INFORMATION ITEM

Lead Scientist Report

Summary

California's freshwater ecosystems are increasingly impacted by higher temperatures, altered precipitation, and extreme events, all of which threaten biodiversity and ecological stability. Powers et al. 2024 emphasizes the importance of understanding complex ecological interactions, highlighting that climate change impacts on California's freshwater ecosystems require tailored, flexible strategies. Their suggested approach focuses on improving predictive models, expanding ongoing monitoring, enhancing education in ecosystem stewardship, and forming collaborative policies to build climate resilient freshwater systems in California.

Anticipating responses to climate change and planning for resilience in California's freshwater ecosystems

Power, ME, S Chandra, P Gleick, WE Dietrich. 2024. Anticipating responses to climate change and planning for resilience in California's freshwater ecosystems. Proceedings of the National Academy of Science 121(32): e2310075121. https://doi.org/10.1073/pnas.2310075121.

As climate change accelerates, California's freshwater rivers, lakes, and wetlands are under mounting pressure from rising temperatures, shifting water cycles, and altered seasonal flows. In *Anticipating Responses to Climate Change and Planning for Resilience in California's Freshwater Ecosystems,* Powers et al. 2024 outlines the complexities of predicting ecosystem responses to climate change and recommends key actions to build ecosystem resilience.

California's freshwater systems face unprecedented challenges as climate change reduces snowpack and shifts precipitation patterns, especially in the Sierra Nevada.

These changes include earlier snowmelt, increased winter runoff, and decreased spring and summer flows, leading to elevated flood risks and additional strain on water management systems. These seasonal changes disrupt ecosystem processes, impacting river temperatures and the migratory cues critical for species like salmon. Extreme events, including droughts, mega-floods, and intensifying wildfires, add further stress by damaging water quality and ecosystem health. California's native freshwater species, which have adapted over millennia to the state's Mediterranean climate, now face both rapid environmental shifts and long-standing stressors such as land conversion, water diversion, pollution, and invasive species. These combined pressures not only threaten local biodiversity but also have significant cultural and economic repercussions for nearby communities. Accurately predicting these changes, and planning effective responses, is increasingly essential for long-term conservation efforts.

One of the main challenges in predicting ecosystem responses to climate change is understanding the complex interactions between climate, water systems, and human influences that shape California's freshwater environments. Adaptive management strategies, like those used in the Yolo Bypass floodplain, demonstrate how maintaining floodplain connectivity supports both biodiversity and agricultural needs. This approach offers a model for managing the Delta's ecosystems for increasing resilience and can guide broader conservation efforts as climate conditions shift in California.

Powers et al. describes the need to improve the accuracy of predictive models to better anticipate how ecosystems will respond to environmental stressors. In Lake Tahoe, research has shown that nutrient influx, rather than invasive species like the Mysis shrimp, drives algal growth, affecting water clarity. This challenges management practices that were focused solely on controlling invasive species. This example underscores the importance of field experiments and continuous data collection to reveal cause-and-effect relationships within ecosystems and improve conservation strategies.

Currently, California's agencies are beginning to adopt ecosystem-based management approaches that consider species interactions within broader ecological contexts. This multi-layered strategy includes models that connect changes in hydrology and climate to ecological processes, with a particular focus on

the “critical zone”—from soil to bedrock—which plays a vital role in water storage and release.

To help address future climate change impacts comprehensively, Powers et al. describes a four-part strategy that includes expanding predictive modeling capabilities, enhancing field studies, fostering ecosystem stewardship through education, and developing policies to support ecosystem resilience. They propose creating a dedicated center to unite agencies, tribes, scientists, and community members to advance ecosystem modeling and coordinate long-term monitoring, ultimately building the capacity needed to support resilient freshwater ecosystems across California. Combining traditional ecological knowledge with modern tools like remote sensing and environmental modeling could improve the efficacy of climate resilience strategies and promote a more integrated, long-term approach to ecosystem management.

