Sunset
EXPERIENCE THE WEST

Nervous energy

Billions of barrels of oil lie in the Monterey Shale. The windfall from tapping into that deeply buried cache could be mind-blowing – so could the damage.

The Getzelmans want a reliable water supply for their vineyard. Photo Dave Lauridsen

Barry Yeoman - March 2014

As Paula Getzelman and I stroll among her Syrah and Grenache vines, she points out how the free-standing plants were "head-trained," or cultivated to look like goblets. Head-training can produce less fruit per acre than growing the plants on horizontal trellises, but that's okay with her. "It allows the vine to give its all to a smaller number of grapes," she says.

Paula's Tre Gatti Vineyards, a 5-acre boutique operation in California's San Antonio Valley that she runs with her husband, Paul, has provided the couple with more than just an income and a palate-pleasing product. It has given them an exit from their fast-paced city lives. She had worked in the health care and pharmaceutical industries, he in food sales. At one point she was traveling four days a week for her job. "What we were doing was for the money," she says, "not for the soul." In 2001, craving a change, she moved back to Lockwood, the agricultural town in southern Monterey County where the couple had started their married life three decades earlier. Paul followed in 2003, and that year they planted their vines.

Coaxing grapes from the ground is dicey business. There are tiny leafhoppers that drain chlorophyll from the plants. There are late-summer days when an imprecise forklift movement can overturn a half-ton of grapes onto the dirt road. But these days Paula worries about another industry that wants to coax its own product from deeper beneath the soil.

The San Antonio Valley is part of the Monterey Shale, a 1,750-square-mile patchwork of rock that the oil industry calls a potential energy bonanza. A 2011 U.S. government study estimated that the recoverable oil inside the shale

far outstrips the reserves fueling the current booms in North Dakota and Texas.

That oil is not easily obtained, though. Trapped inside the rock, it needs to be extracted by one of several modern technologies. The best known is hydraulic fracturing, nicknamed "fracking," which entails drilling deep beneath the earth's surface and horizontally across the rock, then pumping water, chemicals, and sand underground to fracture the shale and free up the fuel. Fracking has unlocked stubborn oil and natural gas reserves elsewhere, creating jobs and fostering hopes for an energy-independent future. A recent study by the International Energy Agency said the technology is driving down U.S. gas and electricity prices, and it predicted that the United States will become the world's largest oil producer around 2020 and that North America will be a net oil exporter by 2030.

But fracking and related activities have also been linked to water and air pollution, health problems ranging from asthma to low birthweight babies, wildlife habitat disruption, and boomtown ills such as homelessness and crime. Environmental activists warn that these problems could plague California if the Monterey Shale is exploited.

Paula, 71, is no activist. But she worries, in her measured way, that drilling the shale without a better understanding of the risks could jeopardize the San Antonio Valley's most valuable resource. "What we have in that vineyard is dependent on water," she says. "If our water is decimated, both in quality and quantity, we pretty much have no fallback position. Once the water is gone, you can't reclaim it."

The Native Americans who lived in California thousands of years ago observed that the ground naturally seeped petroleum, which they used in thickened form for everything from canoe building to chewing gum. It took until the 19th century for oil drilling to begin, and in 1892 the first gusher erupted near Ventura. That kicked off a series of booms as oilfields were discovered around Los Angeles, the Central Valley, and offshore. Output peaked in 1985, though California still ranks third among the states in oil production.

With the easiest oil gone—oil that flowed from its source rock and pooled in underground reservoirs, waiting to be sucked out like a Slurpee—the big questions are how much remains and whether it can be reached. The U.S. Energy Information Administration (EIA) tried to answer those questions in a 2011 report examining the Lower 48's shale resources. When it came to oil, the leader by a landslide was the Monterey Shale, a checkerboard of discrete basins that stretches from Southern California's Orange County to the Eel River watershed north of Ukiah. EIA put the Monterey's recoverable potential at 15.4 billion barrels, more than four times that of the next most promising formation, North Dakota's Bakken Shale. The agency later lowered its estimate to 13.7 billion.

The report came out as fracking, ramping up nationwide, triggered North Dakota's current oil boom and Pennsylvania's natural gas rush. But drilling horizontally across the Monterey might prove trickier, because its rock strata have been jumbled over the eons by seismic activity. "On the East Coast, if we look at the geology, it's akin to a layer cake," says Jayni Foley Hein, executive director of the Center for Law, Energy & the Environment at the University of California, Berkeley. "In the Monterey Shale, it's more akin to a marble cake."

