

CALIFORNIA REGULATORS: SEE NO FRACKING, SPEAK NO FRACKING

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The state agency responsible for regulating oil and gas drilling in **California** has long turned a blind eye to the use of hydraulic fracturing.



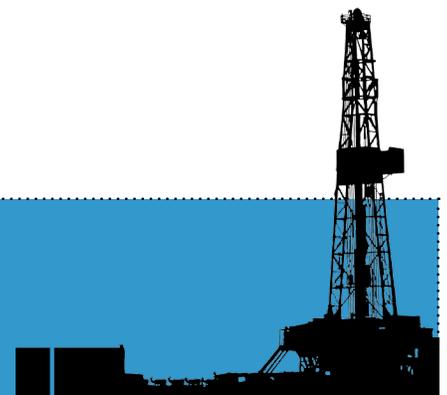
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by **Renée Sharp**, Director, California Office & Senior Scientist, EWG
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Executive Summary

The state agency responsible for regulating oil and gas drilling in California has long turned a blind eye to the use of hydraulic fracturing (fracking), insisting as recently as this year that drillers rarely use the process in the state despite industry records documenting the practice at least as far back as 1953.

The state's Division of Oil, Gas and Geothermal Resources' insistence that fracking has been uncommon in California – despite ample evidence to the contrary – has not kept the agency from seeking additional funding to oversee the practice. In May 2010, the division requested and received more than \$3 million and 17 new positions to expand its regulatory program “to cover all new technologies for [enhanced oil recovery], including shallow thermal injection diatomite, hydraulic fracturing and [carbon dioxide enhanced oil recovery] injection wells.” (Diatomite, also known as diatomaceous earth, is a sedimentary deposit formed by the fossilized remains of single-celled aquatic algae.)

The division's rationale for proposing new regulations was that “Californians would not want to see injection of fluids associated with oil and gas production migrating beyond the area of where it is intended to be.” The agency did, in fact, receive the extra funds in its 2010-2011 budget, but to date it has issued no fracking regulations. Moreover, in January 2011, Elena Miller, the head of the division at the time, told EWG that it had no plans to do so. A year later, in February 2012, Mark Nechodom, newly appointed director of the Department of Conservation, told EWG and six other environmental organizations following repeated questioning that the agency does not have fracking regulations “on its plate.” He said the department would only begin to develop such regulations if the legislature were to require them or there was “manifest damage and harm” from fracking in California.

The state's failure to confront reality is hardly surprising, since the Division of Oil and Gas of the California Department of Conservation admits that it makes no attempt to monitor, track or regulate hydraulic fracturing in any way. As recently as December 2010, the agency circulated an official fact sheet stating that fracking in California is "not common," "limited" and only "occasionally used for a brief period." A revised fact sheet, posted from May 2011 until recently on the division's website, says that it "only has anecdotal information about the use of the practice. That said, the division does not believe that fracking is widely used in California." A new version, posted on Feb. 16, 2012, acknowledges that "fracking is used for a brief period to stimulate production of oil and gas wells" in California but goes on to say that "the Division doesn't believe the practice is nearly as widespread as it is in the eastern U.S. for shale gas production." What the Division doesn't say is that most fracking in California is used for oil, not gas, production. In 2009, the Division reported oil and gas production in 31 of California's 58 counties from a total of 52,186 oil wells and 1,639 gas wells.

In terms of potential environmental risks, however, there is no real difference between fracking for oil and fracking for natural gas. Both use a mixture of chemicals, water and sand blasted into the earth under high pressure. Both use vertical and horizontal drilling. Both use substantial amounts of water. Both can cause well casing failures. And both produce waste water that must be disposed of in some fashion.

It is not known how many of these California wells were "fracked," but Environmental Working Group researchers uncovered documentation showing that hydraulic fracturing has taken place in at least six California counties: Kern, Los Angeles, Monterey, Sacramento, Santa Barbara and Ventura. The exact number of fracked wells in the



Natural Gas Drilling, Sutter Buttes in the background.
Sutter or Colusa County, California
(Photo credit: CalWest, Flickr)

state is unknown, but it is clear that the total likely reaches into the thousands. Industry documents show that by the mid-1990s, more than 600 wells had been fracked in one Kern County oil field alone.