Delta Science Program Activities

California Sea Grant State Policy Fellowship Program

In September 2024, staff from the Delta Science Program (DSP) and Planning and Performance Division participated in the annual matching workshop for the California Sea Grant State Policy Fellowship Program. State Policy Fellows are recent post-graduates interested in exploring a career path in the public sector at the science-policy interface. Fellows are matched with municipal, state or federal agencies for 12-month fellowship periods to gain ‘hands-on’ experience in marine, coastal, and/or watershed resources and decisions affecting those resources in California. The contract to support the 2024 and 2025 classes of fellows was approved by the Council at the September 2023 meeting.

The Council has hosted a total of 44 fellows through this program for the past twelve years. Previous work performed by fellows includes working with the Delta Lead Scientist on monthly Lead Scientist Reports to the Council; supporting the Delta Independent Science Board; participating in the Delta Science Plan and Science Action Agenda updates; and assisting in Delta Plan amendments and updates. The Council’s 2024 cohort of fellows included:

• Margot Mattson, Adaptive Management unit (DSP) and Independent Science Board support (ISB)

• Megan Nguyen, Research Funding unit (DSP) *now a member of the Council's staff

• Alex Stella, Collaborative Science and Peer Review unit (DSP)

• Jessica Weidenfeld, Science Communication, Synthesis, and Decision-Support unit (DSP)

• Dane Whicker, Planning and Performance Division

The 2025 class of fellows will join the Council early next year (between January and March). Fellowship placements for this next class include:

• Jonathan Huang, Adaptive Management unit (DSP) and Independent Science Board support (ISB)

• Hollis Jones, Collaborative Science and Peer Review unit (DSP)

• Irisanly Suarez Romero, Climate Change and Environmental Justice Unit (Planning and Performance Division)

• Nicholas Rowlands, Science Communication, Synthesis, and Decision-Support unit (DSP)

• Vivian Sieu, Research Funding unit (DSP)

California Sea Grant Social Science Extension Specialist position

The Council is excited to announce that California Sea Grant, through a contract with the Council, recently announced an exciting opportunity for a Social Scientist to assist with research and outreach on the human dimensions of California water and environmental management and policy issues related to the Sacramento-San Joaquin Delta. The Academic Coordinator II (Social Scientist Extension Specialist) will conduct or facilitate research, education, and outreach projects that address the human dimensions of Delta water management, ecosystem management, and Delta as Place issues, such as those identified in the Delta Science Plan, Science Action Agenda, Delta Adapts, Tribal and Environmental Justice Issue Paper, and the

Delta Plan. The position description is provided in the Council meeting packet and available online (https://caseagrant.ucsd.edu/about/jobs-opportunities/academic-coordinator-california-sea-grant-social-scientist-extension). The linked page includes the position description and access to the application portal through University of California San Diego's Academic Personnel RECRUIT System."

On Your Radar

Delta Science Tracker office hours

The Delta Science Tracker project team is continuing to host open office hours to answer questions and provide assistance with navigating and contributing projects to the tool. Anyone working on science activities in the Delta is encouraged to attend. (https://sciencetracker.deltacouncil.ca.gov).

Upcoming dates for these office hours include:

- November 21 - 10:00 am to 11:00 am
- December 5 - 11:00 am to 12:00 pm
- December 19 - 11:00 am to 12:00 pm

Please visit the Delta Science Tracker "Getting started" page (https://sciencetracker.deltacouncil.ca.gov/get-started-delta-science-tracker) for the most up-to-date information about office hour schedules and meeting links.

Microplastics Symposium – May 9, 2025

The Delta Science Program and UC Davis Coastal and Marine Sciences Institute (CMSI) will co-host a symposium on May 9, 2025, to explore ecotoxicity of microplastics and related contaminants. The hybrid event will be held at the International Center on the UC Davis Campus and Zoom. More information, including registration and a detailed agenda, will be available in early 2025.

By the Numbers

Dr. Lisamarie Windham-Myers will summarize current numbers related to Delta water and environmental management. The summary (Attachment 2) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

List of Attachments

Attachment 1: Visual Summary of Article

Attachment 2: By the Numbers

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