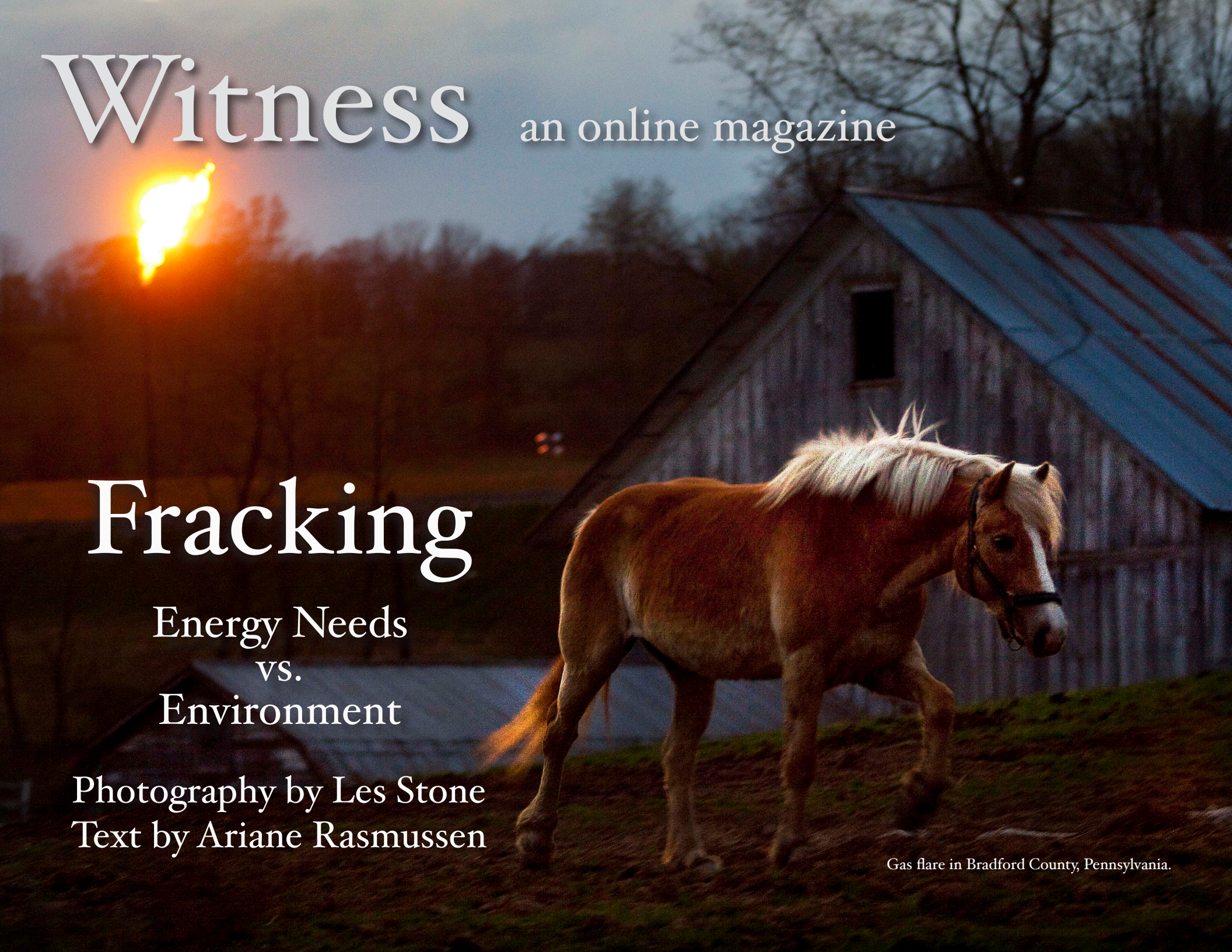
Witness an online magazine

Fracking

Energy Needs vs. Environment

Photography by Les Stone
Text by Ariane Rasmussen



Gas flare in Bradford County, Pennsylvania.



