



## INFORMATION ITEM

### Lead Scientist Report

### Summary

This report provides a summary of a recent publication from Dettinger et. al. concerning recommendations for managing water in headwaters of the Sacramento-San Joaquin Delta. The authors recommend new approaches for managing precipitation that comes in the form of rain rather than snow in order to mitigate some of the projected impacts of climate change on California's water supply.

### Recent Delta Science: Keeping Water in Climate-Changed Headwaters Longer

*Dettinger, M., Wilson, A., & McGurk, G. (2023). Keeping Water in Climate-Changed Headwaters Longer. San Francisco Estuary and Watershed Science, 21(4).*  
<http://dx.doi.org/10.15447/sfews.2023v21iss4art1>

There are many projections and scenarios about the future of California's climate, each with a range of projections about how California's water supply will be impacted. In general, scenarios predict a grim future of warmer temperatures, less snowpack, earlier and flashier runoff, drier summer conditions, and potentially increased intensity of wildfires. The authors of this newly-released *San Francisco Estuary and Watershed Science* essay emphasize that there will always be uncertainty in the amount of water that will arrive in the form of precipitation and suggest focusing future planning on the changes in how precipitation arrives.

Historically, the Sacramento-San Joaquin watershed has been managed for long-term moderate flows in channels during the warmer seasons. However, considering climate change projections, this is likely to become more difficult due to elevated spikes of runoff in the winter and spring. Surface water is critical for all life in California and can reduce wildfires. Subsurface water is necessary in keeping forests healthy and can also contribute to reducing wildfires. In a future with less snowpack in the Sacramento-San Joaquin watershed, holding non-channelized waters (headwaters) for longer can potentially restore

the slow drainage processes provided by snow storage, notably an important delay in flows toward warmer months.

The authors lay out three potential management strategies for retaining the water received upstream in non-channelized headwaters longer.

1) Soils and Percolation management as a co-benefit in forest health restoration activities

Although models predict the same amount of precipitation to occur in headwater areas, this precipitation is likely to be in the form of rain as opposed to snow. Less snowpack and more rain means outflow of winter water will happen more quickly in the warmer months, which has large implications for water management and flood management strategies. A possible approach to address this altered form of precipitation is to identify mechanisms where water can percolate into the soil faster and deeper, creating subsurface flows so that the water will leave the system more slowly. The authors suggest that soil-surface treatments that enhance the percolation of water be prioritized in forest health treatments (e.g., forest thinning or restoration of natural fire regimes) and seen as a goal instead of a coincidental benefit. This kind of strategy can result in wetter soils, for longer periods, that can potentially reduce impacts of wildfire.

2) Beaver-population restoration or an increased amount of beaver-inspired headwater infrastructure

Beavers are considered “ecosystem engineers” and historically their habitat alterations led to stored water behind many small dams in upper reaches of the Sacramento-San Joaquin Watershed. Storing surface water in distributed headwaters enhances groundwater recharge, slows or reduces floods downstream, provides water supply in warmer months, and subdues wildfires. However, increasing the beaver population could pose problems with existing human-made infrastructure. Instead, the authors note that there has been a push towards using artificial beaver structures to recreate the benefits that beavers can provide to an ecosystem without some of the downsides to their behavior.

3) Forecast-informed reservoir operation strategies (FIRO)

FIRO uses weather and flood forecasts to better inform decision-making around how much water to release from the existing reservoirs in order to reduce flood risk or recharge aquifers. A majority of the FIRO feasibility studies have taken place in more downstream dams and reservoirs whereas the goal of this paper focuses on keeping upstream surfaces water out of channels for longer. Therefore, the authors suggest strategies that focus on

the upstream application of FIRO to keep water higher in the watershed for a longer period.

Finally, the authors note that the state's current California Water Supply Strategy does not discuss the words "headwaters," "mountain," "meadow," or "forest." As the agencies and institutions prepare future plans, the authors recommend they incorporate keeping water in the headwaters longer in order to combat a portion of the effects of climate change in California.

