Research Brief

MARCH 2024

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Bay Area Water Supply Resilience and the Bay-Delta Plan

Finding sustainable solutions to meet the needs of water-stressed communities without compromising ecosystem health is an ongoing challenge, but a new approach examining drought, policy, and climate change impacts to water supply performance offers options.

Background

The Bay-Delta is one of California's most important water systems, and an update to the current (circa 1996) water management plan is urgently needed, but the process has been slow and contentious. In 2018, sharply declining fish populations prompted the State Water Board to adopt amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary — known as the "Bay-Delta Plan" — requiring 40% of unimpaired flow to be left in-stream for ecosystem use between February 1 and June 30 each year. The Bay-Delta Plan's unimpaired or natural flow requirement applies to the Tuolumne River as well as two other major tributaries of the San Joaquin River. Currently, the Tuolumne River retains 21% of unimpaired flow during February through June of an average year, but only 11% during some of the driest years. This means that significant cutbacks on withdrawals will be required to achieve the increased in-stream flow requirements of the amended Bay-Delta Plan.

Managing the Tuolumne River to balance coequal goals of water supply and ecosystem health is further complicated because it is the primary source for the San Francisco Public Utilities Commission's (SFPUC) Hetch-Hetchy Regional Water System (RWS) which supplies water to 2.7 million urban customers. Under the amended Bay-Delta Plan, SFPUC anticipates that it will be responsible for over half of the required cutbacks. This has prompted the SFPUC and Central Valley irrigation districts to propose an alternative Tuolumne River Voluntary Agreement which emphasizes nonflow interventions including habitat improvements and predation management. In addition, climate change effects including variable

POINTS FOR POLICYMAKERS

- **During drought and dry years, the unimpaired flow requirement policy would result in faster depletion and slower recovery of Regional Water System (RWS) storage, when water shortages are most keenly felt.** The impact of the amended Bay-Delta Plan policy might involve earlier conservation responses and increased time spent at lower storage levels, where meeting present demands must be balanced more aggressively against reserving stored water for future use. When considering extreme prospective hydrologic scenarios, this impact could result in a situation in which the system runs out of water and cannot meet all demands.

- **Drought resiliency planning is not a one-size-fits-all approach.** Planning that considers drought in the context of a continuous hydrologic record – currently missing from the Reliability Assessment approach — is critical to success. To maintain a sustainable water supply amidst climate and policy stressors, planning should recognize and address the distinct risk profile that characterizes the RWS, its vulnerabilities, and opportunities to respond effectively.

- **Storage is a valuable indicator of water supply performance**. Storage emphasizes the reserves available to meet water supply needs as opposed to the current intensity of conservation measures, which is more directly manipulated by system managers. Delivery reduction as a metric indicates how aggressively conservation is being implemented but provides less direct information about the system's health or drought severity.

- **Continued innovation is required to meet climate and planning challenges of the future.** A key future study would integrate coping strategies into the analysis to better understand the opportunities available to mitigate the water supply impact of the amended Bay-Delta Plan policy. Development of risk-based performance standards for sustainable water supply and quantitative streamflow targets for ecosystem health is required. Ongoing evaluation of the climate change impact to future hydrology and ways to better predict future water system demands are also needed.

precipitation will result in more extreme wet and dry years, affecting snowpack and consequently, water storage required to meet peak summer demand of residential and agricultural customers.

Planning and Assessment

Quantitatively assessing the water supply impact of the Bay-Delta Plan ecological flow requirement is a fundamental step toward balancing this impact commensurate with ecological outcomes. Water suppliers currently utilize an Urban Water Management Plan featuring a reliability assessment that considers a future planning window of 20 years and compares water supply and demand under three planning scenarios: a single normal year, a single dry year, and a 5-year drought period. Using this reliability assessment methodology with an extended "design drought" of 8.5 years, SFPUC estimates that meeting Bay-Delta Plan ecological flow requirements in a multiyear drought would result in an up to 49% reduction in annual water supply deliveries. Other analysis, however, contends that such severe reduction is a consequence of management decisions which hold back too much water in storage. This debate highlights important limitations in the planning and communication of urban water reliability — in this instance and in California more broadly.

Stanford researchers sought to overcome these planning limitations through a risk-based analysis focused on what the new Tuolumne River ecological flow requirement means for Bay Area water supply reliability. Their study prioritizes such aspects as uncertainty, transparency, and changes in water supply over time. This new approach provides a valuable contribution to the planning conversation by evaluating multiple aspects of water supply and communicating corresponding risk profiles as an alternative to representing performance with a simplified score that can harbor disagreement over how the score was calculated.

The researchers found that the water supply impact of the amended Bay-Delta Plan looks different under different conditions, but that on average, the new ecological demand is slightly larger than the total urban water supply the RWS currently delivers. Had the policy been in place during the recent 2012-2016 drought, offsetting its impact would have required a further 35% reduction in water supply deliveries maintained across four years, on top of the conservation efforts that actually happened. Still, plentiful Tuolumne River streamflow is available in other years, which points to the importance of management actions in non-drought years in helping to weather drought years successfully. Because future climate is uncertain, prospective water supply performance also carries uncertainty. Yet even with this uncertainty, the water supply impact of this policy is something that must be planned for and managed as part of a reliable future water supply.

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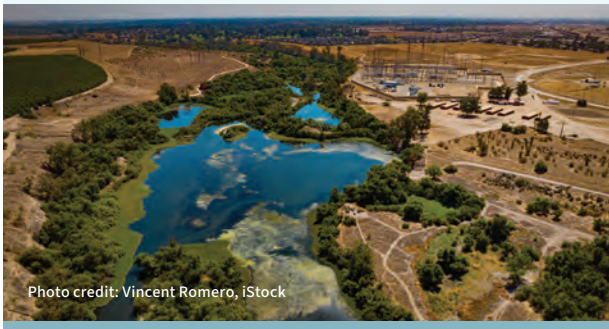

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This brief is based on **Water Supply Planning in the Face of Drought and Ecosystem Flows: Examining the Impact of the Bay-Delta Plan on Bay Area Water Supply** published in *Environmental Science & Technology.*

FOR MORE INFORMATION

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