

Water Deeply

California Towns Tackle Nitrate Pollution With Local Solutions

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It will take decades to slow nitrate contamination in groundwater from industrial agriculture in parts of the state of California, so communities are taking matters into their own hands to get clean drinking water.

PORTERVILLE, CALIFORNIA, A town of about 50,000 people, lies nestled at the foothills of the Sierra Nevada Mountains, near the gateways to [Sequoia](#) and [Kings Canyon national parks](#). It's an idyllic setting, but in the nearby rural communities of East Porterville, Poplar, Terra Bella and Ducor, many residents get their drinking water from private wells that are rarely tested for contaminants. That's potentially dangerous because groundwater in the area is known to be polluted with nitrates.

A program in Porterville is trying a new tactic to help people in these communities obtain clean water. It's one of a number of local responses trying to tackle the state's nitrate problem.

A by-product of the nitrogen fertilizer that farmers put on crops, nitrates in groundwater have increased since the rise of industrial agriculture in the 1950s. Growers apply more fertilizer than the crops can absorb, and the excess nitrates are then washed into surface or groundwater when the crops are irrigated. In California, the most heavily affected areas are the Tulare Lake Basin in the San Joaquin Valley, where Porterville lies, and the Salinas Valley on the Central Coast, 100 miles south of San Francisco. Although nitrate pollution can also come from animal waste and ineffective sewage treatment, in these areas [96 percent is from crop agriculture](#), according to a study conducted by the University of California, Davis for the State Water Resources Control Board.

It's difficult to know exactly how many people are exposed to nitrate-laced drinking water across the state. The U.C. Davis study estimated that up to [250,000 people](#) using 10,000 private or small local system wells are at high risk of excessive exposure to nitrates in the San Joaquin and Salinas valleys. And [recent state data](#) identifies about 60 public water systems chronically out of compliance with safe nitrate levels.

The [biggest known health risk](#) to consuming nitrates is blue-baby syndrome, or methemoglobinemia. When babies consume nitrates, bacteria in their stomachs convert it to a more toxic form, nitrites, which reduces the body's ability to deliver oxygen. Symptoms include difficulty breathing and a bluish color around the eyes and mouth. Without medical attention, the condition can induce coma and lead to death. Pregnant women are also at risk. [Some studies](#) have shown links to birth defects and certain cancers, but the evidence is not as clear.

So what's California doing about it?

The state started to get serious about cleaning up nitrates a decade ago. It is now working with growers to stop new pollution and is considering how it might clean up old contamination. But it's costly to clean an entire aquifer, and even extraordinary efforts would take several decades to pay off.

So the state is also focused on funding interim local solutions to supply people with safe drinking water. Most of these instant fixes include bottled water, installing a filter at the kitchen sink or a big filter at a wellhead. Other, more permanent solutions include drilling a new well or connecting contaminated systems to cleaner ones in neighboring towns. In the meantime, towns are pursuing their own solutions.

Rural Outreach

Cristobal Chavez, a former truck driver and Teamster, lives with his wife and five foster children outside the small Tulare County town of Poplar, where he has 15 acres and raises sheep, goats and chickens.

High levels of nitrates were reported by municipal water systems in his area, prompting the nonprofit Community Water Center based in nearby Visalia to ask to test Chavez's well two years ago as part of an outreach campaign to private well owners. The state doesn't require private well owners to test their wells for contaminants, and many people don't know that they should or they can't afford to do so.

Results for Chavez's well showed levels of nitrate more than three times the maximum contaminant level allowed by law, according to the Community Water Center.

"We were surprised. We were using that water for drinking and everything," says Chavez. "Since they told us, we don't do it anymore." But that's been at a cost of nearly \$200 a month for bottled water.

Chavez's well went dry three years ago during the drought, forcing him to dig a deeper well. Now he says, "I have plenty of water, but I can't drink it."

Without access to a community water system, many private well owners are on their own when it comes to finding solutions to nitrate contamination. But in Porterville, about 10 miles down the road from Chavez, Self-Help Enterprises, a local nonprofit, is working to change that.

In an area where many residents are low-income and rely on private wells, Self-Help Enterprises decided to target those most affected by nitrates: expectant mothers and infants. The organization offers them water tests when they visit the office of their local Women, Infants and Children (WIC), a federal food and nutrition program. A grant from the Central Valley Salinity Coalition, a nonprofit alliance of agricultural businesses and water districts working to clean up salts and nitrates, has funded a six-month pilot program that launched in April.

So far, 63 people have taken home testing kits, and 25 have returned them, says Abigail Solis, community development specialist with Self-Help Enterprises. Of the 25 water samples tested, eight had nitrate levels above the legal limit and one was four times the legal limit, she says.

If a test reveals dangerous nitrate levels, project funds will cover bottled water delivery as long as the pilot runs – through to October of this year – or an under-sink filter, which cleans the water through reverse osmosis.

As for why more people aren't taking advantage of the program, Solis says access is likely an issue. The WIC office can accept water samples only between 10 a.m. and 3 p.m., Monday through Wednesday, to ensure that the sample is tested quickly enough to give accurate results. People are at work during the day, says Solis, and transportation is a hurdle for many. Solis is working to obtain funding to continue the project and hopes to send someone out to collect samples from people's homes to increase participation.

