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Why Not Frack?

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Bill McKibben

The End of Country
by Seamus McGraw
Random House, 245 pp., $26.00

Under the Surface: Fracking, Fortunes, and the Fate of the Marcellus Shale
by Tom Wilber
Cornell University Press, 272 pp., $27.95 (to be published in May 2012)

Gasland
a documentary film by Josh Fox
Docurama, DVD, $29.95

Garth Lenz

A fracking site run by the Cabot Oil and Gas Corporation in Susquehanna County, Pennsylvania, October 2011

In one sense, the analysts who forecast that "peak oil"—i.e., the point at which the rate of global petroleum extraction will begin to decline—would be reached over the last few

years were correct. The planet is running short of the easy stuff, where you stick a drill in the ground and crude comes bubbling to the surface. The great oil fields of Saudi Arabia and Mexico have begun to dwindle; one result has been a rising price for energy.

We could, as a civilization, have taken that dwindling supply and rising price as a signal to convert to sun, wind, and other noncarbon forms of energy—it would have made eminent sense, most of all because it would have aided in the fight against global warming, the most difficult challenge the planet faces. Instead, we've taken it as a signal to scour the world for more hydrocarbons. And it turns out that they're there—vast quantities of coal and oil and gas, buried deep or trapped in tight rock formations or mixed with other minerals.

Getting at them requires ripping apart the earth: for instance, by heating up the ground so that the oil in the tar sands formation of Canada can flow to the surface. Or by tearing holes in the crust a mile beneath the surface of the sea, as BP was doing in the Gulf of Mexico when the Deepwater Horizon well exploded. Or by literally removing mountaintops to get at coal, as has become commonplace across the southern Appalachians.

Or, in the case of the books under review, by "fracking" the subsurface geology in order to make natural gas flow through new cracks. The word is short for "hydraulic fracturing" and in the words of Seamus McGraw, it works like this: having drilled a hole perhaps a mile deep, and then a horizontal branch perhaps half a mile in length, you send down

> a kind of subterranean pipe bomb, a small package of ball-bearing-like shrapnel and light explosives. The package is detonated, and the shrapnel pierces the bore hole, opening up small perforations in the pipe. They then pump up to 7 million gallons of a substance known as *slick water* to fracture the shale and release the gas. It blasts through those perforations in the pipe into the shale at such force—more than nine thousand pounds of pressure per square inch—that it shatters the shale for a few yards on either side of the pipe, allowing the gas embedded in it to rise under its own pressure and escape.

This new technique allowed the industry to exploit terrain that it had previously considered impenetrable. It was used first in the late 1990s in what's called the Barnett Shale in Texas, and is also being widely used to liberate oil from beneath the Bakken Shale in North Dakota. But the industry's biggest excitement has come in the East, where a boom has been underway for several years in the so-called Marcellus Shale that runs from West Virginia into upstate New York. This gas-trapping shale formation has been estimated to hold as much gas as the whole United States consumes in a century. (The estimates are

highly contested; some analysts are insisting that new data show them to be considerably smaller, though still vast, and indeed at the end of January the federal government slashed its earlier predictions in half.)

The gas is also ideally situated along the route of many existing natural gas pipelines and near the heavy-consumption eastern megalopolis. If you're an energy company, it's about the best place on the planet to find a huge pool of gas—it's like discovering an underground deposit of beer directly beneath Yankee Stadium. Because of the potential profits, the agents of various companies have fanned out across the back roads of the region in a remarkable land rush, seeking to lock up drilling rights on the hitherto not-very-valuable acreage of marginal dairy farms and cut-over woodlots.

The two books under review tell the story of that land rush. In fact, they manage to tell exactly the same story, with exactly the same set of characters—a few neighbors along a rural road in Dimock, Pennyslvania. Pennsylvania has been the very epicenter of this boom, less for geological than for political reasons: the powers that be in Harrisburg have been remarkably congenial hosts to the new fracking industry, rolling out the red carpet. (They're so generous that, unlike Louisiana or Texas, they don't even charge a severance tax on the gas that's generated in the state. In fact, they've even offered up official state forests for use as drill sites.)

