



INFORMATION ITEM

Lead Scientist's Report

Summary: This month, we feature two papers authored by Sam Bashevkin of the Delta Science Program and colleagues that focus on leveraging long-term monitoring data to better understand drivers of and trends in Delta water temperature, a key determinant of the survival of imperiled species such as Chinook Salmon and Delta Smelt. The work addresses Management Need 5 of our 2022-2026 Science Action Agenda: Acquire new knowledge and synthesize existing knowledge of interacting stressors to support species recovery and ecosystem health. Both studies spotlighted here are synthesis studies that draw new conclusions from long-term boat-based monitoring data largely collected by the Interagency Ecological Program.

WARMING IN THE UPPER SAN FRANCISCO ESTUARY: PATTERNS OF WATER TEMPERATURE CHANGE FROM FIVE DECADES OF DATA. BASHEVKIN, MAHARDJA, & BROWN, LIMNOLOGY AND OCEANOGRAPHY, 2022.

Given the past and projected continuation of global air temperature increases, it is important to understand the pace and effects of water temperature increases in aquatic systems. In places like the San Francisco Estuary (Estuary), where managed fish species (e.g., Chinook Salmon and Delta Smelt) are already near temperature thresholds for their survival and growth and increasing incidences of harmful algal blooms may be linked to temperature increases, this issue is critical. Examining historical spatial and seasonal variability in temperature changes over time is one way to prepare for projected temperature increases. Ascertaining historical patterns could allow us to better project when and where future increases would occur in the Estuary and more effectively plan for climate impacts when selecting areas of highest priority for management or restoration.

In this study, Bashevkin, Mahardja, and Brown analyzed long-term water temperature trends in an integrated dataset that spanned over 50 years. The team found that over this period of time, water temperatures have increased on average 0.017°C per year (or 0.85°C over the 50 years). While the rate of temperature change has varied over time, there persists an underlying warming trend. Increases were the most widespread throughout the Estuary during the late fall to winter (November to February) and mid-spring (April to June), which overlaps with juvenile

Chinook Salmon development and the spring spawning season of Delta Smelt, respectively. Warming was the most rapid in northern regions that are important for fish migration and areas of tidal wetland habitat. However, warming was more geographically limited in March, July, and August, and no warming trends were identified in October.

A copy of the study can be found [here](https://bit.ly/3x88MSg) (bit.ly/3x88MSg).

SEASONALLY VARIABLE RELATIONSHIPS BETWEEN SURFACE WATER AND INFLOW IN THE UPPER SAN FRANCISCO ESTUARY. BASHEVKIN & MAHARDJA, LIMNOLOGY AND OCEANOGRAPHY, 2022.

Water temperature management of the Delta and its tributaries is growing in importance as the climate warms. For example, the Biological Opinion regulating the management of winter-run Chinook Salmon requires the maintenance of a cold water pool in the Shasta Reservoir to support cold-water releases in May through September of years in which water temperatures would otherwise be above mortality thresholds for incubating eggs. However, despite the extensive amounts of research into the inflow and water temperature of the Estuary, most prior studies have investigated these factors individually rather than in relation to one another.

Filling this knowledge gap, Bashevkin and Mahardja evaluated relationships between inflow and water temperature in two long-term datasets, analyzing how the relationships vary by season, locale, and along the salinity gradient. Results indicated that the relationship between water temperature and inflow is predominantly negative, meaning lower temperatures were associated with higher inflows. Water temperatures decreased by up to 2°C from periods of low to periods of high inflow. Conversely, in winter and in downstream regions from July to September, a positive relationship was found, wherein higher temperatures were associated with higher inflows, with temperature changes up to 1.2°C. While this study provided strong foundational information about how temperature and inflows varied in relation to each other, it did not determine whether inflows caused the observed temperature changes. Thus, future studies into the underlying mechanisms of these relationships are needed to understand the effects of actions like dam releases on water temperature.

A copy of the study can be found [here](https://bit.ly/3MeaZ3Z) (bit.ly/3MeaZ3Z).