Fracking

Energy Needs vs. Environment

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Text by Ariane Rasmussen

Hydraulic fracturing, also known as fracking, has been the subject of widespread controversy for some time now – especially in the Marcellus Shale region of Pennsylvania, United States. Here the unconventional method of "horizontal drilling" to extract natural gas from deep rock formations has been going on since 2008.

Fracking is the process of injecting millions of gallons of water, mixed with sand and chemicals, into a well to create small cracks in underground rock formations to prop it open and allow gas to flow to the surface. It is just one of the steps in the natural gas extraction process. The Marcellus Shale, an area rich in gas, is located under parts of Pennsylvania, New York, Ohio, and West Virginia, and is only one of the many areas being drilled throughout the country.

While the gas industry says that shale gas extraction operations are safe, help address the nation's energy needs, create new jobs, and foster economic growth, there are also major concerns that gas-related byproducts harm the environment and those living in nearby areas. Concerns include an increase in earthquake activity, the pollution of air and water, a decline in public and livestock health, and a threat to the livelihood and overall quality of life of many locals and small farm owners.

According to the Energy Information Administration (EIA), U.S. shale gas production has increased twelve-fold over the past decade. In fact, the EIA projects that, at this pace, shale gas production will rise to 13.6 trillion cubic feet (tcf) by 2035, representing nearly half of all U.S. natural gas production –1 tcf of natural gas is enough to heat 15 million homes for one year, generate 100 billion kilowatt hours of electricity, or fuel 12 million natural-gas-fired vehicles for one year.

The two major areas for natural gas production in Pennsylvania are Susquehanna and Bradford counties. They have the most wells being drilled and the most gas being produced, says George Stark, director of external affairs for Cabot Oil and Gas Corporation. They drill 7,500 feet down to get into the Marcellus Shale.

Cabot is among the major operators in that area, with 200 thousand acres of land leased in Susquehanna County, which includes Dimock Township, and a total of 175 wells already completed.



The extraction and production of natural gas requires many steps including the drilling and hydraulic fracturing of wells, the "completion" or cleaning up of the wells, the treatment and compression of gas, and the gathering and processing of gas.

It takes about 20 days to drill one well, about one week to "complete" the well and then the pipeline is put in to carry the gas off to market. A well pad site consists of 4-6 wells. Compressor stations and impoundment pounds are also common near gas sites.

"If you took the amount of gas that is produced in Susquehanna County and Bradford County in 6 months, you would heat and provide all the energy needs for 6 million homes for an entire year," Starks says. Currently, there are approximately 34 states being drilled for natural gas in the United States. The boom that has occurred in the past decade was possible thanks to technological advances that made horizontal, and not just vertical, drilling possible.

Dr. Art McGarr, a geophysicist with the U.S. Geological Survey (USGS), has been studying the connection between fracking-related operations and earthquake activity. He notes that his administration has been very positive about horizontal drilling as at least a temporary answer to the country's energy problems. More domestic energy means





Pipelines being laid in Bradford County. Thousands of miles of pipeline are being laid around Pennsylvania to transport the gas.



Drilling, fracking and pipeline operations from the air.

less dependence on the Middle East and South America.

"So, the government has promoted shale gas operations and it's really been almost like a new Gold Rush. There's been just amazing oil and gas booms going on because of this so-called 'unconventional' technology that has come into play in many parts of the U.S. Not to a great extent in California so far, but elsewhere like Pennsylvania,

Ohio, Arkansas, Texas, Oklahoma, Colorado, and North Dakota – where these technologies have given their economy a huge boost. So, it looks like it's a problem that's going to continue to expand," says McGarr.

The economic impact of the gas drilling industry is difficult to assess on a per state basis, since much of the personnel needs to be imported from other states, especially in the early stages of the operation when locals have not yet been trained for the job. Although it is known that states like Ohio largely rely on the drilling industry for economic success, the economic benefits of the industry in states like Pennsylvania and New York are unclear.