"Sometimes we think families either don't care about these issues or they're not aware," says Solis. "We have learned families are very aware and care very much. They're just not sure what they can do about it."

Bottled Water Reliance

Irma Medellin started the grassroots organization El Quinto Sol de America to drive civic participation in Tulare County communities where many residents don't feel they have a political voice, she says. A big part of that work has included raising awareness about water contamination.

"It's necessary to work together so our government listens and then the government can also include us in their plans," she says through a translator. "The government has a lot of money, but poor communities are often the last in line."

Grassroots activism in the valley in recent years has helped to bring more resources to hard-hit areas. The state now has 85 active projects supplying bottled water to California communities suffering from water contamination or drought impacts. Thirty of those projects address nitrate contamination.

"The agricultural industry is contaminating the water, and we pay the price," says Medellin.

But in at least one area of the state – the Salinas Valley in Monterey County – some farmers are finally paying too. In that area, both growers and residents rely primarily on groundwater, which, thanks to decades of intensive agriculture, is polluted with nitrates. Starting this summer, individuals using private wells and towns affected by

nitrate pollution are now receiving bottled water deliveries paid for by local area growers. This temporary program emerged after the State Water Resources Control Board and the local Central Coast Regional Water Control Board made moves toward cracking down on agricultural polluters in the area.

They drafted an enforcement order against the larger farmers in the Salinas Valley, prompting the parties to agree to a settlement in which growers would provide affected people with clean water immediately and work to install long-term water supply solutions, such as digging deeper wells for them or connecting them to nearby water systems.

Technological Solutions

Bottled water programs are only a stopgap measure until more permanent solutions can be found, but that often takes years. Another option is point-of-use filtration systems that go under a sink and use either reverse osmosis or distillation, but they usually cost several hundred dollars apiece and most households would need several. Filters also need to be changed regularly.

Pending state legislation, [Assembly Bill 166](#) would direct the State Water Resources Control Board to study the feasibility of providing rebates for household water filtration systems for residents.

Large water filtration systems can also be installed at the wellhead. Typically those systems have been considered expensive, slow and challenging because they require ongoing maintenance, such as changing filters and properly disposing of the brine waste that is generated.

But a United Kingdom-based company, [Ionex SG](#), thinks it has found a better way. Its system uses ion exchange, a technology that's been around for years and exchanges a contaminant with a more desirable substance, says chief executive officer Phil Chandler. Traditional ion exchange systems generate large volumes of waste, but Ionex's technology reduces that waste, he says, and thus lowers the disposal costs.

The technology – which can be used to treat contaminants such as nitrates, as well as hexavalent chromium, uranium or perchlorate – is already being tested in California with four different water agencies.

“After five years of self-funded research and field trials [Ionex SG] is conditionally approved for drinking water applications in California,” says Chandler. And since 2015, the company has been treating nitrate-contaminated drinking water in the San Joaquin Valley for Triple R Mutual Water, which has 152 connections in the Sierra foothills town of Springville in Tulare County.

Chandler says that Ionex is committed to working in the San Joaquin Valley, where the region's small, rural communities provide a good opportunity to test the company's technology. “I can predict that we will be installing further treatment systems in the region in 2018.”

Making New Connections

Treatment systems to remove nitrate aren't the only option for impacted communities. Seville, a small, rural town nestled among orange groves in the eastern San Joaquin Valley, is populated with second- and third-generation agricultural workers, as well as recent immigrants. The community of about 500 has just one well, and it's tainted with nitrates.

Ruben Becerra grew up in Seville and now lives in a neighboring town, but he returns to his boyhood home several times a week to deliver bottled water to his 93-year-old mother. “The water is not drinkable,” says Becerra. In addition to nitrates, the leaky infrastructure also invites bacterial contamination. Buying bottled water has been an economic hardship for local residents, many of whom are elderly, disabled or work in low-income jobs, he notes.

Becky Quintana, also from Seville, has been drinking and cooking with bottled water for nearly a decade. But some of her fellow residents couldn't afford \$60 a month for bottled water. “They'd only buy water for infants, and the rest of family would drink the tainted water,” she says.

“For years Seville was a stepchild out in the country – totally abandoned out there,” Becerra says. “No one wanted to deal with us. But officials now are forced to work on the problems.”

Things improved three years ago when the state agreed to supply everyone with bottled water. But the residents of Seville are also pursuing more permanent solutions.

Seville joined forces with its neighboring town of Yettem to dig another well, where they found clean water. Now they must expand the well and build pipes to both towns, says Ryan Jensen, community water solutions manager at the Community Water Center.

However, just because the water is clean now doesn't mean it will stay clean. "The well could become contaminated," says Jensen. "Then they would have to shut it down and drill a new well." Or now that the new combined Yettem-Seville water district will have three wells, managers could blend contaminated water with less contaminated water to meet federal water-quality standards.

Another possibility is to obtain water from a surface water source, and a multi-town partnership, including Seville, is exploring that possibility.

"This has been a marathon for us," says Quintana. "I'm not sure how many months or years it will be till we get clean water coming through our infrastructure."