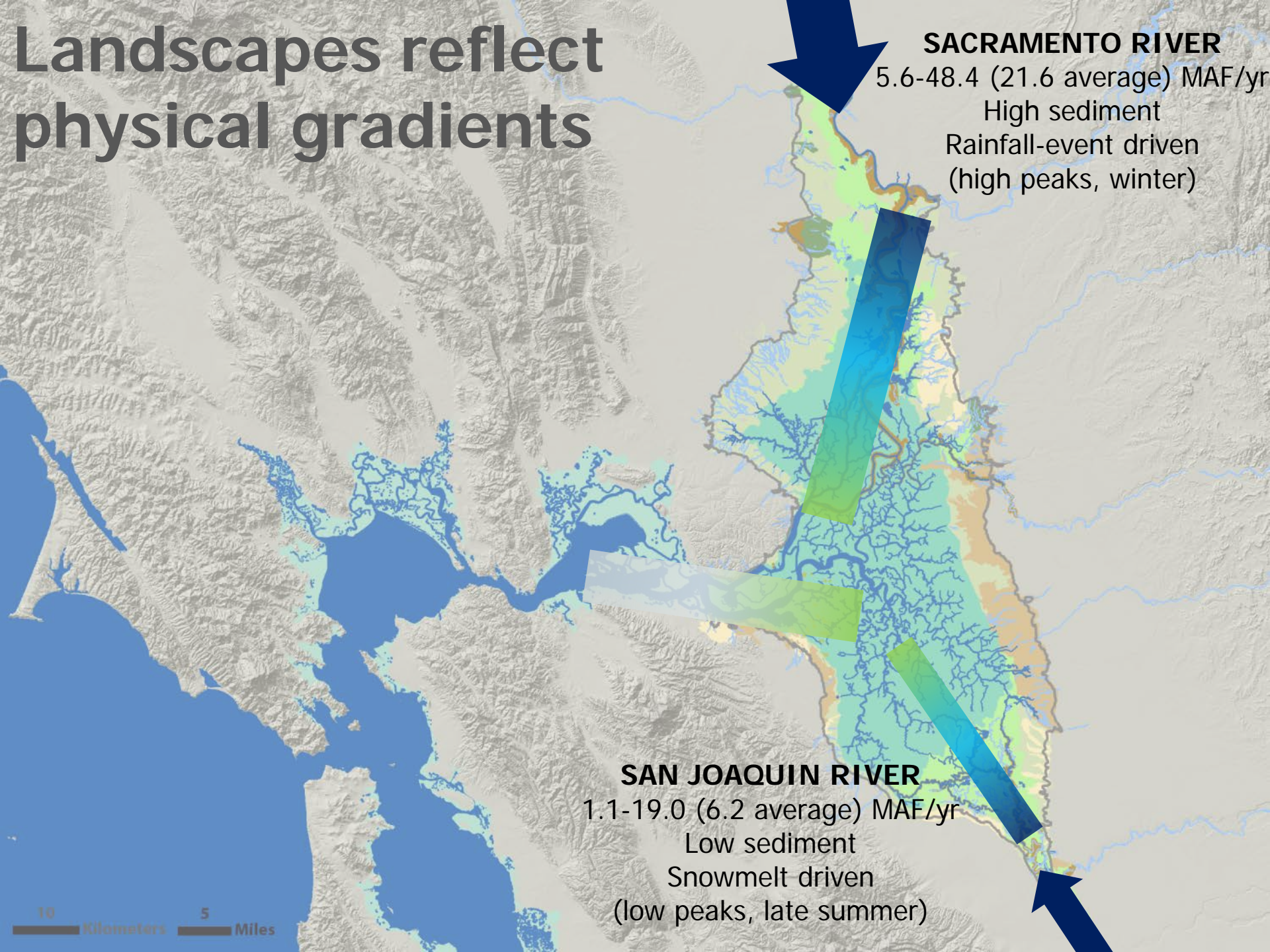


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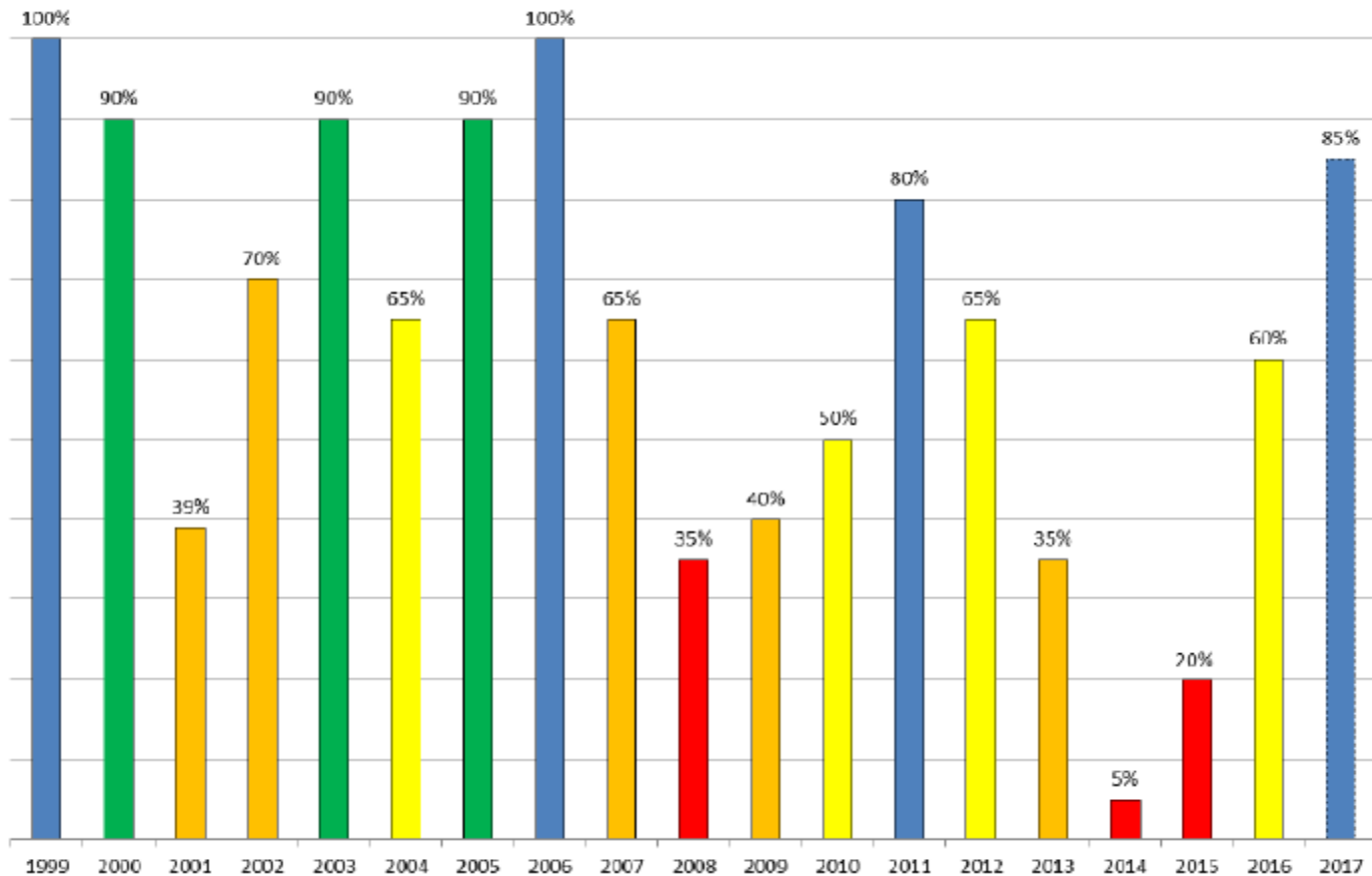


Dettinger et al. *Water* 2011: Atmospheric rivers, floods and the water resources of California

Landscapes reflect physical gradients



SWP Allocation by Year Type



Water Year Types

- Wet
- Above
- Below
- Dry
- Critical

Importance of the Bay-Delta

- 2/3 of California residents (~26 million people) rely on Delta water
- Delta water irrigates 45% of the fruits & vegetables produced in US
- 80% of California's commercial fishery species rely on the Delta
- Delta provides habitat for 700 species; global hotspot for biodiversity



Delta Co-Equal Goals

- Providing a more reliable water supply for California
- Protecting, restoring, and enhancing the Delta ecosystem

Goals must be met in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.