Representatives of the energy services company Halliburton told EWG in the fall of 2011 that 50-to-60 percent of new wells being drilled in Kern County were hydraulically fractured. And according to data in the 2009 annual report of the Division of Oil and Gas, the five most productive oil fields in Kern County had 1,527 new wells drilled that year. From these figures, EWG estimates that, at a minimum, more than 750 California wells were fracked in 2009 alone. This is clearly an underestimate, however, both because it counts only a subset of the wells in California – and about half as many wells were drilled in 2009 as in each of the previous two years.

Underscoring the risks, a Kern County farmer was awarded \$8.5 million in damages in 2009 after his almond trees died when he irrigated them with well water that had been tainted by nearby oil and gas operations. The contamination was traced to unlined pits where Aera Energy LLC, one of California's largest oil and gas producers, had for decades dumped billion of gallons of wastewater that slowly leached pollutants into nearby groundwater. It's unknown if any of this wastewater came from hydraulic fracturing; what is clear is that California's ground and drinking water are not being adequately protected from the hazards of fracking and oil and gas operations in general.

Just last year, moreover, the federal Environmental Protection Agency audited the Division's activities and found a variety of "program deficiencies" in its regulation of other types of underground injection. Among other things, the EPA concluded that the state agency's rules do not adequately protect all underground drinking water sources and could leave some "exposed to fluid movement" of hazardous chemicals used in drilling operations.

In summary, the Division of Oil and Gas insists in the face of overwhelming evidence to the contrary that fracking is rare in California. As a result, the agency can hardly look for problems stemming from hydraulic fracturing, because it has no idea where fracking is occurring. Furthermore, the division says it has no plans to regulate or even monitor the practice unless the legislature requires it or the agency is handed evidence that fracking is causing "manifest damage and harm." The division maintains this head-in-the-sand stance even though it sought and received funding to develop regulations to prevent groundwater contamination from hydraulic fracturing.

Full Report

State Regulators Asleep at the Wheel

In California, the Division of Oil, Gas and Geothermal Resources is charged with regulating all phases of oil and gas development and ensuring that these activities do not harm people or the environment. [1] Anyone wishing to drill new wells, rework existing wells or plug and abandon old ones must apply for a permit from the division. The agency tracks the exact amount of oil and gas produced, the drilling depth and the amount of fluid injected during the course of various enhanced oil recovery projects. [2] The division does not, however, track, regulate or monitor any aspect of hydraulic fracturing, which involves high-pressure injection of millions of gallons of water laced with sand and a variety of chemicals in order to create a network of cracks in underground formations and free trapped oil or gas, dramatically increasing production.

The term hydraulic fracturing does not appear once in the 274 pages of the agency's 2009 Annual Report (the latest available). [3] In late 2010, EWG could not find even one mention of hydraulic fracturing on the state's website. And on Dec. 7 of that year, a Department of Conservation representative sent EWG a [fact sheet](#) that said:

"Although companies are not required to report the use of hydraulic fracturing for well stimulation in California, anecdotal evidence suggests fracking similar to that used in the eastern U.S. is not common in the state. Fracking generally involves the use of significant amounts of water. DOGGR is unaware of projects using unusual amounts of water... Fracking seems to be limited in California because: A) equipment costs are high and B) the state is not underlain by the massive shale formations where fracking is most effective... In California, fracking is occasionally used for a brief period to stimulate production of both oil and gas wells." [4]

The fact sheet, later posted on the division's website, essentially said that the state didn't know anything, but the public shouldn't worry because fracking is uncommon in California.

On Jan. 13, 2011, state Sen. Fran Pavley (D-23), who represents a district that stretches from downtown Los Angeles west to Oxnard, [wrote to the supervisor of the Division of Oil and Gas](#) requesting basic information

about fracking in California. [5] In its [Feb. 16 response](#) the division detailed how little the agency knew. [6] The division reported that it:

- was “unable to identify where and how often hydraulic fracturing occurs in the state”
- was “not aware of the amount of energy produced using hydraulic fracturing;”
- had “no information” about water use;
- had “no data on the safety, efficacy and necessity” of the practice;
- had “no permitting process” and “no regulations currently in place specific to hydraulic fracturing.”

The division’s letter added that the “limited data we have is unreliable as there are neither reporting requirements nor regulatory parameters of when, how, and what needs to be reported when applying for permits.”