For all the logistical challenges, the sheer amount of anticipated oil makes the Monterey too tempting for the energy industry to leave alone. “I think you could see, if the technological barriers are overcome, a significant replacement of imported oil with domestically produced oil,” says Tupper Hull, vice president of the Western States Petroleum Association. A University of Southern California study, funded by Hull’s organization, projected that, if EIA’s estimates are correct, drilling could create 2.8 million jobs in California and bring in $24.6 billion in state and local taxes during the peak year of 2020.

But the government’s projection has been disputed. In December, two organizations critical of fracking—the Post Carbon Institute and the Physicians Scientists & Engineers for Healthy Energy—released an analysis by veteran Canadian geoscientist J. David Hughes that concluded the EIA numbers are significantly overstated. That cast doubt on the rosy jobs forecast in the USC study. Other industry-friendly studies have predicted smaller job gains too.

Susan Christopherson, an economic geographer at Cornell University, says the prosperity brought by oil and gas extraction often proves temporary. “It’s an industrial process,” she says. “It drives out other activities like tourism or farming. Once the boom-bust cycle is over and the drillers leave, those counties often have fewer people and less diverse economies than when they started.”

Before it was renamed Lockwood in the late 19th century—after suffragist Belva Lockwood, who by some reckoning was the nation’s first female presidential candidate—the Monterey County settlement was some times called Hungry Flats or Poverty Flats. “Even the rabbits had to bring their lunch,” locals said.

It was hardly less isolated when Paul Getzelman’s mother, Lucile, came in the late 1920s to teach at a one-room schoolhouse in nearby Bryson Hesperia. Her arrival was big news for Lockwood’s bachelors. “The young men were buzzing around like flies,” Paula says. Lucile chose a suitor named Maurice Getzelman, and in 1929, the couple married.

In the 1930s, the two of them bought a general store in Lockwood, eventually moving it to the new paved road through town, where it sits today. It reminded Paul of a western-movie general store—“with the Levi’s in back,” he says, “hardware on one side, fresh meat, a little bit of fresh produce.” Paul, now 68, grew up attending cattle brandings and dove hunts. His elementary school graduating class had five students.

Paul and Paula married in 1972 and ran the store together. Paula, a self-described city girl, learned how to roll dice with the old-timers for coffee. The work, she learned, was unrelenting. “A rural store is a mistress,” she says. “We would get people knocking on our door at midnight wanting to know if they could get a gallon of gas.” Wanting their three boys to have the benefits—sports, culture—of a more urban life, the Getzelmans moved to Fresno in 1975.

During their absence, the San Antonio Valley began to change. The first modern vineyard was planted in 1996. The valley’s high hillsides, dry summer heat, and cool nights help nurture fruity, crisply acidic grapes. A stampede followed, Paula says, as growers converted fallow land and barley fields to vineyards.

Returning to Lockwood after a quarter-century, the Getzelmans found primal satisfaction in the cycles of vineyard life. “When we saw the first leaf come up, I cried,” Paula says. “It was like giving birth.” In 2006, at the behest of the Getzelmans and another grower, the federal government named the San Antonio Valley its own viticultural area.

Not long afterward, the first hints that oil companies might be interested in the local shale began surfacing. A well was drilled 10 miles from the Getzelmans’ farm, annoying the neighbors but not really alarming them. Oil and gas company representatives quietly began buying mineral rights near that well, though no one has approached the Getzelmans. News spread of the fracking booms in other places. The government released its 2011 Monterey Shale assessment. That year, and the next, the Bureau of Land Management auctioned mineral rights it owned in southern Monterey County. Buying the rights were Vintage Production California, a subsidiary of Occidental Petroleum, as well as three agents that acquire and manage land for drillers: Neil Ormond, Lone Tree Energy, and West Coast Land Service.

Paula realized how little she knew about the Monterey Shale. The state did not track fracking activity. Oil companies were cagey about their plans. Studies about the environmental effects of hydraulic fracturing were few. But there were reports of related water contamination in other states. As she learned more, Paula grew wary, particularly about the prospect of pumping fracking fluid—which often includes chemicals (such as benzene, 2-butoxyethanol, and toluene) that are linked to cancer or damage to the liver, bone marrow, or central nervous system—below the valley’s groundwater. “If they were to frack out here, and it were to go horribly wrong,” she says, “the consequences would be unspeakable.”