Climate change is a stressor that will influence many climate, hydrology, and ecosystem variables of the Delta and the Delta's watershed, primarily through enhanced extreme events in this century. The Delta Science Program is currently coordinating a series of synthesis papers focusing on extreme weather and climatic effects and their impacts on the environment, water supply, and human uses of the Bay-Delta for the next edition State of Bay-Delta Science. Individual chapters focus on atmospheric rivers, droughts, heatwaves, catastrophic wildfires, and governance. Further, the Delta Adapts Draft Adaptation Plan being discussed tomorrow (at the March 1, 2024, meeting) includes strategies for local storage of both surface and groundwaters supplies in the north and south Delta (WSR-2), as well as modification of reservoir operations to respond to changing climate conditions (WSR-4).

## Delta Science Program Activities

### Current peer reviews

The Collaborative Science and Peer Review (CSPR) unit at the DSP coordinates peer reviews to support Delta decision-making. Two current peer review projects are highlighted below.

#### *Fish and Aquatic Effects Analysis for Long-term Operations*

The U.S. Bureau of Reclamation (Reclamation) reinitiated Endangered Species Act (ESA) Section 7 consultation for the long-term operations (LTO) of the Central Valley Project (CVP) and State Water Project (SWP). The Fish and Aquatic Effects Analysis is a portion of the Environmental Impact Statement, a report mandated by the National Environmental Policy Act, that is being developed by Reclamation for the LTO of the CVP and SWP. The analyses inform a Biological Assessment, which the U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration (NOAA) Fisheries will then evaluate to determine whether the Proposed Action will jeopardize listed species.

The intent of this peer review is to evaluate the analytical approach and use of methods and tools taken by Reclamation to assess how the LTO of the CVP and SWP affect the aquatic environment and the exposure, response, and risk to select ESA-listed species (individuals and populations). The peer review panel consists of five members with expertise in aquatics (habitat and food web), fisheries (fish biology and physiology), hydrologic alteration, and population dynamics. They are currently reviewing the project's materials, meeting bi-weekly for discussion, and drafting a co-authored letter report to Reclamation. The review kicked off in late November and the letter report is expected to be available in April 2024.

#### *Summer-Fall Habitat Action Monitoring and Science Plans*

The California Department of Fish and Wildlife (CDFW) issued an Incidental Take Permit (ITP) to the Department of Water Resources (DWR) for the continued operation of the SWP in March 2020. The Summer-Fall Habitat Action (SFHA) is a critical component of an adaptive management plan for the SWP as it is intended to improve habitat conditions including the overlap of key physical and biological attributes (e.g., salinity, turbidity, and food availability) to support Delta Smelt growth, survival, and recruitment. DWR and Reclamation, through collaboration with the Delta Coordination Group (DCG), have developed Monitoring and Science Plans for the SFHA that are updated annually, with several additional action-specific monitoring and research plans (e.g., Suisun Marsh Salinity Control Gates reoperation). In addition, a structured decision-making (SDM) approach was adopted to determine the suite of Summer-Fall actions to recommend in a given hydrologic year based on a transparent and standardized tradeoff assessment of key objectives and performance metrics.

The purpose of this peer review panel and the individual letter reviews that panel members will produce is to assist the DCG and ITP Adaptive Management Team in making improvements for the evaluation and adaptive management of the SFHA. Reviewers will provide feedback on how to continue or modify the SDM approach, monitoring, and adaptive management of the SFHA, including prioritized recommendations for cases where resources are limited. The Panel consists of four members, including two members with food web ecology and fisheries expertise and two members with structured decision-making expertise. The review began this January, and the final letters are expected to be available in May 2024.

## Review of the Long-Term Operations of the Central Valley Project and the State Water Project

The National Academies of Sciences, Engineering, and Medicine (National Academies) recently held the first public meeting of its new committee on Jan 30 - Feb 1. The purpose of the effort is to conduct a biennial review of the monitoring, modeling, and other relevant scientific activities that support the long-term operations of the Central Valley Project (CVP) and the State Water Project (SWP). Each year, the CVP and SWP move millions of acre-feet of water from Northern California to a wide variety of water users throughout the state, including municipalities, agriculture, industries, and wildlife refuges. Operation of the CVP and SWP is challenging and complex; affecting species protected under the Endangered Species Act while enduring the ever-increasing extremes of California's climate. The focus of the review this cycle is on Old and Middle River (OMR) flow management, Shasta cold water pool management, summer-fall Delta Smelt habitat, and recommendations on how to improve modeling and monitoring strategies and decision-support tools.