The division did say, however, that it had the legal authority to regulate fracking: “Although the division has statutory authority to regulate hydraulic fracturing under Section 3106 of the Public Resources Code, the division has not yet developed regulations to address this activity.” [7]

At some point in the spring of 2011, the division removed from its website the fracking fact sheet it had sent to EWG in December 2010. On May 1, the agency replaced it with a revised hydraulic fracturing page that said almost nothing about fracking in California but did include a link to the [division’s letter to Sen. Pavley](#) and a link to a new “[Hydraulic Fracturing Information Sheet](#).” This document, which was still on the division’s website in February 2012, states that the agency “only has anecdotal information about the use of the practice. That said, the division does not believe that fracking is widely used in California.” [8]

Under the heading “Is Fracking used in California?” the “information sheet” adds this:

“Fracking, as portrayed in the documentary ‘Gasland,’ is used to retrieve non-associated natural gas. More than 90 percent of California’s non-associated gas production occurs north of Stockton and is produced from sands rather than shale. Sands do not respond well to hydraulic fracturing.”

The division does not mention that fracking is also used to enhance the recovery of oil. As it turns out, fracking is used widely in California for oil extraction.

On Feb. 16, 2012 the Division of Oil and Gas updated its hydraulic fracturing fact sheet once again. In the

[new version](#), the Division acknowledges for the first time that fracking is happening in California, saying that “fracking is used for a brief period to stimulate production of oil and gas wells.” [9] The Division, however, once again focuses on fracking for natural gas, even though the practice is almost exclusively used in California to enhance oil, not gas production. The fact sheet asserts: “The Division only has limited information about the use of the practice. Although some companies have voluntarily announced that they are fracking, the Division doesn’t believe the practice is nearly as widespread as it is in the eastern U.S. for shale gas production.”

Fracking is Widespread in California

In contrast to the state agency’s stance, EWG research turned up more than three-dozen scientific articles that clearly show that hydraulic fracturing has been widely used in California for almost 60 years. The first reference appears in a [1960 paper](#) that noted, “Well stimulation by hydraulic fracturing and by associated techniques has been carried out in fields along the Whittier fault trend in the Los Angeles basin since 1953, with a total of 53 jobs performed to date.” [10]

In a [1978 industry journal article](#), Tenneco Inc. boasted of its “massive hydraulic fracturing job that ranks as the biggest ever undertaken in California,” though it classified the million-dollar effort as experimental. [11] From



*Venoco Rig Drilling Exploratory Well, Hames Valley, Bradley, Monterey County, California, 2010”
(Photo credit: Charles Rowley)*

then on, things sped up quickly. A [1984 article](#) in the Journal of Petroleum Technology, Mobil Oil Corp. engineers said: “Our company began fracturing diatomaceous earth zones in the San Joaquin Valley (CA) in 1976. Since then, hundreds of fracture treatments have been performed in several fields in formations of this type in the valley.” [12]

A decade later, [Chevron Corp. scientists wrote](#) that as of July 1, 1994, “over 2,000 fracture stages have been performed during the completion of over 600 wells” in California’s Lost Hills field, an area that was not subjected to much fracking until the mid-to-late 1980s. [13, 14, 15] The article said fracking had become more than commonplace, stating: “Massive hydraulic fracturing treatments... are an integral part of developing these reserves.” [16] That same year, an [industry publication](#) reported that Chevron and Dowell Co. performed a world record “frac” in the Lost Hills, pumping 2.97 million pounds of sand proppant into a single well. [17]

In a [2008 paper](#) prepared for a meeting of the Society of Petroleum Engineers, Pinnacle Technologies made clear how extensively fracking was being used in the state, reporting that “[t]he process has been applied to a large scale in many Central and Southern California fields to enable economic development and reasonable hydrocarbon recovery. Example formations include the Belridge Diatomite, Stevens Sands, Etchegoin, Antelope shale, McLure shale, McDonald shale, Point of Rocks sands, Kreyenhagen shale, Ranger sands, the UP Ford Shale, and the Monterey shale.” [18]

