



Impacts of Land Subsidence

Land Subsidence in California

Subsidence, or the gradual sinking of land, has occurred in California for more than 100 years. In some areas it has been successfully stopped or prevented, while in other areas it is ongoing or even accelerating.

The impacts of subsidence vary across the state and may result in damages to different types of infrastructure.

Some of the types of infrastructure impacted include:

- **Water Conveyance:** canals, concrete linings, and gate structures
- **Flood Control Systems:** channels and levees
- **Roads, Bridges, and Utilities**
- **Groundwater Wells**

Water Infrastructure

Large-scale canals deliver water to vast areas of the Central Valley and Southern California. Projects like the State Water Project and the Central Valley Project deliver millions of

Subsidence can be caused by different processes. These include oil extraction, excessive groundwater pumping, and natural geologic processes. In many parts of California, excessive groundwater pumping is the primary cause of subsidence. Over the past ten years, alarming amounts of subsidence of 1 to 5 feet or more have been recorded in the Sacramento Valley and, primarily, in the San Joaquin Valley.

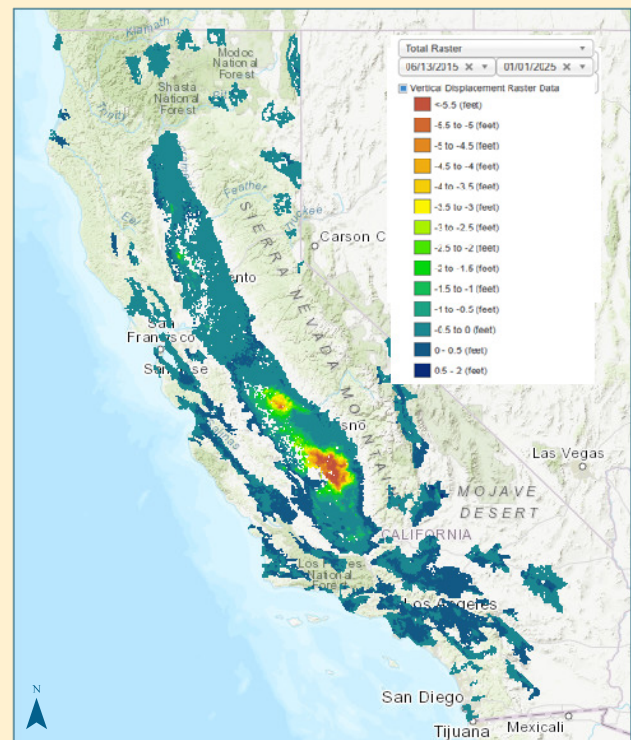


Figure 1. SGMA Data Viewer map of total subsidence from 2015-2025.

acre-feet of water to urban and agricultural users to grow crops and use in their homes and businesses. This water is moved from the wet northern part of the State to the dry southern part of the State by a system of gravity canals, pumps, and control structures. When the land sinks along these canals they lose their ability to move water, and the canal structures are put at risk (**Figure 2**).

In recent decades, groundwater pumping near canals in the San Joaquin Valley has caused the land to sink and reduce the effectiveness of the canals to deliver water. In response, the State Water Project established the [California Aqueduct Subsidence Program](#). This program monitors subsidence and has released a series of reports documenting subsidence impacts and potential future impacts (Original Study, 2017; Supplemental Report, 2019; and Subsidence Forecast Report, 2024). According to the findings from these reports, subsidence is an ongoing significant problem and, together with climate change, will diminish the State Water Project's future water deliveries.

Another project that has experienced subsidence impacts in the San Joaquin Valley is the Friant-Kern Canal, which delivers water from Friant Dam near Fresno to farms across the San Joaquin and Tulare valleys. The Friant

