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Groundwater in California

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Groundwater is a vital, but threatened, component of California's water supply.

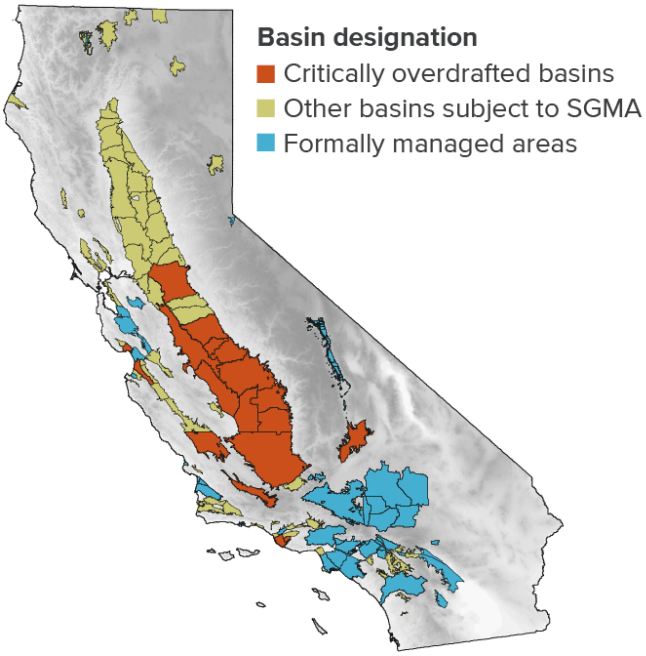
- On average, groundwater basins provide approximately 40% of the water used by California's farms and communities, and significantly more in dry years. Many communities rely entirely on groundwater for drinking water, and it is a critical resource for many Central Valley and coastal farmers.
- In some basins, groundwater pumping has exceeded replenishment for decades, causing groundwater depletion or "overdraft." Many basins also face challenges with salt or contaminants in groundwater.
- Groundwater use was largely unregulated by the state until the passage of the 2014 Sustainable Groundwater Management Act (SGMA). This law requires local agencies to address the undesirable impacts of overpumping and to bring their basins into balance by ending long-term overdraft.

SGMA now requires local agencies across California to manage groundwater sustainably.

- Prior to SGMA, some areas—including many cities in Southern California and Silicon Valley—had created local authorities to regulate pumping and charge fees to fund groundwater replenishment programs.
- SGMA now requires local agencies in other parts of the state to manage their basins sustainably. While SGMA gives agencies until the early 2040s to achieve this goal, they must prevent significant undesirable results of pumping along the way.

- The biggest challenges lie in "critically overdrafted" basins, which have the largest imbalances. This includes much of the southern Central Valley—California's largest farming region—where overdraft is nearly 2 million acre-feet annually (more than 10% of net water use).

The Sustainable Groundwater Management Act governs groundwater use across California



SOURCE: Developed by the authors using information from the California Department of Water Resources (DWR): SGMA Data Viewer, Reference Layers, and SGMA Portal.

NOTES: The map shows the designation under SGMA of 129 basins that account for most of California's groundwater use. This includes 21 "critically overdrafted" basins, most of which had to submit their sustainability plans in 2020, and 66 other high- and medium-priority basins, which submitted their plans in 2022. Formally managed areas are basins that already had formal management in place prior to SGMA. This includes 34 adjudicated groundwater basins, which have court-appointed watermasters and are exempt from SGMA requirements, as well as 10 areas with other management arrangements, such as special management districts, which have approved alternative plans under SGMA (two of these—Pajaro Valley and Borrego Springs—are considered critically overdrafted but are shown as formally managed areas). For adjudicated basins, the map shows subarea boundaries.

Unsustainable groundwater use affects many Californians, particularly during drought.

- Overdraft can cause many undesirable impacts, including falling groundwater levels, impaired water quality, and damage to infrastructure and aquifer storage capacity from sinking lands. These effects are heightened during droughts, when water users increase pumping to make up for reduced surface supplies.
- As the depth to access groundwater increases, the energy costs to pump water also rise. Wells that are not sufficiently deep, including many domestic wells, can go dry altogether. More than 2,000 domestic wells went dry in each of two recent droughts.
- Where groundwater and surface water are connected, overdraft can lead to reduced flows in rivers and streams. Lower flows can harm ecosystems and downstream users. And in coastal basins, seawater can intrude into depleted aquifers, damaging crops and contaminating drinking water.

Groundwater quality is a growing concern.

- The State Water Board requires water utilities to meet drinking water quality standards, and some groundwater contains contaminants at levels that exceed these standards. While it is sometimes possible to address contamination by relocating wells, meeting drinking water quality standards can require costly treatment to remove contaminants.
- Industrial chemicals such as PCE, TCE, hexavalent chromium, and PFAS are particularly a concern in parts of urban Southern California. Nutrients such as nitrate from fertilizer and manure are present in groundwater in many farming areas. Some naturally occurring contaminants, such as arsenic, also pose challenges.
- Salinity is a growing threat to southern Central Valley agriculture as well as drinking water supplies. Salts in the region's soils and groundwater lower crop yields, increase production costs, and will eventually reduce the availability of groundwater and lands that are suitable for irrigation.

Local agencies are now implementing their first groundwater sustainability plans under SGMA.

- Groundwater sustainability plans (GSPs) detail the extent of groundwater overdraft in each basin, the local impacts of this overdraft, and strategies to achieve sustainability. In some southern Central Valley basins, the state has found that GSPs do not adequately address undesirable results of pumping; hearings are

underway to determine whether basins will be put under probation, with State Water Board oversight.

- Most plans rely heavily on strategies to increase water supply in overdrafted areas. One popular strategy is groundwater recharge—capturing and storing more water underground during wet years, using methods such as moving water to dedicated recharge basins, spreading water on farmland, or switching over to surface water use to allow basins to replenish naturally. In 2023, managed recharge in the southern Central Valley increased by 17% compared to 2017, a comparably wet year.
- The 2020–22 drought also saw some local agencies accelerate the implementation of demand reduction strategies to help bring their basins into balance. Common strategies include pumping restrictions, fees for volumes pumped, and programs to incentivize growers to fallow some farmland. Local agencies have also been increasing efforts to address the impacts of overdraft, for instance by mitigating impacts to domestic wells and avoiding pumping in areas where land is sinking.