How likely is it that something might, in Paula’s words, “go horribly wrong”? That’s the core of the debate over fracking nationwide, and it’s complicated by a knowledge void. “The research is not keeping up with the pace of growth,” says Rob Jackson, a professor of earth sciences at Stanford University. “We’ve been playing catch-up in the scientific community, and that’s especially true for the realm of potential human health interactions.”

Oil and gas companies have fractured rocks since the late 1940s, albeit on a smaller scale than today. “This technology has never been associated with groundwater contamination in California,” says the petroleum association’s Hull. Some scientists feel hopeful the Golden State will maintain a healthy track record even as hydraulic fracturing or other well-stimulation methods ramp up. “Drilling for oil is a large-scale industrial process,” says Mark Zoback, who is a professor of geophysics at Stanford and an industry consultant. “There are a lot of things that can potentially go wrong. But if you follow best practice, and you get good regulations and enforce them, it can be done safely.”

Still, water contamination elsewhere shows that fracking is hardly foolproof. Researchers at The University of Texas at Arlington have discovered elevated levels of arsenic, selenium, and strontium—sometimes exceeding the government’s safety thresholds—in private drinking-water wells near drilling sites in Texas’s Barnett Shale. Likewise, Jackson and his former colleagues at Duke University have found heightened levels of methane and other gases in the water wells of Pennsylvanians living near Marcellus Shale fracking sites.

"It's very easy to say, rhetorically, that there haven't been any instances of water contamination documented in the state, so what's there to worry about," says environmental scientist Michael Kiparsky, associate director of the Wheeler Institute for Water Law & Policy at the University of California, Berkeley. But there's a logical flaw in that reasoning, he says: Unlike the Marcellus and Barnett, the Monterey has never had high-intensity fracking on the same scale. Moreover, Kiparsky says, it could take decades or longer before contamination migrates far enough to be detected. "The problem then becomes similar to Superfund sites, where the activity that caused the pollution didn't come to light as hazardous until later, and often until the perpetrator was long gone."

Researchers do know there are plausible mechanisms for contamination. Fracturing shale also cracks the rock above it, says Anthony Ingraffea, a professor of civil and environmental engineering at Cornell. "You're damaging what Mother Nature has provided over the last 300 million to 500 million years as a natural cap," he says. "Over some period of time, there's a possibility that the damage will allow gas or oil or other hydrocarbons to leak upward."

The weakest links in the safety chain, according to experts, are the steel casings and cement that line the wells underground. They're designed to isolate harmful chemicals from the surrounding environment, but they're far from infallible—6 to 7 percent of new wells drilled in Pennsylvania over a three-year period had "compromised structural integrity," according to Ingraffea's research. The worst breaches can poison drinking or irrigation water, and Ingraffea says this "is undeniably happening, has happened, will always happen. And it's not rare." In December, the U.S. Environmental Protection Agency's inspector general released a report on the dangerous levels of carcinogenic benzene and explosive methane in drinking water in Parker County, Texas, near Fort Worth. A gas-production well used in fracking "was the most likely contributor to the contamination of the aquifer," the report noted.

Ingraffea and Kiparsky fear that California oil operations could prove particularly vulnerable to well failure because of their proximity to earthquake faults. "The state is a very seismically active region," Kiparsky says. "Might seismic activity cause the type of damage to cementing and casing that could lead to more contamination of groundwater?"

Research suggests that high-volume hydraulic fracturing could contribute to local air pollution and global climate change. Less often discussed are the implications—well pads, pipelines, access roads, 24-hour lighting, truck traffic—of having a long-term industrial infrastructure across the California countryside. Some of the Monterey Shale lies beneath places like the San Joaquin Valley's Kern County, which is in many parts already heavily industrialized. Other areas, like the San Antonio Valley, remain pastoral.

"The specter of Kern County–type oil development extended to other parts of the state is, to me, really quite frightening," Kiparsky says. "You would have vegetation removed. You'd have soil exposed. You'd have plants and animals displaced. You'd have disturbance of wildlife behavior. You'd have migration corridors interrupted. You could have sediment runoff that could degrade water quality in nearby streams, impacting fish and plant life. The ecological implications are potentially severe."