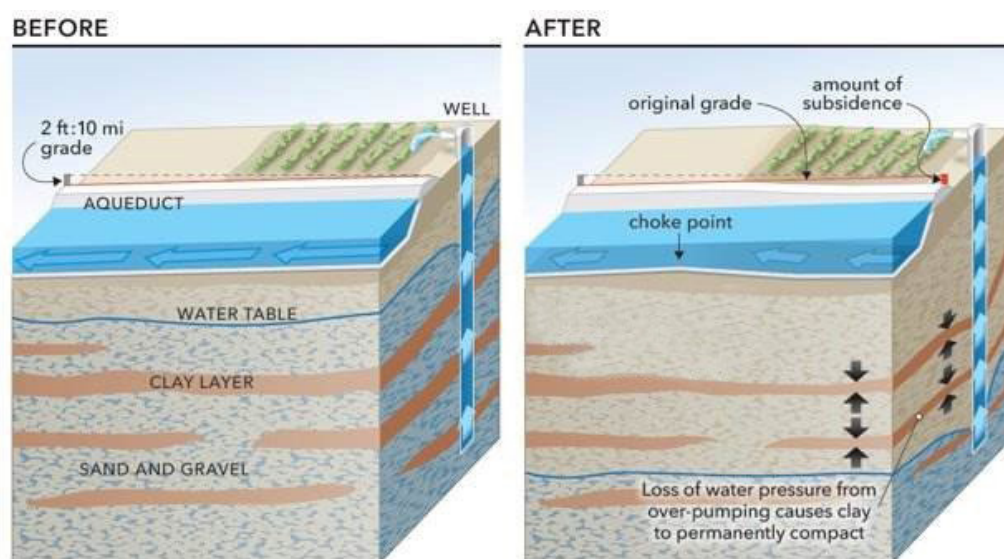


Figure 2. The reduction in capacity to move water due to subsidence.

Water Authority, the operator of the canal, in partnership with other agencies recently built a new canal parallel to the existing canal to move more water (**Figure 3**). This new parallel canal was needed because subsidence reduced the capacity of the original canal by up to 60% in certain areas ([Friant Water Authority Project](#)).



Figure 3. Newly constructed canal next to original Friant-Kern canal after subsidence reduced original capacity by 60% in some areas of the project.

Flood Control Systems

Flood control channels and their supporting levees operate on the principle that water flows downhill – in California’s case, towards the Sacramento-San Joaquin Delta and out to San Francisco Bay. When subsidence occurs, it slows down the water and causes it to pool up in certain areas. This reduces the capacity of the flood control system and leads to an increased flood risk for communities. An example of this impact occurs in the Eastside Bypass, which diverts water from the San Joaquin River near Mendota. This bypass has lost between 25 and 65% of its original capacity due to subsidence (CVFPP 2022).

Roads, Bridges, and Utilities

The nature of subsidence impacts to roads, bridges, and utilities is distributed across communities in the Central Valley and is recently increasing in the Sacramento Valley. Municipalities and local agency managers have completed many projects to repair these issues in the Central Valley, however no widely communicated comprehensive study to capture the extent of the impacts has been conducted to date.

Utilities such as underground gas transmission pipelines, footings for overhead powerlines and local water and wastewater systems have also been impacted by subsidence.

Groundwater Wells

Subsidence impacts on groundwater wells can damage the structure of wells in addition to potentially decreasing the volume of water they can produce. The California Water Foundation (CWF) published a report documenting these well impacts as well as other impacts across California ([CWF Report, 2014](#)). An example of subsidence damage to wells is shown in **Figure 4**, which shows a well casing protruding out of the ground, where the casing is remaining at its original elevation, and the subsided land is feet lower in elevation.

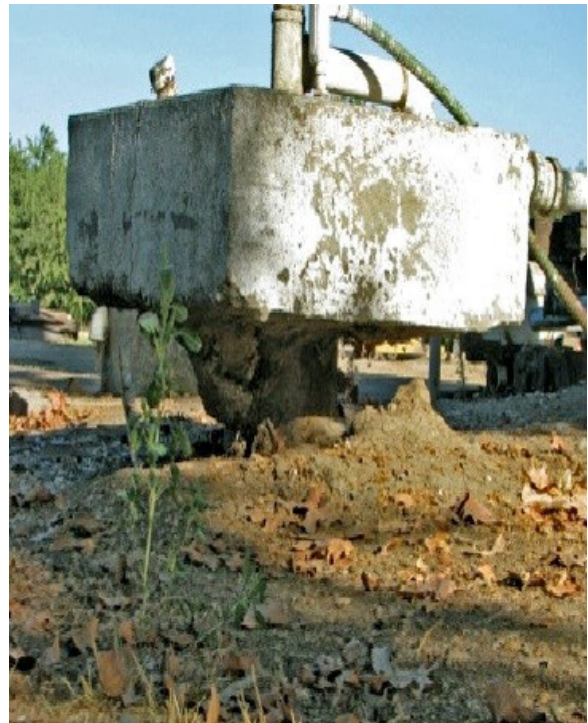


Figure 4. Groundwater well casing protruding out of the ground due to subsidence. ([CWF Report, 2014](#).)

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Land subsidence, driven largely by excessive groundwater extraction, poses risks to California's essential water conveyance and flood control infrastructure. Repairing and maintaining infrastructure to address subsidence impacts has already cost hundreds of millions of dollars.

