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GUEST ESSAY

California Could Capture Its Destructive Floodwaters to Fight Drought

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By Erica Gies

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After a long, dry summer, winter has brought the gift of water to California, via a series of atmospheric river storms. Unfortunately, as these sprawling rivers in the sky have met developed areas covered with concrete and rivers locked in by levees, they have brought destruction: floods, mudslides, washed-out roads, blackouts, uprooted trees and at least six deaths.

But California doesn't have to passively suffer through the whiplash of drought and floods. To reduce risk from both, it can return some of its land to water, working with natural systems.

One way to do this is by making use of unique geologic features called paleo valleys. These buried canyons carved into the state's Central Valley were formed by Ice Age rivers that flowed down the western flank of the Sierra Nevada and were later filled in with coarse sand and gravel from glacial melt.

Today that coarse sand and gravel is a superpower, making paleo rivers exceptionally porous and capable of moving heavy rains underground quickly. The permeability is so great that they can absorb about 60 times more water than the surrounding material that is dominated by clay and silt. Only three of them have been found so far, but the hunt is on to find more, and quickly.

Graham Fogg, a professor emeritus of hydrogeology at the University of California, Davis who has studied California's water systems for 40 years, has a long-held dream: to find a dozen or more paleo valleys and use them to replenish groundwater depleted by over-pumping and controlling rivers with levees and dams. For decades, few people were listening. But lately, that's beginning to change. He and his colleague Rosemary Knight of Stanford University have convinced the state's Department of Water Resources to undertake a three-year survey to find more of them.

The big hope is that an array of paleo valleys could be turned into giant storm drains to quickly absorb heavy rain. Storm water spread over the valleys would sink underground and then move into the surrounding clays and silts, for more than 12 miles on either side of the valley and for hundreds of feet in depth, according to one study. It would raise the diminished water table, which is important because healthier underground water system can feed rivers from below and allow people to continue to pump water from wells. It can also make more water available to plants and soil, help to sustain the rain cycle and reduce fire risk.

There is enough unmanaged surface water from rain and snow statewide to resupply Central Valley aquifers, making more water available to farmers, urban dwellers and the environment. Even with climate change, the state will most likely have enough water for recharge in the future in part because of more extreme weather, according to a 2021 study.

To use paleo valleys to store these big rains, the land above them must be conserved for groundwater recharge. And that's already a challenge: One paleo valley found outside of Sacramento has been slated for a housing development, which would cover it with impermeable concrete and asphalt. Such decisions are typically governed by city and county governments, but the state could incentivize areas with paleo valleys to protect the land above them.

Land use isn't the only issue. The state's major aqueducts that move water from north to south can also play a big role in helping floodwater reach the paleo valleys. The aqueducts are underused in winter when fewer growers need to irrigate their crops and could transport excess storm water to depleted aquifers. Pipes could be added to them to move the water to the paleo valleys.

To find more paleo valleys, California's Department of Water Resources is using airborne technology to map about 100 groundwater zones throughout the state. The good news is that the location of paleo valleys is somewhat predictable: every tributary coming off the Sierra Nevada very likely has one, according to Dr. Fogg. Whether paleo valleys will be used for recharge depends on local land use priorities and each water basin's plan submitted to the state under the Sustainable Groundwater Management Act to balance extraction with recharge.

But governments that prioritize natural systems like paleo valleys will find they are good value, with a cost of about half that of industrial interventions like levees and often performing better in terms of absorbing floods and supplying water through the summer. Although construction continues in flood-prone places, every dollar invested in buying undeveloped land for water's ebbs and flows can save $2 to more than $5 in avoided flood damages. Healthy systems can also maintain themselves, saving money otherwise spent in constant battle with natural forces.

Although California's water is infamously over-allocated in the summer, a great deal of winter water is less constrained by water rights. People are now trying to stake claims to winter water to recharge aquifers so more water is available in the summer when the need is greater. Sorting this out is an opportunity to update the water rights system for a growing population, weakened ecosystems and the climate crisis of the 21st century to better serve the common good.

Paleo valleys are one of the best opportunities for California to find balance between dangerous floodwaters and depleted underground aquifers. And the state wouldn't be alone if it pursued this strategy. Many states, cities and countries are joining what I call the "slow water movement" to restore water's slow phases where surface and groundwater connect. Moving away from our strict control mind-set toward more respect for water's natural cycles can make our human habitat more flexible and strengthen our ability to go with the flow.

Erica Gies is a National Geographic explorer and journalist. She is the author of "Water Always Wins: Thriving in an Age of Drought and Deluge."

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