None of this is certain, he notes, because of the shortage of research.

One day Paula Getzelman and I drove 6 miles beyond Lockwood to the Williams Hill Recreation Area, which is owned by the federal government and operated by the Bureau of Land Management. Silvery digger pines with their enormous cones lined the steeply banked dirt road as we climbed in her SUV. Drought-tolerant chaparral plants hugged the ground. Quail darted in front of us, and long views unfolded in all directions, with hills the color of wheat.

When BLM auctioned off 20,000 acres of mineral leases in 2011 and 2012, many of the parcels surrounded Williams Hill. The agency didn't believe much drilling would take place there, so it performed only cursory environmental assessments. "We haven't seen a big rush into this area," says Gabriel Garcia, a BLM field office manager who has also worked as an environmental protection specialist for the agency.

Environmentalists and local officials took a less sanguine view. They feared that drilling on the land leased by BLM not only might pollute the water and air, but also could harm endangered species like the California condor, which was brought back from the edge of extinction and now numbers over 200 in the wild.

Since 2011, the Center for Biological Diversity and the Sierra Club have filed two lawsuits to block the BLM leases. In March 2013, U.S. Magistrate Judge Paul Grewal ruled that the first set of lease sales violated federal law. "The potential risk for contamination from fracking, while unknown, is not so remote or speculative to be completely ignored," he wrote. BLM is now in settlement talks with the plaintiffs and has promised a fuller environmental review before moving forward.

California's farmers and ranchers have not formed a consensus around fracking. Some, like Paula, believe that, based on current information, the risks outweigh any potential economic gain. Others are eager for the additional income from oil leases—"particularly in this time of severe drought, when they're laying 30 percent of their land fallow," says Diane Friend, executive director of the Kings County Farm Bureau. Farmers there, she says, trust the steps that the oil companies are taking to protect their aquifers. And because saltwater intrusion has already forced many of them to rely on surface water for irrigation, problems underground won't imperil their crops. "One reason they're not afraid," Friend says, "is that the water quality's already bad."

Hull, the industry official, says oil and agriculture have prospered side by side in California for more than a century. "They understand that it's necessary to coexist, and they do so extremely well," he says. The question is whether that peace will continue if drillers crack the Monterey code and the resulting boom demands more water. In a statewide context, the amount of water used for fracking would be small. But experts say it could create local shortages.

The Getzelmans use 7,000 gallons an acre every time they water their vineyard. Nationally, fracking requires about 1 million gallons of water annually per well; in California, which hasn't had horizontal drilling on a mass scale yet, the water usage has been lower. But the state, which has seen its groundwater depleted by almost 20 trillion gallons since the early 1960s, could face tensions too. "Between

groundwater concerns and the state's recently declared 'drought emergency,' any expansion of water use for hydraulic fracturing in this region will likely spark strong public concern that could jeopardize the industry's social license to operate," says a report published in February by Ceres, a nonprofit group that advises business leaders on sustainability issues.

With all the uncertainties about drilling the Monterey, how should California proceed? Last year, the state legislature passed a measure, called Senate Bill 4, allowing hydraulic fracturing and acid stimulation (another extraction process) while also putting in place more regulation than exists today. It also mandated a study of the "hazards and risks" of these techniques that is due by January 1, 2015. The new law disappointed the oil industry, which considers its requirements burdensome and unnecessary. And it disappointed environmentalists, who wanted a moratorium until the safety issues are better understood.

Hull considers the call for a moratorium "draconian"—an overreaction to what he considers modest and well-managed risks. "You would not do anything of a technological nature if you were required to first prove the absence of any risk, of all risk," Hull says. "That's silly."

Paula Getzelman finds herself craving a middle ground between the absolutists. "If we really put our minds to it, we could come up with a method to extract oil safely," she says. Some scientists agree with her. Until that method is developed, though, she believes a moratorium is the best interim measure—"to allow time to gather some evidence, whichever way it might go, and allow for more reasonable discussion on both sides."

With a large enough research investment, Paula says, we might find a way to tap the Monterey that's both lucrative for the oil industry and protective of the environment and human health. If that happens, she'll be all for it. "But if, in fact, people who say it can't be done safely are correct," she says, "you can't go back and unring that bell."