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Case Study

Managed Aquifer Recharge in California

Four examples of managed groundwater replenishment across the state

The Need for Groundwater Management

Sustaining water supplies and preventing hazards

In California, surface water from rainfall, snowmelt, and distant rivers rarely meets the state's urban and agricultural water needs. Groundwater is an essential water source, providing 35% of the fresh water used in California. However, when groundwater is used more rapidly than it is naturally replenished, groundwater management becomes necessary. One of the tools used by groundwater managers is managed aquifer recharge (MAR).

Aquifers, the porous rocks and sediments that hold and transmit groundwater, are naturally replenished by surface water that seeps into the ground. MAR enhances the recharge rate by creating artificial streams and ponds where water trickles into the ground, or by using wells to directly inject water underground. MAR can also be used to improve groundwater quality and prevent some of the negative consequences of groundwater depletion, like ground sinking (subsidence) or the intrusion of salty groundwater from the oceans into coastal freshwater aquifers. Because of its arid climate and large population, California is home to some of the oldest and largest MAR projects in the United States. This case study highlights four of these projects, covering almost a century of MAR and water security in California.

Case 1: Santa Clara Valley Water District

Stopping subsidence and storing water

The land in the Santa Clara Valley, better known today as Silicon Valley, began sinking in the early 1900s as excessive groundwater removal caused the ground to compact. The Santa Clara Valley Water District was founded in the 1920s to recharge groundwater supplies and prevent further land subsidence. However, local water supplies have always been low, and despite many attempts to optimize the use of local water for aquifer recharge, groundwater depletion and subsidence continued until non-local ("imported") state and federal waters from the Sacramento-San Joaquin River Delta were made available to the district in 1965 and 1987. Since then, groundwater levels have been restored and the subsidence has largely stopped

Key Concepts, Defined:

Acre-foot: An acre-foot of water is approximately 326,000 gallons. This is the average amount of water used each year by a five-person household in the United States, although the amount used varies depending on regional climate and water conservation practices. In California, an acre-foot is the average annual water consumption of two and a half single family households.

Total Aquifer Capacity: The total aquifer capacity is the amount of groundwater that the aquifer holds when completely full.

Minimum Operational Aquifer Level: This indicates the amount of water that can be safely removed from the aquifer without undesirable consequences such as land subsidence.

Target Operational Aquifer Level: This is the optimal amount of water to have in an aquifer: enough to provide a steady water supply during a prolonged drought, but with enough space to capture stormwater or excess river water in very wet years.

Regulatory Framework and Management Matter

The success of MAR depends not only on having a suitable aquifer, but also on having an appropriate regulatory framework and proper management.

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