Dams in California

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Alvar Escriva-Bou, Jeffrey Mount, Jelena Jezdimirovic

Dams play a crucial role in California's water management.

The state's dry summers and frequent droughts require abundant storage to meet water demands. On average, more than 60% of the water used by cities and farms comes from rivers, and dams play a key role in regulating this supply. California's nearly 1,500 reservoirs are part of the state's water grid, which includes groundwater basins and thousands of miles of conveyance facilities to move stored water to where it is needed. Most dams and their reservoirs are owned and operated by local agencies and private companies. But state and federal agencies manage 240 large reservoirs that account for 60% of the state's storage capacity.

Dams are operated to meet multiple objectives ...

The state's dams provide multiple benefits in addition to storing water for cities and farms. Dams generate 15% of California's electricity supply on average. Some are operated to capture runoff from winter storms. This is essential for reducing flood risk on the state's large floodplains, particularly for cities in the Central Valley and Southern California. Dams support a large reservoir-based recreation industry. And in California's highly managed water system, flow releases from dams are essential to meet the habitat needs of fish and wildlife.

... but these objectives are often in conflict.

Many large multi-purpose dams are operated with conflicting goals. For example, to manage floods, operators must release enough water to create space in reservoirs for winter floodwaters, which increases the chance that reservoirs will not be full in spring. Over the summer, when recreation demands are highest, reservoirs are drawn down rapidly to meet water and hydropower demands. Finally, many dams are required to conserve and slowly release cold water—which collects at the bottom of reservoirs—to support downstream salmon and steelhead runs. Managing these tradeoffs is becoming increasingly challenging as California's climate warms and precipitation becomes more variable.

Many dams need infrastructure and operational upgrades.

Two-thirds of California's dams are at least 50 years old. Most dams were designed—and are currently operated—based on outdated assumptions about hydrology and earthquakes. More than 90 need major upgrades to better handle large floods or withstand earthquakes. Promising efforts are underway in some watersheds—including the Russian, American, Santa Ana, and Yuba Rivers—to update operations using advanced weather forecasting technology. Operations also need updating to account for changing patterns of precipitation and snowmelt, and to maximize storage in underground aquifers.

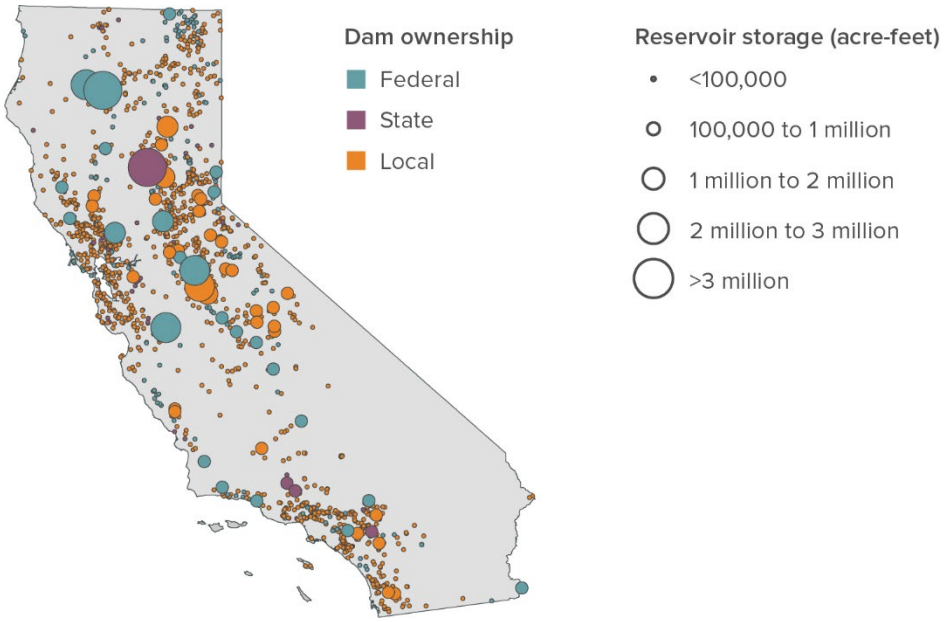
New dams can improve flexibility, but costs are high.