That means that some people have come into unexpected riches, including McGraw's mother, who leased her land for a large sum—for some farmers looking for an easier retirement it's been a blessing. But the money has also divided communities in painful ways, since those who don't reap a bonanza suffer the side effects: the noise and squalor of an industrialized countryside, the danger of quiet roads now overrun with trucks. And even the fortunate run the risk that something will go wrong with the wells on their land.

For example, Victoria Switzer and Ken Ely, neighbors who leased their land to Cabot Oil and Gas in the early days of the boom, then turned into adversaries of the company that did the drilling. They had good reason: before long, drinking water from their wells had turned brown. A neighbor's well exploded, apparently because of "methane migration" from the fracking operations. Cabot insisted it wasn't at fault; for a while it bought bottled water for the neighborhood, but eventually it stopped doing even that. It was, in other words, a kind of horror show, the sort of tragedy that usually accompanies largely unregulated booms. (And this one has been largely unregulated—the Pittsburgh newspaper reported in January that the state doesn't even know where many of the wells in the state have been drilled, because companies, which are supposed to report on their operations, often don't bother.)

The accounts in these two books are complementary. McGraw is the better writer, and because he grew up in the region he has a better story to tell; he describes believable characters and provides a perceptive account of what rural poverty feels like. Wilber is the better reporter; he covered the shale story for the Binghamton newspaper for years, and grounds it in the setting of both Pennsylvania and New York politics.

The two books, however, don't manage to cover some important aspects of the fracking issue. In fact, the most remarkable work on the subject has been done by Ian Urbina, a *New York Times* journalist, and by the rebel filmmaker Josh Fox. Urbina's stories, which seem likely to win a Pulitzer, demonstrate why we can't do without serious newspapers. Beginning last spring, he documented the health risks, lax regulation, industry overstatement, and general corruption that have surrounded the boom.

Fox, for his part, grew up in rural Pennsylvania, and when a drilling company offered $100,000 for rights to his family land, he took his camera to Dimock, and then out west to communities where fracking had been underway for a few years longer, to investigate. The documentary he produced, *Gasland*, earned an Emmy and much critical praise. In the key sequence a Colorado homeowner opens his tap and water comes out, but also gas—which becomes obvious when he lights the stream on fire. One film critic, from *Bloomberg News*, said that Fox "may go down in history as the Paul Revere of fracking," and indeed he has emerged as one of the principal organizers in the fight to limit the spread of the technique. Other opponents—mostly from grassroots environmental groups—have had the most luck in New York, which enacted a moratorium on fracking that may end later this year, and in the Delaware River Basin, whose governing commission has yet to approve widespread drilling.

The emerging movements against fracking, and the science that informs them, raise three key concerns. In ascending order of importance they are:

First, how much damage is being done to water wells and underground aquifers from methane migration and the chemicals mixed with water and then injected into fracking wells under high pressure? You might call this the "flaming faucet" question, and it has understandably and rightly galvanized many of the local people fighting fracking. The industry claims that there's no problem—that the cement casings they put in the wells keep the chemicals out of layers of soil where drinking water might be found. But rigorous scientific study has been scant, in part because since 2005 (at the urging of then Vice President Dick Cheney, whose former company Halliburton is a major player in the fracking boom), drilling companies have been exempt from federal safe drinking water statutes and hence not required to list the chemicals they push down wells.

