

Delta Independent Science Board Report: Flows and Fishes in the Sacramento-San Joaquin Delta, Research Needs in Support of Adaptive Management

Summary: Dr. Jay Lund (Chair, Delta Independent Science Board), will brief the Council about the recently completed Flows and Fishes review report by the Delta Independent Science Board. The presentation will be followed by a discussion with a panel of agency and stakeholder managers to hear responses to the recommendations in the report, and receive Council support for and/or suggestions on how to implement the report's recommendations.

Background

The Delta Independent Science Board (Delta ISB) was established by the Delta Reform Act of 2009 to 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. The Act also states that the Delta ISB "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" (Water Code §85280(a)). The Delta ISB is structuring its reviews by themes.

The theme for this review was the science of how freshwater flows affect Delta fish populations. A major challenge in the Delta is determining a flow regime that benefits desirable fishes while also providing water supply reliability. The review broadly examines the science of water flow effects on Delta fish populations and recommends strategic science activities to improve understanding of underlying processes, to benefit decision-making, and to enhance scientific collaboration and communication concerning fish and flows in the context of other stressors.

As part of the review process, the Delta ISB examined many scientific articles on fishes and flows in the Delta and other ecosystems, including two reports by the National Research Council linking water management and threatened and endangered species. The Delta ISB also attended relevant workshops (e.g., the February 2014 "Delta Outflows and Related Stressors;" April 2014 "Interior Delta Flows and Related Stressors"), received presentations on this topic at Delta ISB meetings, and conducted interviews with 16 individuals from state and federal agencies, consulting firms, interest groups and academia.

A subset of Delta ISB members participated in the interviews, workshop attendance and literature review and wrote the first drafts of the report. These drafts were revised in response to comments received by individual Delta ISB members. In April 2015, a draft report was released for a two-week public comment period and 11 sets of comments were received from academia, private consultants, federal, state and local agencies,

and special interests. The final review report was completed in August and broadly disseminated in September.

Today's Briefing

The scientific challenges to providing a Delta flow regime that benefits desirable fishes while providing water supply reliability are well known:

- The modern Delta differs starkly from the conditions under which its native fish evolved. Non-native fish now predominate, and the habitat and flow needs of native species are difficult to define in light of the highly altered system we encounter today.
- Flows in the Delta affect fishes directly and indirectly and the indirect effects work through other environmental factors, differing among species and life stages, while other drivers of fish production confound the effects of flow.
- Many agencies are involved in Delta fish and flow decision and in scientific efforts to support management of water supply and fishes.

The report offers several recommendations on scientific strategies to benefit adaptive management, and to enhance collaboration and communication among institutions, scientists and managers:

- **Focus on cause and effect**
A deeper mechanistic understanding of the responses to environmental drivers/conditions will improve quantitative predictions and facilitate adaptive management by clarifying uncertainty and risk, by creating specific expectations for outcomes and by strengthening testable hypotheses. Scientific efforts should focus on both direct and indirect effects of flows and fishes. This includes how water flows affect passive and active fish movements, migration and spawning activities and understanding how velocities and depths affect important physical, chemical and biological factors that affect fish vital rates (growth and mortality rates, reproductive success) and ultimately fish abundance.
- **Expand integrative science approaches**
Science priorities should be developed with an integrative, well-planned approach, grounded in relevant management questions focused on mechanistic processes, drivers and predictions. Adaptive science that responds to knowledge-gap identification and strengthens interagency and cross-disciplinary work can speed and solidify scientific discoveries and improve management.
- **Link quantitative fish models with 3-D models of water flows**
To identify information gaps and improve the underpinning of decision support, a specific collaborative effort is needed to develop a 3-D, open-source, hydrodynamic model that can be more widely adopted and integrated with generic and species-specific models of fish growth, movement, mortality and

reproduction and with food-web models. Such a model needs a dedicated home with continuous maintenance, upgrades, access, transparency and user support.