Increased surface storage could improve supply reliability in some regions. In 2018, the California Water Commission approved nearly $2 billion to support construction of two new reservoirs—Sites and Temperance Flat—and expansion of two others—Pacheco and Los Vaqueros. But this is only a small share of total funding needed. The US Bureau of Reclamation is also considering raising Shasta Dam. Although these investments would boost California's reservoir storage by about 9%, annual deliveries would increase by about 1% of annual statewide water used by people and the environment. Improving operations of existing dams and the water grid to maximize groundwater storage is key for managing the hotter droughts and larger floods that climate change is expected to bring.

Some dams are ripe for removal.

Reasons to remove a dam include high environmental costs, earthquake safety hazards, and reduced benefits—for instance, when reservoirs fill with sediment, they lose storage capacity. Over the past 30 years, more than 100 small dams have been removed in California. The 2015 breaching of San Clemente Dam on the Carmel River was the largest dam removal in state history. Several other large dams are targeted for removal, including Matilija Dam, four dams on the Klamath River, and Scott Dam on the Eel River.

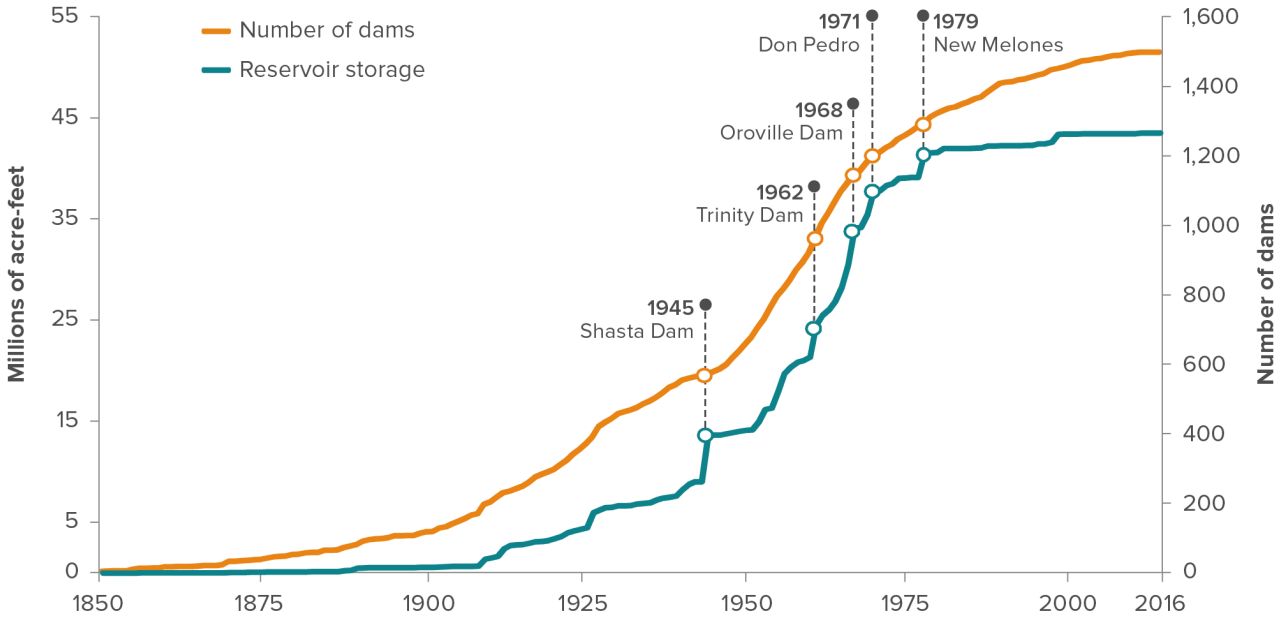
Dams vary in size and ownership



Source: US Army Corps of Engineers National Inventory of Dams.

Note: Local dams include those operated by local agencies and private companies such as power utilities.

Most of California's dams are more than 50 years old



Source: US Army Corps of Engineers National Inventory of Dams, California Department of Water Resources California Data Exchange Reservoir Information

Notes: Figure does not include 86 dams for which the year of construction is unknown. The five largest dams in the state are listed by name. The number of dams includes main reservoir dams and also spillways, dikes, and other auxiliary dams.

Sources: US Army Corps of Engineers (National Inventory of Dams); California Department of Water Resources (Listing of Dams, California Water Plan Update 2013, California Data Exchange Reservoir Information); California Energy Commission (Energy Almanac), American Rivers (Dam Removal).

Contact: escriva@ppic.org, mount@ppic.org, jezdimirovic@ppic.org

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