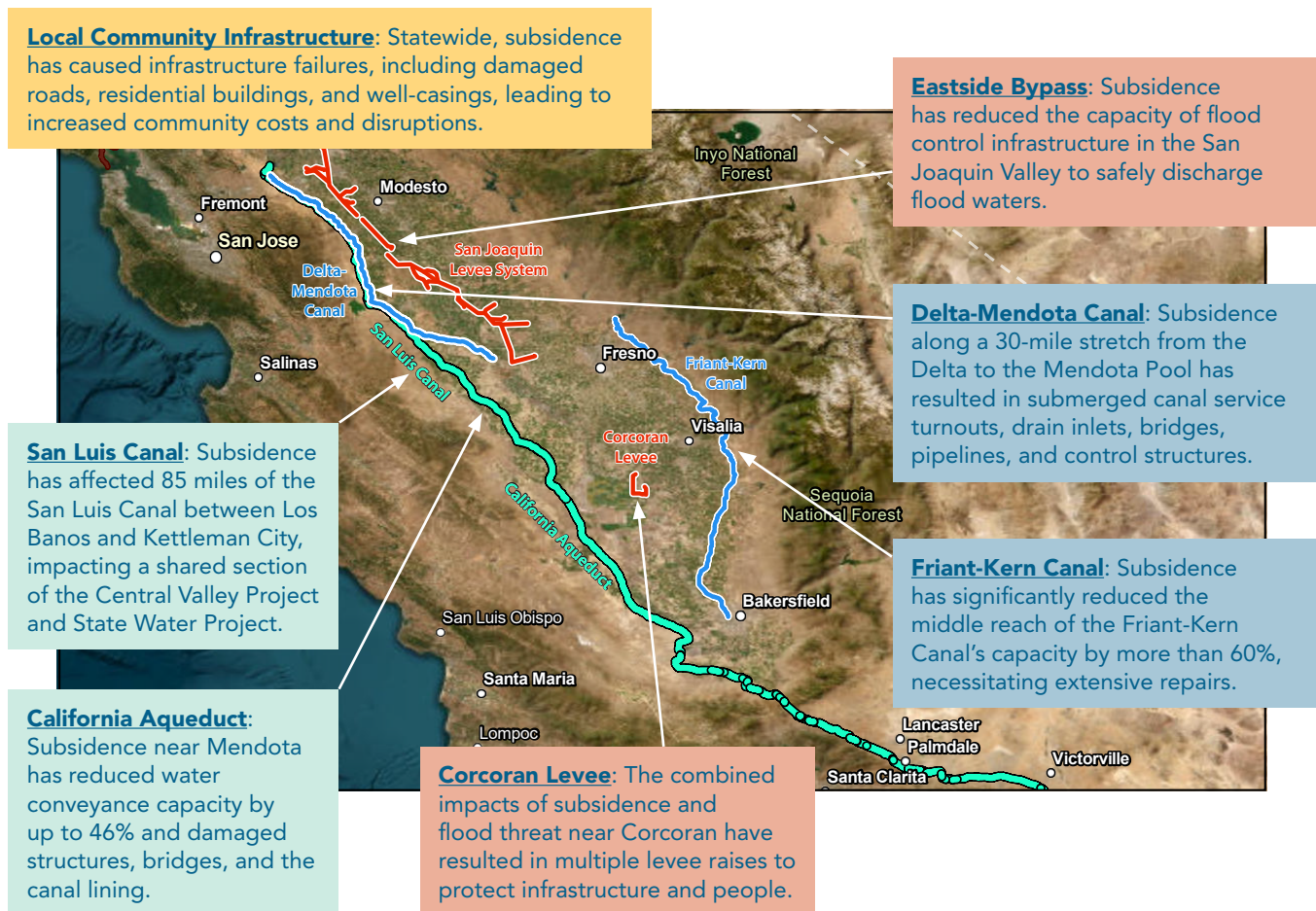


Figure 5. Map of essential infrastructure impacted by subsidence. These and other impacted infrastructure can be seen in the [SGMA Data Viewer](#) by selecting the appropriate Reference Layers. Map features not to scale.

Learn More:

DWR's Subsidence Website:

<https://water.ca.gov/Programs/Groundwater-Management/Subsidence>

Sustainable Groundwater Management Act (SGMA) Program

<https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management>

Data Viewer to see historical and ongoing Subsidence

<https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer>

DWR's Groundwater Assistance & Engagement Program

<https://water.ca.gov/Programs/Groundwater-Management/Assistance-and-Engagement>