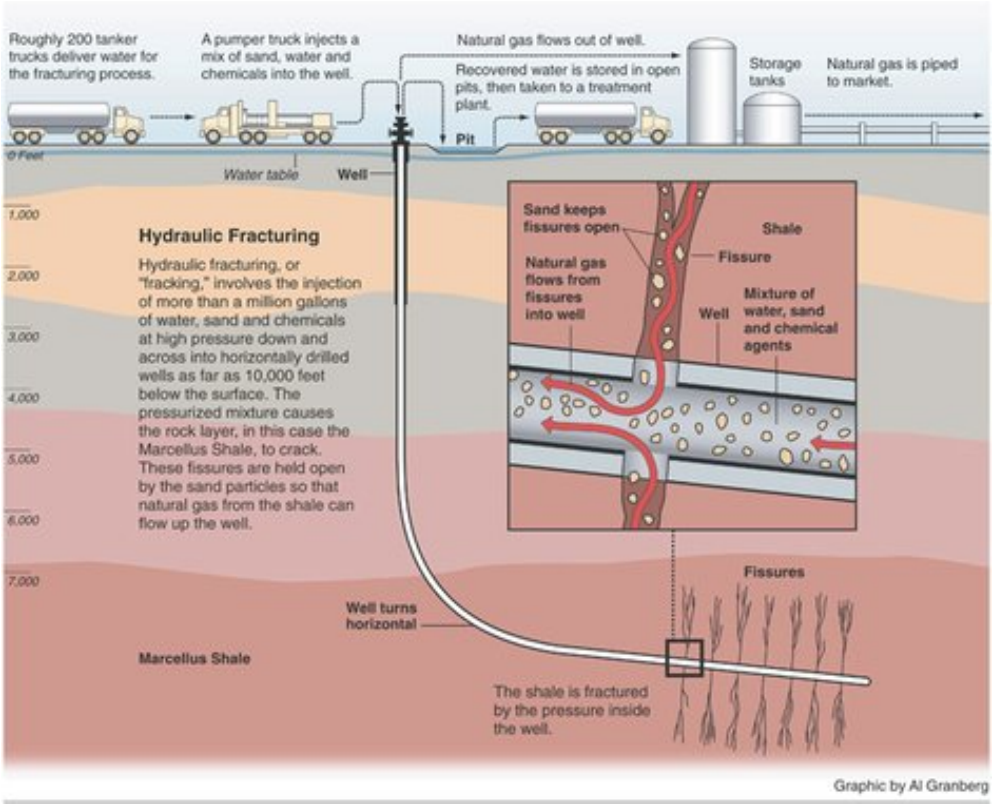
Preliminary research from Duke University seemed to indicate that indeed methane was showing up in drinking water; in December, the EPA released its first thorough study, conducted in the Wyoming town of Pavilion, where residents had reported brown, undrinkable water after nearby fracking operations. The EPA concluded that the presence in the water of synthetic compounds such as glycol ethers and the assortment of "other organic components" were "the result of direct mixing of hydraulic fracking fluids with ground water," and told local residents to stop drinking from their wells.

The company involved insisted that the EPA had introduced the contaminants itself; Oklahoma Senator James Inhofe, best known for decrying global warming as a "hoax," added that the EPA report was part of "President Obama's war on fossil fuels." But the evidence from Pavilion was a powerful indictment of the industry, and it led several leading doctors to call for a moratorium on fracking pending more health research. "We don't have a great handle on the toxicology of fracking chemicals," said Vikas Kapil, chief medical officer at the National Center for Environmental Health, an arm of the Centers for Disease Control.

December, then, was a tough month for the fracking industry, and it ended on a particularly low note—on New Year's Eve a magnitude 4.0 earthquake in Youngstown, Ohio, was blamed on the injection of high-pressure fracking water along a seismic fault, a phenomenon also documented in Arkansas and Oklahoma.

A second concern has to do with the damage being done to rivers and streams—and the water supply for homes and industries—by the briny soup that pours out of the fracking wells in large volume. Most of the chemical-laced slick water injected down the well will stay belowground, but for every million gallons, 200,000 to 400,000 gallons will be regurgitated back to the surface, bringing with it, McGraw writes,

> not only the chemicals it included in the first place, but traces of the oil-laced drilling mud, and all the other noxious stuff that was already trapped down there in the rock: iron and chromium, radium and salt—lots of salt.