While most of the fracking in California to date has been used to increase oil production, there are indications that fracking for gas may be on the increase. As the same 2008 industry article reported: “Despite the routine application of fracturing in many fields, there has been little fracturing experience in the gas-producing formations of Northern California... Based on the initial experience and formation properties, it is believed that hydraulic fracturing has a significant potential in many Northern California gas reservoirs.” [19]

Denver-based Venoco Inc. is acting on this potential. [According to the transcript of a 2008 call to investment analysts](#), company executives touted the Monterey Shale formation as a huge oil and gas play, reporting that the “[i]nitial result of the hydraulic fracturing program we began the fourth quarter continues to be encouraging... We frac [sic] 16 wells in the first quarter and on pace [sic] to frac more than 50 wells this year... we will be aggressively moving the frac program forward to unlock potential [sic] of the field.” [20]

The [database maintained by the oil and gas industry’s website Frac Focus](#), where companies can disclose

information about their fracking practices if they choose, lists 78 wells in California as of Feb. 21, 2012. [21] Of these, one is in Los Angeles, one in Ventura County and two are just barely off the coast of Long Beach. One is shown near Santa Barbara on a map, but the attached documentation places the well in Kern County. The other 73 wells are also in Kern County. All of these wells were fracked sometime in 2011 or 2012. Listings on Frac Focus are entirely voluntary and are known to be incomplete, so this accounting is not likely to be comprehensive.

Documentation from various sources shows that fracking has taken place in at least six California counties: Kern, Los Angeles, Monterey, Sacramento, Santa Barbara and Ventura. [22, 23, 24, 25, 26, 27] It is likely, however, that hydraulic fracturing has been used elsewhere as well. In 2009, the [division reported](#) oil and gas production in 31 of California's 58 counties from a total of 52,186 oil wells and 1,639 gas wells. [28]

Representatives of Halliburton, the energy services company, told EWG researchers that they estimate that 50-to-60 percent of new oil wells in Kern County, the major oil producing county, are being hydraulically fractured. According to the [2009 annual report](#) of the Division of Oil and Gas, 1,527 new wells drilled that year in the county's five most productive oil fields in. [29] From these figures, EWG estimates that, at a minimum, more than 750 California wells were fracked in 2009. This is almost certainly an underestimate, because it accounts for only a subset of the wells in the state, and only about half as many wells were drilled in 2009 as in each of the previous two years.

In Feb. 8, 2012, when EWG researchers described the evidence on the extent of fracking in California to the division's new Oil and Gas Supervisor, Timothy R. Kustic, he responded that the agency had never claimed that fracking was not widespread, only that the division did not have any information about it. Kustic acknowledged that fracking had been used for decades in the state and that he had personally observed a "frac job" in the Sacramento-San Francisco Bay Delta area. Kustic had no answer when EWG quoted from the agency's own [fact sheet](#) that the "the division does not believe that fracking is widely used in California." [30] Notably, Kustic was present at a January 2011 meeting between EWG researchers and division officials and did nothing to refute or correct statements made by then-division head Elena Miller that fracking was not common in California.

Regulators Requested Money to Develop Rules but Did Nothing

Despite its public position that fracking is rare in California, on May 10, 2010 the [Division of Oil and Gas asked the legislature](#) for 17 new positions and a “baseline” appropriation of nearly \$3.2 million (\$2.7 million to be renewed in future years) in order to “strengthen regulatory oversight for all UIC [Underground Injection Control] programs.” [31] Officials wrote that the program was needed to prevent damage to water and natural resources that may be affected by processes that inject fluids and/or gases underground, either to enhance oil and gas production or to dispose of wastes.

In its request, the division said it had been overseeing the underground injection control program since 1983 and that an “expansion of this existing regulatory program is needed to include shallow thermal diatomite wells and hydraulic fracturing. It makes more sense to expand an existing program rather than try to establish a brand new program in a different state agency.” [32]

In two other places in its [letter](#), the division argued for expanding its regulatory programs to include hydraulic fracturing, saying:

“If California wants to move forward and meet the changing needs and technology associated to [sic] oil and gas production, California needs to establish a program to oversee the injection and monitoring of new technology not covered by existing regulations... Californians would not want to see the injection of fluids associated with oil and gas production migrating beyond the area of where it is intended to be.” [33]

In short, the division was arguing that it needed new funding to regulate new types of underground injection, including hydraulic fracturing, while insisting in other documents that the practice was rare. The legislature approved the additional \$3.2 million.

