Droughts in the Delta: How water scarcity catalyzes new water management approaches

2025 State of Bay-Delta Science

Delta Science Program

DELTA STEWARDSHIP COUNCIL

What is drought?

Droughts occur when there isn't enough water for people or the environment. In California, they usually develop after several consecutive years of low rainfall or limited snowpack. Water stored in reservoirs can help buffer effects of a single dry year, but may not be able to make up for many dry years in a row. This means droughts generally begin gradually and their effects get worse over time.

How severe a drought will become depends on two things: 1) water supply – how much water is available, such as from rain, snow or reservoirs, and 2) water demand – how much water is used by people or the environment.

Why is drought management important in the Delta?

As the hub of California's water supply, droughts in the Sacramento-San Joaquin Delta (Delta) impact the water supply for more than 27 million people and a $32 billion agricultural industry. Droughts also have significant impacts on the Delta's ecosystems and the native plants, fish, and other wildlife they support.

Over the last decade, the Delta has faced new management challenges during some of the driest years and lowest snowpacks on record. These conditions have challenged our water supply and pushed some species closer to extinction.

Trends

Droughts are expected to increase in frequency and severity in the coming decades.

Challenges

Droughts create additional challenges to existing conflicts over water needed for people and for the environment.

? Uncertainties

Despite a long history of drought management, there is still great uncertainty over how to best manage for increasing water scarcity over the next century.

September 2025

What are we learning?

Droughts are predicted to become more frequent and more severe as climate change drives temperatures higher, produces fewer large storms, and reduces snowpack. Meanwhile, sea level rise and salinity intrusion will worsen effects of drought by increasing demands for freshwater flows. Managing more frequent and severe droughts requires considering how droughts in the Delta's watershed – and in areas that rely on Delta exports – will affect both water supplies and water demands.

The long history of drought in the Delta has catalyzed numerous management actions, policies, and research studies targeting effects of drought on ecosystems and communities across the state. Droughts impact water quality, reduce water supplies for Delta residents and communities that rely on exported water, and can limit Native American cultural practices. In ecosystems, drought conditions are generally harmful to declining native fish populations, linked to occurrences of harmful algal blooms, and may contribute to the spread of invasive plant and animal species.

As we look to the future, improved planning based on modeling frameworks and tools is necessary to anticipate and respond to the challenges ahead.

Three key takeaways

Decades of experience with droughts has shed light on their effects and led to new management approaches.

It may not be possible to provide for all human and environmental water needs as droughts become more severe in the future.

Building resilience requires new response strategies, forecasting tools, and awareness of impacts on vulnerable communities and ecosystems.

About the State of Bay-Delta Science

The State of Bay-Delta Science is a synthesis and communication project coordinated by the Delta Science Program to summarize the scientific understanding, or "state of the science," of important topics in the Bay-Delta system. For more information, visit the SBDS website at https://sbds.deltacouncil.ca.gov.

This summary is based on the 2025 State of Bay-Delta Science article by Hartman et al. (2025).

Hartman R, Knowles N, Fencl A, & Ekstrom J. 2025. Drought in the Delta: Socio-Ecological Impacts, Responses, and Tools. San Francisco Estuary and Watershed Science 23(1).

http://dx.doi.org/10.15447/sfews.2025v23iss1art3