Establishing Flows: Take-Home Lessons

- Integrate natural and social sciences
- Engage high-level managers to identify decision universe
- Define fundamental vs. means objectives
- Incorporate review by outside experts
- Focus on functional flows

Integrate Natural and Social Sciences

- Strong recommendation from our Independent Science Board
- Many challenging issues to address the co-equal goals
- “Social Science Task Force” being assembled to provide guidance on engaging social science research in the Delta

Engage Decision Makers

- Delta Plan Interagency Implementation Committee: regional directors of 17 state and federal agencies
- Collaborative Science and Adaptive Management Program: agency leaders, water users, and NGOs
- Multiple other avenues for engagement
- Co-production of science

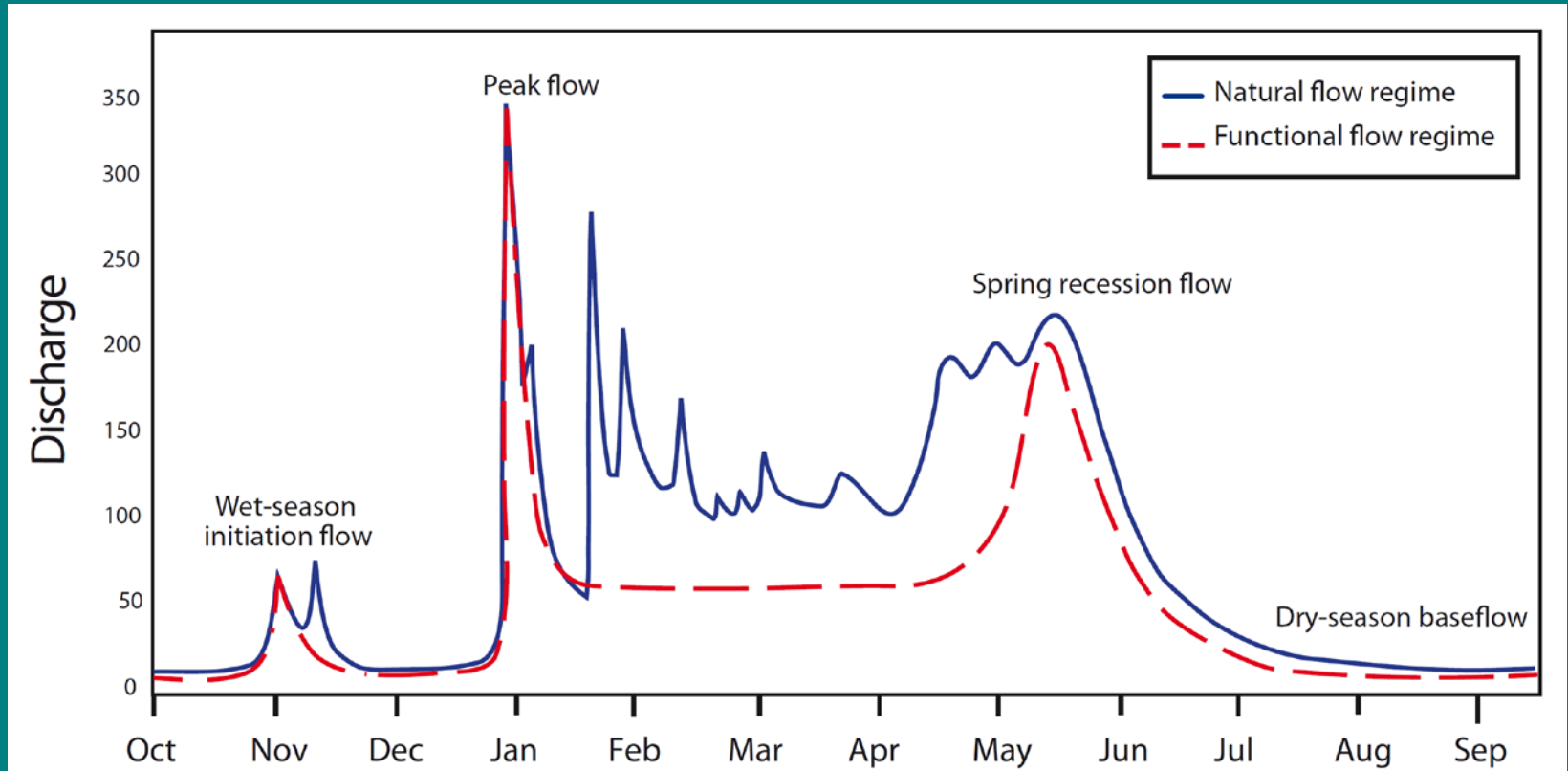
Define Fundamental vs. Means Objectives

- Identify what we really want to achieve, and what the means are to achieve fundamental objectives
- Use structured decision making to identify and work towards these objectives
- Need for broad buy-in and engagement of stakeholders