Six months later, division officials told EWG researchers at a January 2011 meeting that they had no plans to regulate hydraulic fracturing. Moreover, the agency’s [Feb. 16, 2011](#) letter to Sen. Pavley mentioned that a budget change was approved in 2010 “to provide additional resources to address deficiencies in the Underground Injection Control Program.” [34] In direct conflict with what the agency said in its actual budget request, the

letter to Pavley said only that the agency was “in the process of determining what regulations are needed.” It did not say that the division was planning to develop regulations for hydraulic fracturing. [35]

A year later, in February 2012, representatives of the Department of Conservation and the division of Oil and Gas met with EWG and six other environmental organizations. After repeated questioning, Mark Nechodom, the new director of the Department of Conservation, said the agency did not currently have development of fracking regulations “on its plate.” He added that the state would only develop such regulations if the legislature were to require them or there was “manifest damage and harm” from fracking in California.

The state legislature may yet require the division to develop fracking regulations. In February 2011, Assembly Member Bob Wieckowski introduced [Assembly Bill 591](#), basic right-to-know legislation jointly sponsored by EWG and Earthworks, a non-profit that focuses on energy and mineral development issues. Under AB 591, companies would be required to disclose where they are fracking, what chemicals they are using (and in what volume and concentrations), how much water they are using and how they will dispose of wastewater.

The bill sailed through the state Assembly and two policy committees in the Senate but stalled in the Senate Appropriations committee. AB 591 is now a two-year bill, meaning that it must be passed by the legislature by the end of August 2012 in order to reach the governor’s desk in the current session. The major stumbling block has been Halliburton’s objection to disclosing the volume and concentration of certain chemicals it uses, even though the bill includes provisions to protect trade secrets and the company supported a similar provision in Colorado’s recently enacted fracking regulations.

At hearings on the bill in the Assembly and the Senate, representatives of the oil and gas industry freely admitted that there had been fracking in California for decades. The Division of Oil and Gas sent no representatives to any of the hearings and currently says it is neutral on AB 591.

Fracking Could Threaten California’s Groundwater

In its [2010 hydraulic fracturing fact sheet](#), the Division of Oil and Gas said, “To date, DOGGR has no evidence of freshwater contamination resulting from fracking in California.” [37] This may well be true – and is hardly surprising. Since the agency does not know where hydraulic fracturing is taking place, it could not look for evidence of contamination even if it wanted to.

The reality is that the state has never assessed fracking's risks to California's groundwater. In her [2011 letter](#), Sen. Fran Pavley asked the division to "provide the results of any risk assessments that the State of California has conducted regarding potential groundwater contamination associated with hydraulic fracturing." [38] The [agency responded](#): "The division does not know of any state risk assessment regarding potential groundwater contamination associated with hydraulic fracture." [39]

There are solid reasons to be concerned about fracking's potential threat to California's groundwater. [The U.S. Environmental Protection Agency concluded](#) in December 2011 that fracking and natural gas drilling had contaminated groundwater in Pavillion, Wyo. [40] It wasn't the first time the EPA had reached that conclusion. As far back as 1987, [an EPA study](#) found that fracking of a natural gas well had contaminated an underground drinking water source in West Virginia. [41] EPA investigators said the contamination was "illustrative" of a broader problem of pollution associated with hydraulic fracturing but added that their investigation was hampered by confidentiality agreements between industry and affected landowners.

A few years earlier, in 1983, the [EPA had granted the California Division of Oil and Gas "primacy,"](#) or primary authority, for regulating what are known as Class II injection wells. [42] This includes wells where operators inject fluid deep into the earth to enhance oil recovery or to dispose of fluid wastes associated with oil and gas production. Hydraulically fractured wells are technically Class II injection wells, but the practice is not regulated under federal law because Congress in 2005 [exempted fracking from the Safe Drinking Water Act](#) after heavy lobbying by energy companies. [43] What that means is that the job of protecting California's groundwater had been given to a state agency that believed fracking was all but non-existent, while EPA was under orders not to take on the job at all.