- **Examine causal mechanisms on appropriate time and space scales**
Models with time and space scales appropriate for water management questions may not be useful for fish and ecosystem questions that require higher resolution. A comprehensive mechanism-based modeling framework is needed that closely considers time, space and parameter scales relevant to biological processes and physical mechanisms. Timing of flow management and monitoring should reflect major mechanisms that affect fish overall health. Likewise, fish responses should be measured at the time and space scales of expected responses.
- **Monitor vital rates of fish**
To estimate ecosystem conditions or assess the consequences of management actions, monitoring should focus on factors having immediate effects on fishes and be used to calibrate and test models and specific hypotheses. Fish, water quality and water flow monitoring should be coordinated and integrated into a framework to improve synthesis.
- **Broaden species focus**
Most Delta research focuses on endangered and threatened species. Non-native species, however, dominate fish biomass and current food webs. Little is known about the impact of flows on these species, their predation rates or how they drive important food-web relationships. A multispecies framework has been adopted elsewhere and should be considered here, particularly given the threat of new invaders
- **Enhance national and international connections**
The Delta's problems are not unique and a wealth of knowledge exists from other ecosystems. State and federal scientists need access to scientific journals and occasional travel to relevant conferences. This accelerates and improves scientific discoveries, and reduces agency costs by leveraging knowledge gained from elsewhere.
- **Promote timely synthesis of research and monitoring**
Timely synthesis that directs scientific efforts and summarizes results and uncertainties for managers requires dedicated staff time and resources. Considerable effort is needed to translate and communicate the science to the range of users including stakeholders, managers and adaptive management teams.
- **Improve coordination among disciplines and institutions**
A comprehensive scientific framework is needed to improve understanding among ecologists, hydrologists, and hydrodynamic modelers across their various institutions, missions and priorities. A long-term commitment to science that addresses fundamental issues spanning agencies and disciplines can be organized through the Delta Science Plan.

Panelists

Today's briefing includes a panel of leaders of Delta agencies that are involved in gathering and use of information about water flows and fish in the Delta.

Ara Azhderian, Water Policy Administrator, San Luis and Delta-Mendota Water Authority

Ara works on a wide range of issues affecting the federal Central Valley Project, from planning and finance to operations and regulatory implementation. His focus includes administering the Authority's drought response effort with State and federal agencies, representing the Authority in a variety of regulatory processes, and administering the Authority's long-term planning and science efforts. He also participates on the Association of California Water Agencies' Federal Affairs Committee, where he serves as Chair for the Infrastructure & Agriculture Subcommittee. Previously, Ara was the Watermaster for San Luis Water District.

Dean Messer, chief of the Division of Environmental Services, California Department of Water Resources (DWR)

Dean oversees compliance and evaluation, water quality, planning and restoration programs that provide complex scientific and environmental analyses, monitoring and documentation in support of the management of California's water resources and natural environment. His primary responsibility is ensuring the overall environmental compliance of the State Water Project. Dean has experience with toxicity assessment, pathogen detection and the effects of logging practices on water quality. Previously, Dean served as chief of the DWR Office of Water Transfers.

Maria Rea, assistant regional administrator at the California Central Valley Area Office, National Marine Fisheries Service/NOAA

Maria works with a broad spectrum of stakeholders leading NOAA's conservation and management programs to protect and recover populations of endangered and threatened steelhead, salmon and green sturgeon in a jurisdiction that spans the Sacramento and San Joaquin river basins and Delta. Maria's contributions towards salmon recovery include advancing collaboration and communication about the science of species management, and building strong partnerships between state, federal and non-governmental interested parties. Prior to her role as the Assistant Regional Administrator, Maria was the Supervisor for the Sacramento Area Office for NMFS/NOAA.

Christina (Tina) Swanson, director of the Science Center Program, Natural Resources Defense Council (NRDC)

Tina works to expand the NRDC's scientific capabilities and support its legal and policy work across a range of environmental, public health and sustainable management issues. Most of Tina's work has been focused in the San Francisco Bay-Delta and she is an expert in fish biology, aquatic ecosystem protection,

restoration, ecological indicators and water resource management. Previously, Tina was the Executive Director and Chief Scientist at The Bay Institute.

Carl Wilcox, policy advisor to the director for the Delta, California Department of Fish and Wildlife (CDFW)

Carl directs the Department's involvement in Bay-Delta and state-side water policy issues, including the California EcoRestore and California WaterFix programs (formerly coupled as the Bay Delta Conservation Plan). Previously, Carl managed the Department's Bay-Delta Region, including the nine San Francisco Bay Area Counties, Santa Cruz County and the Sacramento-San Joaquin Delta. He has extensive experience in fisheries and wildlife management, lands management, wetland restoration and management, environmental compliance, and habitat conservation planning and permitting.

For today's discussion, the panelists were provided with a few questions intended to help frame the discussion of the review report's recommendations:

- How do you see your department utilizing these recommendations?
- If you had the monitoring information recommended by the Delta ISB, what would your agency do differently?
- What barriers need to be overcome?
- Are there any other recommendations that were not included in the report?
- How can the Council help?

List of Attachments

Attachment 1: [Flows and Fishes in the Sacramento-San Joaquin Delta, Research Needs in Support of Adaptive Management](#)

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