

Shaping water storage expansion in California

By Jay Lund and Maurice Hall Special to The Bee

California's historic drought and approval of a \$7.5 billion water bond have brought vigorous discussion on expanding water storage. A [recent joint study by UC Davis and The Nature Conservancy](#) shows that expanding water storage, while useful, is no panacea by itself; it must be combined with other system improvements and actions in an integrated portfolio approach to California's water system.

The study provides some insights on how expanding water storage capacity, both above and below ground, can work in concert with one another and with the water system as a whole.

Surface reservoirs capture stream flow when it is more abundant and store it for drier times and banking it for short droughts. Where surface water is limited, groundwater is a substantial source of supply and seasonal storage. In addition, groundwater in California stores many times more water than surface reservoirs, and so is vital for weathering multi-year droughts.

In California's vast interconnected water system, storage projects should not be evaluated in isolation. Instead, specific storage projects should be integrated into larger portfolios of actions that include various water sources; types and locations of water storage; water delivery options; and managing all forms of water demands. These portfolios should be evaluated systemwide.

Related

Jay Lund | Trina Wood

> <

Such an integrated, multi-benefit analysis would be more valuable than most common project analyses and policy discussions that examine water storage proposals as isolated projects.

Our study and [earlier](#) work show that the ability to use additional water storage in California is limited and varies greatly with location, availability of water delivery capacity, and how the project is operated to integrate water sources, storage, conveyance and water demands.

The net benefits of adding water storage are limited in several ways:

- New storage capacity is helpful only if water is available to put in storage. California is a dry state and most years lack sufficient precipitation to fill the large amounts of existing reservoir capacity.
- The most productive and least expensive sites for new reservoirs are already developed.
- Water quality and ecosystem problems greatly limit water delivery to and from storage locations across the Sacramento-San Joaquin Delta.



- New storage is often quite expensive.

At most, California could potentially use 6 million acre-feet in combined additional surface and groundwater storage – about a third more capacity than Shasta Reservoir, which would increase state water supplies by less than 5 percent. There is insufficient water in California to fill larger capacities reliably. This limitation would tighten with a drier climate and could loosen somewhat with wetter and more variable stream flows from the loss of snowpack with a warmer climate.

Under no circumstances can new water storage capacity alone solve most of California's water problems.

While new storage can increase reliable supplies for farms and cities and provide flows at the right time and place for fish and wildlife, the total benefits do not necessarily exceed the substantial costs.

Water supply and environmental benefits are greatest when surface and groundwater storage operations are coordinated with other parts of water system supplies. Reducing net water use, increasing water reuse in coastal areas, improving system integration and flexibility including more reliable water markets, eliminating infrastructure bottlenecks and reducing ecosystem conflicts by improving ecosystem health are all important components of an integrated portfolio.

Water infrastructure programs that are purposefully designed and implemented to work together with other parts of the water system and with other water management actions can significantly outperform individual projects in providing water supply, healthy ecosystems and flood protection under a variety of climate conditions.

Water storage studies have been ongoing in California for more than a century. Today, we must plan new water policies and infrastructure in a crowded and changing landscape with large and diverse water demands, legacy infrastructure and an accumulation of stakeholders, institutions and regulations.

The benefits of integrated management are clear. The recently passed Proposition 1 and state groundwater regulations should be instrumental in supporting coordinated and systematic regional and statewide examinations of water supplies, infrastructure and policy.

A transformation is needed in how agencies and stakeholders conduct water studies if California is to squeeze the most benefits from our limited water and water infrastructure investments. State and local taxpayers and ratepayers deserve broader, more independent, integrated and timely analysis of water projects which includes public and environmental benefits as well as water supply and flood control.

Jay Lund, a professor of civil and environmental engineering, is director of the [Center for Watershed Sciences](#) at UC Davis. Maurice Hall is an independent water resources consultant, who worked on the study while at [The Nature Conservancy](#).