Nevertheless, in 2011 the [EPA evaluated](#) how the state agency "oversees and manages the permitting, drilling, operation, maintenance and plugging/abandonment of Class II [underground injection wells]..." [44] The federal regulators found that the California agency's program did not meet a number of federal requirements, and in July 2011, they sent a letter to the division highlighting a variety of "program deficiencies that require more immediate attention and resolution." [45]

In the letter and accompanying [490-page report](#), the EPA said the division's current regulations for Class II injection wells fail to protect potential underground sources of drinking water. [46] The state division's "actual practices" could leave underground sources of drinking water "exposed to fluid movement due to improperly

plugged wells and/or lack of cement in the casing/wellbore annulus,” the EPA evaluation said. [47]

The EPA also said that the division is not adequately protecting drinking water from underground injection activities because “Zone of Endangering Influence” determinations “are not being performed for injection wells throughout the state.” [48] This zone is the area in which pressure from the injection process could cause injected fluids to migrate into underground sources of drinking water. Instead of making site-specific assessments, the EPA said, the state division is simply assuming that the radius for potential fluid migration is a quarter-mile. As the EPA explained, while “the fixed radius approach may be appropriate for some injection wells, there are others where this approach will not adequately capture the full extent of pressure influences from the injection activity (i.e., the [Zone of Endangering Influence], if calculated, would exceed a quarter-mile radius around the well).” [49]

In addition, the EPA determined that the division is not requiring adequate testing to ensure that pressure levels in injection wells are safe. [50] Both federal and California law limits injection pressures to ensure that well casings remain intact and that no damage will be done to the surrounding geologic formations or drinking water sources. [51]

Taken together, the EPA’s findings of serious deficiencies in the state agency’s current regulations raise the question of whether the California Division of Oil and Gas has the capacity to adequately protect drinking water from fracking risks even if it tried.

This is not simply a theoretical issue, since there is at least one well-documented case of above ground disposal of wastewater from oil and gas operations contaminating California groundwater. In 1999, when Kern County farmer Fred Starrh began irrigating his fields partly with groundwater, his cotton plants wilted and his almond trees died. Starrh suspected contamination from nearby Aera Energy’s oil drilling and [sued the company](#). [52] Through this lawsuit, he discovered that the company, which is jointly owned by Shell and ExxonMobil, had dumped billions of gallons of wastewater into unlined pits that eventually contaminated the underlying aquifer. Nine years later, Starrh was awarded \$8.5 million in damages, though he said it would cost many times more than that to truly clean up his fields and groundwater. Other farmers may also be at risk. Of the 78 wells in the incomplete listings on [FracFocus’ website](#), 13 appear to be in the middle of agricultural fields. [53]

The question of how much water is being used for hydraulic fracturing is also important for California, given

the state's perpetual water woes. According to EWG's review of a sample of fracked wells [described on the FracFocus website](#), the amount of water used to frack a single well can range from about 100,000 to more than 1.5 million gallons. [54] It's unknown how much of this is fresh water versus produced or recycled water, but it is clear that fracking has the potential to use significant amounts of California water. And during droughts, when farmers and state residents get their water cut back, the oil and gas industry often [suffers from no such cutbacks](#). [55]

Fracking and Toxic Chemicals

Another reason for Californians to be concerned about unregulated hydraulic fracturing is the many toxic chemicals that are used in the process, including some that are known carcinogens and reproductive toxins.

To release oil and natural gas from underground formations, drillers inject anywhere from tens of thousands to millions of gallons of fluid into wells under extremely high pressure. This creates fractures that extend out from the well into the surrounding formations and free trapped gas or oil, dramatically increasing production. Fracking fluid is typically about 90 percent water and 9 percent "proppant," typically sand, that is used to "prop" open the fractures. [56] The fracking fluid also contains relatively small amounts, often less than 0.5 percent, of chemical additives.

This percentage seems small, but the total amount of chemicals can actually be large because of the huge volumes of fluid used, and even very low levels of chemicals in drinking water can cause major problems. A single teaspoon of benzene, for example, is enough to contaminate more than 260,000 gallons of water to a level that exceeds the EPA's drinking water standard of 5 parts per billion.