Stark says, "When the industry comes, the first thing you provide are good-paying jobs. I think that gets overlooked. We have about 400 jobs just in Susquehanna County that are being filled by Susquehanna residents, not by somebody else from afar. Then the taxes are coming out of those. The jobs are there for decades, generations, lifetimes."

Gas corporations also donate money to local areas when they come in. Stark says that Cabot has already invested 25 million dollars in upgrades and repairs to the roads, $100,000 into the school system in Susquehanna County, and 2 million dollars into a new hospital being built in Montrose, Susquehanna County.

A 2008 independent study that analyzed the economic health



Fracking takes thousands of waste water trucks to service each well. Bradford, PA.



Gas pipeline near East Smithfield, PA.

of counties in Western states and compared them to counties focused on fossil fuel extraction for economic development concluded that "while energy-focused counties race forward and then falter, the non-energy peer counties continue to grow steadily...Counties that have focused on broader development choices are better off, with higher rates of growth, more diverse economies, better-educated populations, a smaller gap between high and low income households, and more retirement and investment income." The study, called "Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-focusing Counties Benefiting?," was prepared by Headwater Economics, an independent non-profit firm.

"Most of these people doing the drilling are from out of state. They come from all over the place – they come from Arkansas, and Alabama, and Texas, Colorado, I've seen plates from all over," says William (Bill) Ferullo, of Bradford County. "I would say that 75-80 percent of the jobs are held by people from out-of-state around here. But it did bring a lot of trucking jobs here, but most of the expertise jobs are from out of the area. It's come up maybe 20 percent gain in local jobs, but now things have slowed down here."



Gas well being drilled on a farm near Wyalusing, Pennsylvania.

The numbers of jobs provided by the gas industry in an area decreases over time once wells have been drilled and completed and require only daily maintenance and monitoring. A well's lifetime is between 30 and 50 years. The equipment on site also needs to be maintained regularly.

As to who gets the gas, Stark says: "It's decided by the

purchasers, so we're looking for those that want to purchase natural gas in bulk. Sometimes it's done by another pipeline company that has a contract to deliver so much gas to an area. Sometimes that's done by a local distribution company in Susquehanna County. We're delivering gas locally that is being used in manufacturing. We also see that a lot of electrical generators want to use it. Now, they are not in Susquehanna County, but they are along the pipeline routes. So your gas is going from your pipeline to, whether it'll be another part or Pennsylvania or to New York, and then it's being utilized for electric generation."

A public concern is that there is no federal legislation keeping the gas local, or even within the nation. Gas companies are privately owned and sell to whomever they want.

There are also concerns about the vast differences in fracking regulations throughout the country. The U.S. Environmental Protection Agency (EPA), which administers federal environmental laws, delegates much of this authority to the states. Although the state has to adhere to standards that are at least as high as the EPA standards, state attitudes about fracking and its wastewater disposal, for example, vary – especially if a state's economy relies on the industry. According to Chesapeake Energy Corporation, headquartered in Oklahoma City, drilling a typical Chesapeake Marcellus deep shale gas well requires approximately 100,000 gallons of water and hydraulically fracturing it requires an average of 5.5 million gallons per well.

McGarr explains that when they are producing the gas, they also produce a lot of wastewater as a by product – more than can usually be recycled or re-used – and the most economical way of disposing of it is by injecting it down deep disposal wells. These aquifers are usually at least 2,000 meters deep and are way below the shales they produce the gas out of so that they are separated from drinking water aquifers, which tend to be shallow. If everything goes according to plan, the wastewater disappears into these deep brine aquifers and there are no problems.

But if things don't go according to plan, hydraulic fracturing wastewater disposal causes earthquakes. A connection between wastewater disposal and seismic [earthquake] activity was found based on research conducted by the USGS over the past few years to



A truck carries gas from a well.

determine whether recent earthquakes were natural or man-made. There was a series of earthquakes of magnitudes between 2.0 and 3.0 in Youngstown, Ohio, that started shortly after the injection well began operating there. These 10 earthquakes led up to the big 4.0 magnitude earthquake felt in the area on New Year's Eve of 2011. Fracking wastewater injection was terminated there.