Al Granberg/ProPublica

The question is what to do with that volume of bad water. If it leaks into small streams, disaster results: the classic case is Dunkard Creek, which rambles for forty miles along the Pennsylvania–West Virginia border. In Wilber's words, "its clear, green eddies and swimming holes, shaded by hemlock and sycamore trees, attracted generations of anglers, paddlers, picnickers, and nature lovers" who enjoyed the 161 aquatic species found in its waters.

In September 2009, however, pretty much everything died in the course of a few days—everything except an invasive microscopic algae that normally lives in estuaries along the Texas coast. This bloom of "golden algae" that killed everything else was a mystery—how could a species that usually lives in brackish water on the ocean's edge have survived in a freshwater Appalachian creek? The answer emerged swiftly: drilling companies had been illegally dumping wastewater in the region, turning it into brine.

Instead of simply dumping the water, the companies could have sent it to the local sewage treatment plant—but these were generally not set up to handle high volumes of briny water. Along the Monangahela River, for instance, when treatment plants started accepting tanker trucks loaded with waste-water, "workers at a steel mill and a power plant in Greene County were the first to notice something strange: river water began corroding equipment." The state eventually had to put the Monongahela on a list of "impaired rivers," and 325,000 residents of the region were at one point told to drink bottled water.

As Ian Urbina reported in the *Times* last February, the water returning from deep underground can carry naturally occurring "radioactivity at levels higher than previously known, and far higher than the level that federal regulators say is safe for…treatment plants to handle." Despite a 2009 EPA study never made public, the federal agency has continued to allow "most sewage treatment plants that accept drilling waste not to test for radioactivity." And most drinking-water intake plants downstream from the sewage treatment plants, with the blessing of regulators, have not tested for radioactivity since 2006, even though the drilling boom began in 2008.

Industry, as usual, is unconcerned, at least in public. "These low levels of radioactivity pose no threat to the public," said the CEO of Triana Energy. They are "more a public perception issue than a real health threat." But as Urbina pointed out, a confidential industry study from 1990, which looked at radium in drilling water dumped into the ocean off the Louisiana coast, found that it posed "potentially significant risks" of cancer for people eating fish from those waters.

The natural gas wells can cause air pollution problems too: Wyoming, for instance, no longer meets federal air quality standards because of fumes seeping from the state's 27,000 wells, vapors that contain benzene and toluene, according to Urbina.

> In sparsely populated Sublette County in Wyoming, which has some of the highest concentrations of wells, vapors reacting to sunlight have contributed to levels of ozone higher than those recorded in Houston and Los Angeles.

In a county without a single stoplight, regulators this time last year were urging the elderly and children to stay indoors.

There are steps that industry could take to reduce some of the pollution—wastewater, for instance, can be captured in huge on-site tanks and pushed back down so-called "injection wells," precisely the process that apparently set off the Youngstown temblor. Even this process, however, leaves large quantities of salty residue, and the wells can keep oozing out their toxic load for many years after drilling is done. Some enterprising drilling companies have, Urbina wrote, "found ready buyers [for wastewater] in communities that spread it on roads for de-icing in the winter and for dust suppression in the summer. When ice melts or rain falls, the waste can run off roads and end up in the drinking supply."

In any event, overmatched regulators who can't even keep an accurate count of the number of wells are having a hard time coping with waste products—especially since the political power of the industry just keeps growing. Pennsylvania inaugurated a new

governor last year, Republican Tom Corbett, who had taken more gas industry contributions than all his competitors combined. Not only did he quickly reopen state land to new drilling, he claimed regulation of the industry had been too aggressive. "I will direct the state's Department of Environmental Protection to serve as a partner with Pennsylvania business, communities and local governments," he said. [1]

What is the effect of this surge of gas on national and global efforts to cope with climate change? Though New York and other states will make their decisions on drilling largely on the basis of local effects, this may be the most important question of all, since the implications will extend far beyond the borders of particular geologic formations or specific watersheds. Four years ago, when word of the spectacular potential scale of the gas finds began to filter out, many environmentalists were thrilled. Robert F. Kennedy Jr., for instance, who founded the Waterkeeper Alliance and who has been a leader in the fight against mountaintop removal coal mining, wrote an Op-Ed for the *Financial Times* in the summer of 2009 declaring that "a revolution in natural gas production over the past two years has left America awash with natural gas and has made it possible to eliminate most of our dependence on deadly, destructive coal practically overnight."