Incorporate Expert Reviews

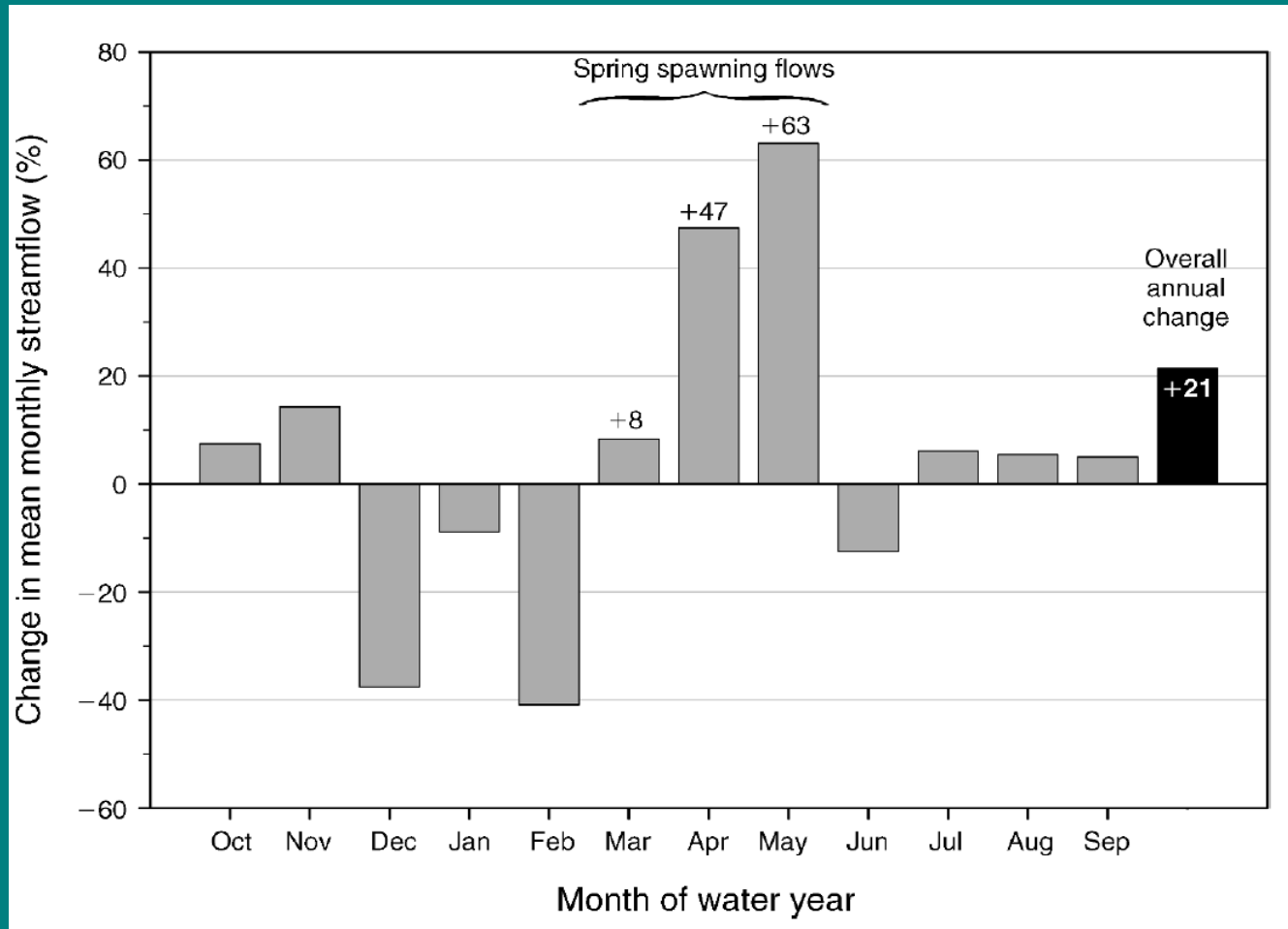
- Delta Independent Science Board
- Targeted review panels

