California's invisible reservoirs

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Imagine if California discovered a natural reservoir that could hold as much water as all the existing reservoirs in the state. Such a reservoir would allow Californians to store even more water in wet periods and help the state outlast the type of drought currently plaguing us (which is not over despite some recent splashes of monsoonal moisture).

In fact, California has more than 500 natural reservoirs in its underground aquifers, whose total storage capacity dwarfs that of the state's surface reservoirs. Surface reservoirs in California can hold about 50 million acre feet of water. In comparison, the state's aquifers have a combined capacity of about 850 million to 1.3 billion acre-feet.

As this drought drags on, calls are growing to enlarge existing reservoirs or build new ones. Storage will become even more important in the face of climate change if our snowpack shrinks and droughts grow more frequent and longer. Although new surface storage will sometimes be beneficial, cost and environmental impacts frequently will preclude this option. California needs to give greater attention to the cheaper but less visible option of storing water under our very feet.

Groundwater storage enjoys a variety of advantages over surface reservoirs. A study by Stanford's Water in the West program found that recharging groundwater is typically much cheaper than surface water storage or desalination. The median cost of groundwater recharge in California is $390 per acre-foot, with a range of $90 to $1,100 per acre-foot. By comparison, reservoir expansion costs between $1,700 and $2,700 per acre-foot. Desalination is even more expensive at $1,900 to $3,000 or more per acre-foot.

The benefits do not stop with lower costs. Evaporation losses are minimized. Rivers, streams and springs flow better. And by recharging aquifers, groundwater storage helps avoid or reduce many of the costs of groundwater overdraft, where pumping lowers groundwater tables by extracting more water out of the aquifer than is replenished. Overdraft leads to increased pumping costs, saltwater intrusion and land subsidence, which also can damage infrastructure.

Groundwater storage is not a panacea. Recharging groundwater, which often involves spreading water in surface ponds and letting it percolate down to the aquifer, is much slower than adding water to surface reservoirs. Extracting water from aquifers is also slower and requires significant amounts of energy. On balance, however, the advantages of groundwater storage are enormous.

California water agencies have made increasing use of groundwater banks in recent years. In Kern County, three water banks - Arvin-Edison, Kern and Semi-Tropic - offer more than 3 million acre-feet of storage, more capacity than the San Luis Reservoir. The agencies that operate groundwater banks previously have used them to deal with droughts, storing water in wet years and then drawing needed supplies in drought years.

To make greater use of the state's invisible underground reservoirs, California must take at least two steps. First, it must provide effective management of its groundwater. No one will store water if they have no guarantee of getting it out, and overlying landowners will oppose the banking of water unless they know that the banker will take out no more water than it stores and will not contaminate the aquifer. Unfortunately, effective groundwater management is lacking in much of the state - a problem the Legislature is now examining.

Second, California should ensure funding parity for groundwater storage, including the infrastructure to make it happen. Storage funding in the proposed California water bond, for example, offers only vague language on groundwater storage but highlights a list of specific surface storage projects to fund. Regional water storage solutions will vary, but groundwater storage is a proven option that deserves much more focus and support.

In this land of little rain, we cannot afford to ignore the vast groundwater storage capacity that nature has provided us.

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