DELTA SCIENCE PROGRAM ACTIVITIES

Salinity Management Workshop Report Out

On April 26-27, 2022, the Delta Science Program convened the first in a series of workshops focused on salinity management in the Delta. The overarching goal of this workshop was to kick off a collaborative adaptive management process for evaluating long-term tradeoffs associated with alternative strategies for salinity management during droughts. Specific goals were to: (1) build toward a shared understanding of how salinity management affects different people, industries, and ecological systems; (2) identify knowledge gaps that could be filled with future research and scenario-based modeling; (3) start conversations around goals for long-term adaptive management; and (4) lay the foundation for a collaborative scenario-based modeling exercise. The workshop had over 200 registrants, about half of whom were affiliated with California State agencies. Other registrants primarily represented federal, local, and nonprofit organizations, universities, and consultancies. Workshop discussions focused on exchanging diverse perspectives associated with salinity management in the Delta, the challenge of developing meaningful metrics of impacts, the importance of community engagement and collaboration, and the barriers to innovation and experimentation. Despite a diversity of interests, a unifying prioritization on social justice and equity emerged. Specifically, a key takeaway was the perceived inevitability of tradeoffs and the recognition of the importance of the intentional effort to mitigate disproportionate cost burdens on vulnerable and historically marginalized communities throughout the Delta. Other discussions focused on a proposal for a demonstration exercise that will use quantitative computer models to evaluate alternative scenarios for future salinity management in the face of drought and sea-level rise. The demonstration will help identify needs and gaps and set the stage for a long-term, collaborative scenario planning and modeling process. Participants expressed a desire to relax model assumptions about how operations of the water projects are conducted, and to use complementary quantitative and qualitative approaches to assess socio-economic and ecological impacts.

Workshop feedback will inform a series of meetings to be held later this year, during which the project team will seek more detailed input from stakeholders and other interested or affected parties. Pilot scenarios will subsequently be modeled,

and outputs are expected to be presented for discussion in the winter/spring of 2023,

Delta Science Fellows: Review Panel

The Delta Science Fellowship awards funds to masters and Ph.D. students and postdoctoral scholars for up to two years to advance research that addresses the 2022-2026 Science Action Agenda. Review panels convened in early June to evaluate the set of proposals received. Two biophysical science panels reviewed 18 applications, while one social science panel reviewed three applications. Award decisions will be reported to the Council in July.

California Water Data Symposium

The seventh annual California Water Boards Water Data Science Symposium, hosted by the Surface Water Ambient Monitoring Program (SWAMP) (bit.ly/3GQBBa7) and the California Water Quality Monitoring Council (bit.ly/3xf75DD), will be held virtually from June 28-30, 2022. The symposium's goal is to improve the collection and use of water quality monitoring data for management decisions. The event also includes a Water Data Challenge, a data "hackathon" aimed at collaborative problem solving using water data to answer important questions. This year's challenge questions are: 1) Racial equity demands we center on the most vulnerable communities: How might we do this? 2) Policies and regulations have real impacts on real people: Do we fully understand the impacts of water, natural resource, and health-related policy and regulations? 3) Government data belongs to all: Are we succeeding in making data accessible to everyone?, and 4) Open and transparent water data are foundational to operationalizing systemic justice and equity: Can we improve the quality and usability of our data and metadata? Sam Bashevkin will be presenting a talk on San Francisco Estuary monitoring data: "A rich legacy of interagency collaboration: Five decades of ecological monitoring in the San Francisco Estuary," and Laurel Larsen will be presenting a talk on Delta Science Program synthesis activities.

More information can be found at [California Water Data Science Symposium | California State Water Resources Control Board](#) (bit.ly/3Oa81PB).

BY THE NUMBERS

Delta Science Program staff will provide a summary of 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 Summary (provided at the Council Meeting)
- Attachment 2: Article visual of relationships between water temperature and estuarine flow (Bashevkin et al. 2022)

CONTACT

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