

USGS finds vast reserves of salty water underground

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A new nationwide study has unearthed the huge hidden potential of tapping into salty aquifers as a way to relieve the growing pressure on freshwater supplies across the United States.

Digging into data from the country's 60 major aquifers, the U.S. Geological Survey reports that the amount of brackish - or slightly salty - [groundwater](#) is more than 35 times the amount of fresh groundwater used in the United States each year.

Supplies exist in every state except New Hampshire and Rhode Island, with the largest reserves in the central U.S. In the Golden State, the California Coastal Basin and Central Valley aquifers together contain close to 7 billion acre-feet of brackish [water](#), which if desalinated could provide enough water for the state's needs for the next 160 years.

Untreated brackish water can replace fresh water for some uses, but would have to be desalinated for municipal use. A recent study by the Oakland-based Pacific Institute found that the costs of doing that were competitive with other methods of adding water capacity.

"This is a big leap for the water sector," said Newsha Ajami, director of urban water policy at Stanford University's Water in the West program. "It's amazing we have so much capacity now to map and measure."

Finding evidence of more than 800 times the amount of brackish groundwater the U.S. currently uses, the study provides a starting point

for more in-depth local analyses.

"The use of brackish groundwater has been growing since the 1970s," said Jennifer Stanton, a USGS hydrologist and lead author of the study. "Our goal was to determine the data gaps so we know enough about the resource to use it sustainably."

Brackish water contains dissolved minerals ranging from 1,000 to 10,000 milligrams per liter. But the salinity doesn't matter too much for the mining and oil and gas industries, which have been the biggest users of untreated brackish groundwater. The salty cousin of fresh water also finds favor with many livestock species that can drink brackish water in the lower concentration range, as well as with carefully managed salt-tolerant crops. When it comes to using brackish water for municipal use, however, the U.S. Environmental Protection Agency follows higher standards that entail treatments to remove salts.

Texas, California and Florida lead the pack with the most number of brackish groundwater desalination plants.

In the Bay Area, the Alameda County Water District has one such facility in Newark that has been desalting about 14,000 acre-feet of water annually since 2003 - about 40 percent of the water supplied by the district. There are currently two dozen brackish desalination facilities in California producing a total of 80,000 acre-feet of water annually. That's a year's worth of water for 400,000 people. The dry state of Texas has 46 inland brackish desalination facilities producing similar amounts - and hopes to develop more.

"The thing that surprised me is just how much interest there is in obtaining updated information about brackish groundwater resources," Stanton said.

The report is expected to spark more discussion because it lays out the depths at which the water exists, salt concentrations, water volumes and aquifer features that make them easy or difficult to tap.

Although California just had one of its wettest years on record, experts warn that the situation could quickly change. "Yes, we have had one year of flooding and a lot of rain, but it doesn't mean that in a year or two we're not going to go back to drought conditions," Ajami said.

That means local and regional water agencies must continue to develop a variety of water supplies to make themselves more secure during the drought years, said Rich Mills, chief of the water recycling and desalination section at the California Department of Water Resources. "You want to make sure different regions have diverse water supply portfolios, which means that if one falls short, you have another one to rely on," added Ajami.

In that light, water agencies will continue to look to California's vast salty aquifers to make their overall water supply more resilient, Mills said. Three new brackish desalination plants are under construction in the state, and at least 17 more are being planned - one of which will be located in an unincorporated area of Monterey County just north of Marina.

All of the other projects will be located in Southern California. Also, an alliance of Bay Area water agencies has plans for a large plant in Pittsburg, with the potential to desalt brackish water from the Delta and deliver 23,000 acre-feet of water a year.

Despite the interest, however, it is unclear how sustainable it will be to pump the vast resource because of real concerns about groundwater overuse and land subsidence - the Central Valley being a prime example. Aquifers in the highly productive agricultural region have a lot of clay.

"When we take water out of layers that are mostly clay, they squish and you lose the pore space forever," said Rob Jackson, an earth scientist at Stanford.

"People in the Central Valley are using groundwater from deeper and deeper layers," added Jackson, who published a California groundwater map last year. "If we're going to use groundwater, we've got to think about where the subsidence will occur and pump groundwater from somewhere else."

Recharging the aquifers is also an issue. Deeper layers contain ancient water that can take hundreds of thousands of years to refresh naturally, so using the resource would be highly unsustainable.

"If the agencies are going to be pumping brackish water out, they also have to manage how it will recharge over time," said Rich Juricich, principal engineer in charge of sustainable groundwater at the California Department of Water Resources.

One of the ways toward groundwater sustainability is to replenish aquifers artificially by injecting water into them or by allowing water to trickle down through ponds and trenches. "There's an opportunity to do more managed recharge in California to capture some of the runoff water and store it underground for use and also to recharge the aquifers," Jackson said.

The USGS report, he and other experts say, is a promising start in pinpointing areas where brackish water could become a sustainable resource for many communities.

"There's a lot of usable groundwater under our feet in California," Jackson said, "as long as we're careful about where and how we use it."

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