The reason environmentalists prefer gas to coal is simple: when burned, it produces about half as much carbon dioxide per unit of energy. That is, if we could convert our coal-fired power plants to natural gas (which in most cases is not that hard to do), carbon emissions would drop. But it's actually not that simple. Natural gas—CH4—in its unburned state is a remarkably powerful greenhouse gas itself, molecule for molecule many times stronger than CO2. So if even a little bit leaks out to the atmosphere in the drilling process, gas, according to some estimates, can cause even more global warming than coal.

The data showing just how much it would do so are scarce. An early study from Robert Howarth at Cornell found that fracked gas might do 20 percent more damage to the climate, at least over the next few crucial decades, than coal; earlier this winter another Cornell team, using different leakage rates, found that it might be only half as bad as coal. More data may eventually clarify the extent of the threat. But fracked gas is not as clear a winner in this fight as many had originally assumed.

There's a deeper question still. If we increased the use of natural gas, it would replace some coal from the planet's power-generating mix. But it would also crowd out truly low-carbon sources of power: abundant and cheap natural gas would make it that much harder to get sun and wind (or, if it's your cup of hot water, nuclear power) up and running on a large scale.

As the International Energy Agency reported last summer, the numbers are significant:

their projections for a "Golden Age of Gas" scenario have atmospheric concentrations of CO2 peaking at 650 parts per million and temperature rising 3.5 degrees Celsius, far higher than all the experts believe is safe. In September, the National Center for Atmospheric Research tried to combine all the known data—everything from methane leakage in coal mines to the cooling effects of coal-fired sulfur pollution—and concluded, in the words of the scientist Tom Wigley, that the switch to natural gas "would do little to help solve the climate problem."

As a result of such findings, and of all the on-the-ground problems in Pennsylvania and out west, environmental groups are backing away from their earlier support for gas. Robert F. Kennedy Jr., for instance, has grown increasingly critical; and at the grassroots tens of thousands of highly organized activists with visible and articulate spokesmen (the actor Mark Ruffalo has been especially notable) are making an impressively strong stand against further drilling.[2] Their efforts come up against the staggeringly deep pockets of the fossil fuel industry, which is used to winning battles. Bowing to that pressure, and trying to ward off the appeal of the GOP's "drill, baby, drill" rhetoric, the president praised fracking in his State of the Union address, promising to "develop this resource without putting the health and safety of our citizens at risk."

The rush to exploit "extreme energy," and to rip the planet apart to get at it, knows no national boundaries. Urbina reported last year that the big energy companies have spread the fracking technology around the planet, finding new shale deposits in more than thirty countries.

One can reasonably expect that if regulators are overwhelmed in Pennsylvania, the same may be the case among the shale deposits in Papua New Guinea. In any event, it should by now be clear that fracked gas is not a "bridge fuel" to some cleaner era, but a rickety pier extending indefinitely out into a hotter future. This is one of those (not rare) cases where abundance may prove a great problem.