A number of scientists and agency representatives provided presentations on relevant topics including water operations, the regulatory landscape, ecology, salmon and smelt to the distinguished 18-person committee at the recent National Academies public meeting. During the afternoon panel discussion, the Council's Executive Officer, Jessica Pearson, spoke about the Council's important role in the Delta and in directing California environmental resource management. Others on the panel included Cathy Marcinkevage (NOAA), Donnie Ratcliff (Fish and Wildlife Service), Eric Reichard (United States Geological Survey), Louise Conrad and Lenny Grimaldo (CA DWR), Eric Oppenheimer (State Water Resource Control Board), Brooke Jacobs (CA DFW), and Michelle Williams (Western Area Power Administration). Many other interested parties presented their perspectives during an open mic session. Additional information will be presented and discussed during the National Academies next meeting scheduled for Feb 28 – Mar 1, 2024. The committee is expected to complete its report in 2025.

The Delta Science Program facilitates independent scientific peer reviews of science pertinent to long term operations of the CVP and SWP including a biennial review of the science underlying long term operations of the CVP and SWP from 2010-2017.

As the committee considers the monitoring, modeling, and other scientific activities that support the long-term operations, the committee will benefit from the results of recent and ongoing DSP reviews, including:

1. United States Bureau of Reclamation's (Reclamation) water temperature modeling platform: a recently completed review to evaluate Reclamation's new real-time decision support tool to manage precious cold water pool resources
2. Reclamation's fish and aquatic effects analysis in its new Biological Assessment: an ongoing review to evaluate the analytical approach used to assess how the LTO of the CVP and SWP affect the aquatic environment and the exposure, response, and risk to select ESA-listed species (individuals and populations), and whether quantitative and qualitative methods and risk assessment tools are used appropriately
3. DWR's summer-fall habitat action monitoring & science plans: a recently initiated review of monitoring and science plans to evaluate the "Delta Smelt Summer-Fall Habitat Action" (SFHA); a critical component of an adaptive management plan for the SWP intended to improve habitat conditions for the endangered Delta Smelt.

## On Your Radar

### March 12-13, 2024 State of the Estuary Conference

The next biennial State of the Estuary Conference will be held March 12-13, 2024, in Oakland, CA at the Henry J. Kaiser Center for the Arts. The San Francisco Estuary Partnership (SFEP) organizes this event every two years to highlight the current management and ecological health of the San Francisco Bay-Delta Estuary. Several Council staff are participating in the conference as planning team members, session organizers and facilitators, and oral and poster presenters. A full agenda is available here:

<https://www.sfestuary.org/state-of-the-estuary-conference/>.

### March 26-27, 2024: Salinity Management Workshop

Registration is now open for the Salinity Management Workshop on March 26 and March 27. This two-day virtual workshop is being hosted by the Delta Science Program to discuss tools and strategies, identify knowledge gaps, and build shared goals for adaptively managing ocean saltwater intrusion in the Sacramento-San Joaquin Delta. Day One of the workshop will focus on tradeoffs involved with salinity management and who is impacted,

while Day Two will focus on discussing modeling results that compare scenarios with different management actions and amounts of sea level rise. The agenda is now available here: <https://deltacouncil.ca.gov/pdf/science-program/agenda/2024-03-26-27-salinity-management-workshop-agenda.pdf>.

### 2024 Interagency Ecological Program (IEP) Annual Workshop

The Interagency Ecological Program (IEP) will hold its Annual Workshop on April 23-25, 2024, in the auditorium of the California Natural Resources Agency building. The event will be free and have both in-person and virtual attendance options. An additional data skills training course is being offered on April 18. More information on the agenda and registration will be released soon.

### By the Numbers

Science Program staff will summarize current numbers related to Delta water and environmental management. The summary (Attachment 1) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

### List of Attachments

*Attachment 1: By the Numbers*

*Attachment 2: Visual Summary of Article*

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