The chemicals in fracking fluid can range from relatively benign compounds to known carcinogens. They are introduced for a variety of purposes, including killing bacteria, inhibiting corrosion, reducing friction, increasing fluid viscosity and reducing surface tension. Because disclosure is not required in California, it is unknown exactly which chemicals are being used in the state. However, [New York State has assembled a list](#) of nearly 200 chemicals that are being used or proposed for use in fracking operations there. [57] Among them are ten chemicals known under [California's Proposition 65 program](#) to cause cancer and/or reproductive harm: 1,4 dioxane, formaldehyde, benzene, toluene, ethylbenzene, acrylamide, naphthalene, dibromoacetonitrile, ethylene oxide, and thiourea. [58]

This is just the beginning. According to the New York Department of Conservation, the 200 chemicals have also been associated with cancer and reproductive effects, adverse effects on the nervous system, liver, kidneys, blood-cell-forming tissues, respiratory and gastrointestinal tracts, as well as general irritation to the skin, eyes, nose, and throat. [59] For many chemicals on New York’s list, there is little information at all on their potential health hazards.

The use of diesel fuel and its components for fracking has received special attention. In a [2004 report](#) on hydraulic fracturing of coal bed methane natural gas deposits, the EPA concluded that “the use of diesel fuel in fracturing fluids poses the greatest threat to [underground sources of drinking water] because BTEX compounds in diesel fuel exceed the [maximum contaminant level] at the point-of-injection.” [60] BTEX refers to benzene, toluene, ethylbenzene and xylene, all of them toxic at very low concentrations.

For Californians, this, too, is no mere theoretical risk. In 2011, a [Congressional investigation](#) determined that 26,444 gallons of diesel fuel had been injected into California wells in hydraulic fracturing fluids from 2005-2009. [61] But once again, the Division of Oil and Gas insists it is powerless. Its 2011 [fracking fact sheet](#) says that “DOGGR has no authority to permit the injection of diesel fuel because it is a refined product.” [62]

According to the EPA, long-term exposure to benzene can cause cancer, and short-term exposure can lead to temporary nervous system disorders. Long-term exposure to toluene, ethylbenzene and xylene can cause liver and kidney damage as well as nervous system disorders such as spasms, tremors and speech impairment. Short-term exposure can cause health problems including fatigue, impaired cognitive ability and nausea. [63, 64, 65, 66] EPA’s maximum allowable concentration of benzene in drinking water is five parts per billion – higher amounts are considered harmful – and the agency’s policy goal is to have no benzene in water. [67]

In a 2004 article published in the European Journal of Oncology, Myron A. Mehlman, a professor at the Robert Wood Johnson School of Medicine and Dentistry, wrote that “there is no safe level of benzene above zero that can protect workers and the public from the carcinogenic effects of benzene.” [68] EPA’s maximum levels for the other BTEX chemicals in drinking water are one part per million (ppm) for toluene, 0.7 ppm for ethylbenzene and 10 ppm for xylene. [69, 70, 71]

The EPA has estimated that the concentration of benzene in fracturing fluid at the point of injection ranges between nine times and 880 times the safe level for water. The agency also concluded that toluene, ethylbenzene

and xylene also exceed safe levels in some situations. [72] The oil and gas industry often insists that fracking fluids couldn't possibly pose a threat to drinking water supplies because the chemical additives constitute a very small percentage and typically are injected thousands of feet below groundwater sources. EPA's findings have shown that this argument doesn't hold water.

Communities Begin to Question as Drilling Companies Point to California

In 2009, California produced 229.8 million barrels of oil, making it the fourth largest oil producing state after Alaska, Texas, and Louisiana. The number of oil and gas wells has been steadily rising over the last 15 years, from 44,217 oil wells and 1,172 gas wells in 1995 to 52,186 oil and 1,639 gas wells in 2009. [73]

The amount of oil produced has actually declined somewhat in recent years, but the still untapped potential resource is massive. As the federal [Energy Information Agency notes in its July 2011 report](#) on emerging US energy sources, California's Monterey shale is the largest such formation in the country. With 15 billion barrels of recoverable oil underlying 1,750 square miles of Southern California, the Monterey formation represents 64 percent of the nation's shale oil. [74]

Hydraulic fracturing is being touted as a key to tapping fully into this resource. In May 2010, Venoco Inc. held a briefing for potential investors at the New York Plaza Hotel focusing on its "Monterey Shale exploration opportunities and exploitation program." [75] In the [100-slide PowerPoint presentation](#), Venoco representatives said that "recent advances in 'unconventional' development technology have the potential to unlock immense reserves in the Monterey." They added that although the Monterey formation "has produced for over a century... technology to fully exploit its potential is very recent." And, finally, they noted that the "unconventional" or "enabling technologies" include "horizontal drilling," "massive hydraulic fracturing" and "multi-stage stimulation." [76]