LETTERS

Why Frack? April 26, 2012

'Why Not Frack?' March 22, 2012

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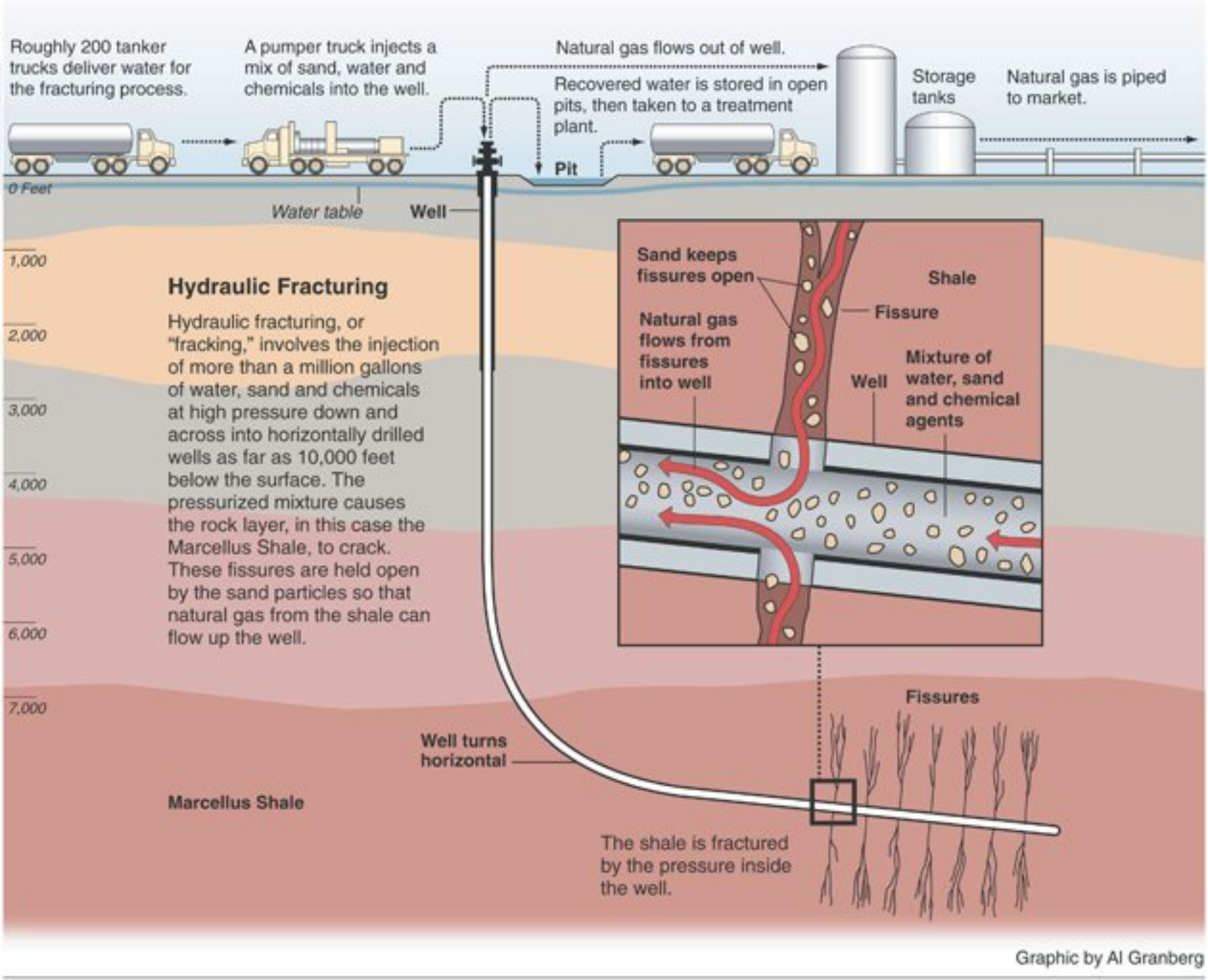
1. 1
The list of environmental consequences associated with fracking sometimes seems endless. In January the *Chicago Tribune* reported that the very fine sand ideal for

including with the slick water pushed down the wells is slated to come from a 425-million-year-old rock formation just outside the gates of an Illinois state park, spurring widespread protest from neighbors and conservationists. ↩

2. 2
Kennedy is not the only one to make this transition. I was originally encouraged at the thought of major natural gas finds as well, because they seemed, as I mentioned in passing in my 2010 book *Eaarth*, to extend slightly the short time we have to get off fossil fuel without doing more climate damage. But as I researched the method, its appeal steadily lessened, and in the last year I've been joining with others to actively oppose fracking. ↩



Graphic by Al Granberg