Functional Flow Approach for Mediterranean Climates



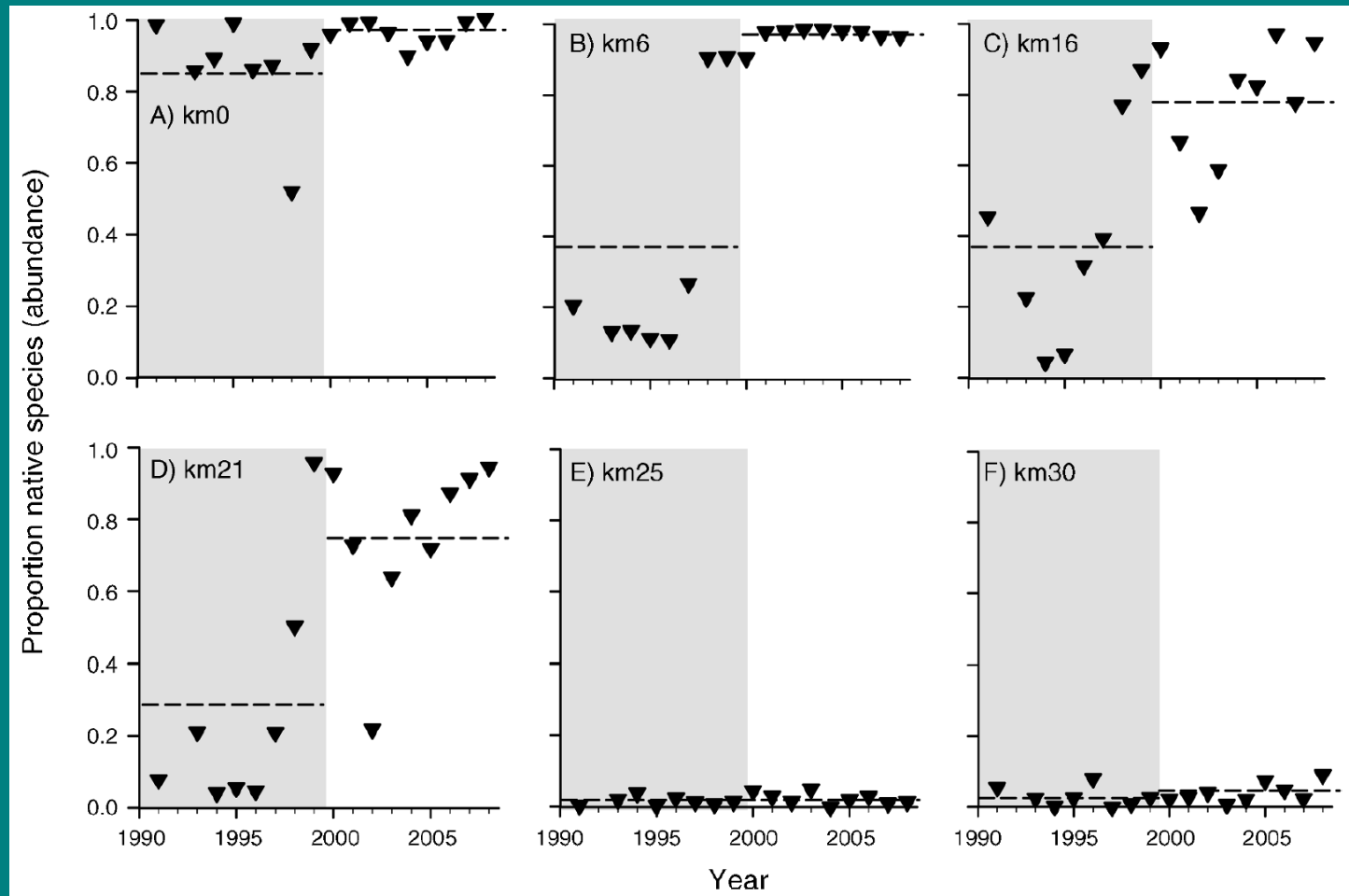
Yarnell et al. *BioScience* 2015: Functional flows in modified riverscapes: Hydrographs, habitats and opportunities

Putah Creek Example: Shift in Flow



Kiernan et al. *Ecological Applications* 2012: Restoring native fish assemblages to a regulated California stream using the natural flow regime concept

Putah Creek Example: Fish Response



Kiernan et al. *Ecological Applications* 2012: Restoring native fish assemblages to a regulated California stream using the natural flow regime concept

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