While fracking is still something of a sleeper issue in California, companies are beginning to encounter resistance as communities become aware that the practice is taking place nearby. In June 2011, Los Alamos rancher and vineyard owner Steve Lyons contacted Santa Barbara county officials after discovering that Venoco had fracked a well on his property. Lyons has what is known as a "split estate;" he owns his land but not the mineral rights

beneath it, which were retained by a previous property owner. As his ranch manager, Tom Prendiville, told [a wine industry publication](#), “This did not happen with our permission.” [77]

Santa Barbara officials were taken aback. They had not known that fracking was taking place in the county, even though [Venoco claimed](#) that it is not the first operator to frack there and that the practice had been used in other wells for more than 25 years. [78] After a series of public hearings and forums, [the county Board of Supervisors decided unanimously](#) in December 2011 that companies planning to frack would have to apply for a special permit from the county planning commission. [79] Lyons, meanwhile, has been trying to get a list of the chemicals used so he can test his water but has so far been unsuccessful. The county can’t help because while it can regulate what oil and gas companies do above ground, [the only government agency that can regulate what happens below ground](#) is the state Division of Oil and Gas. [80]

The debate in Monterey County has become even more pointed. After [a county administrator approved a Venoco permit](#) for nine exploratory wells using hydraulic fracturing, a local land trust appealed. [81] The issue was set to be heard at an Oct. 26, 2011 planning commission meeting, but Venoco quickly [pulled its permit application](#) after the commission [released a meeting agenda](#) noting that it recommended supporting the appeal and denying the project. [83]

The pushback on fracking in California is extending to the courts. When the state Bureau of Land Management released its environmental assessment for the proposed leasing of more than 2,500 acres of land in Monterey and Fresno counties in April 2011, [environmental advocates objected](#), focusing particularly on the potential impact of hydraulic fracturing. [84] After their concerns were dismissed, [the Center for Biological Diversity and the Sierra Club lodged a formal protest](#) and then, in December, sued the Bureau for failing to address the issue. [85] The suit is pending.

It remains unclear is whether fracking could potentially trigger earthquakes in California. It’s been known for decades that wastewater injection can cause quakes, and [recent evidence](#) has pointed to at least some potential for hydraulic fracturing to trigger them as well. [86, 87, 88] At this point, the threat of groundwater contamination from fracking seems much more serious than the potential for triggering a big quake in California, but given the state’s seismic history, it would be foolish to dismiss the question. Right now, with very little information on fracking available to scientists or the public at large, it is impossible to even begin to study the issue.

Conclusion and Recommendations:

It is troubling and even shameful for California, a state that has been a leader on environmental issues, to be turning a blind eye toward the risks of hydraulic fracturing. The responsible state agency has gone out of its way to avoid regulating the practice even after it requested and received funding to do so. EWG recommends the following actions to correct the missteps by the Division of Oil and Gas and ensure that California's ground and drinking water is adequately protected from the threat of hydraulic fracturing:

1. The Division of Oil and Gas should update its fact sheet to clearly acknowledge that fracking is currently taking place in California and has been for decades.
2. The Division should identify and track where fracking is taking place and post the information on a state-run website.
3. California state agencies should develop regulations that require oil and gas companies to disclose what chemicals they are using to frack each well (with volume and concentrations), the amount of water used, the source of the water, and whether any radioactive tracers are being used. This will allow regulators, scientists and landowners to learn what substances to test for in nearby water supplies.
4. Landowners within at least two miles of proposed drilling or fracking operations should be notified and given an opportunity to weigh in on permit decisions.
5. Oil and gas companies should be required to pay for testing and monitoring of nearby groundwater before and after drilling and fracking by independent laboratories selected by potentially affected landowners. The federal EPA recently made a similar recommendation to New York State authorities.
6. Water recycling should be mandatory for oil and gas operations.
7. Because of its inherent risks, drilling and fracking should not be allowed close to residential areas or drinking water sources. The state should rely on the best available science to establish areas where drilling and fracking should be prohibited.

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