In regards to another earthquake area that USGS studied extensively, the Raton Basin in Southern Colorado and Northern New Mexico, McGarr adds, "We looked at all the earthquake activity that had occurred in the ten years after 2001 and decided there was no doubt that these earthquakes are associated with the extensive wastewater disposal that goes on there."

Not all states permit the geological disposal of wastewater. Pennsylvania is one of them. If they can't inject it, they transport it. "They are trucking [the wastewater] to Oklahoma and injecting it there. They are moving the problem across the state line," says McGarr. "So, I think this is one reason why seismicity in Oklahoma has increased so dramatically starting in 2009 when it was first noticed. I think there's going to continue to be a lot of seismic activity in places





Charts show the presence of contamination.

like Oklahoma as well as Ohio, which gets wastewater from out of state and it's important to their economy."

USGS has been working with the U.S. Environmental Protection Agency (EPA) to help give them seismological guidance on how to take these earthquakes into account when regulating these disposal wells.

Lives Changed

Earthquake activity is not the only concern communities and researchers have; the overall quality of life of many of those living near well sites has also taken a toll since the arrival of the gas companies. Communities are worried about the impact the industry's by-products have on their water, air, livestock, and health.

The main areas impacted in Pennsylvania are Bradford, Susquehanna, and Washington County, but they are just examples of what has been happening throughout the United States. Quiet rural regions have been turned into busy areas with the influx of trucks bringing in heavy machinery, sand, rocks, and other materials required for gas drilling.

"You hear all kinds of booms and bangs, real loud noises and the lights are keeping you awake at night and all the trucks. We had about 12 trucks lined up right outside of our house at one o'clock in the morning one night. They work overnight. And then when the flaring came, you couldn't even breathe around there. The flaring was terrible," says Pat Klotz, of Bradford County.

"I was on oxygen, but when I found out about the methane, I got rid of it because oxygen and methane don't mix. The air quality around here, some days it's really, really bad. I've called the DEP, the EPA, and the problem is that they only come a couple of days later to check the air quality. They always come too late," she says.

Millions of gallons of potentially hazardous chemicals and known carcinogens are injected into the wells during the hydraulic fracturing process. According to a report that was issued by Reps. Henry Waxman of California, Edward Markey of Massachusetts, and Diana DeGette of Colorado in 2011, 29 of the fracking chemicals used by leading gas and oil companies from 2005-2009 are "known-or-suspected human carcinogens." Methanol, which is also flammable, was identified as the most widely used chemical in gas operations.

Disclosure policies on these chemicals vary from state to



Ray Kemble of Dimock, Pennsylvania points out the water samples collected from three different counties.

state, and even when a list of the products used in fracking fluids is released by the gas company, certain ingredients can still be unknown and deemed "proprietary information." It would be like Coca-Cola releasing a list of its every ingredient.

This lack of information makes it difficult for land owners to know what to test for in their water supplies when they are concerned about contamination.

Barely containing her emotion, Klotz says that she recently lost her dog and that she attributes it to the bad water.

"We've had some kind of fluid coming down on our property. We have a dog that started having seizures, my white Akita. We've had her since she was a pup and we just had to put her down because she was very ill, but she wasn't ill before all this crap," says Klotz. "We had the dog run and the dog would run where the fluid came down, we don't know for how long. It looked like kerosene or fuel oil, we're not really sure. We ran out of water and I gave my dog some. She was drinking and I watched her getting like she was drunk after drinking the water."

A list of possible side effects from the large consumption of methanol by the EPA includes: lack of coordination; severe abdominal, leg, and back pain; loss of vision and even blindness; and gastrointestinal problems.

The report also says that, "Methanol by itself is not likely to cause environmental harm at levels normally found in the environment. Methanol can contribute to the formation of photochemical smog when it reacts with other volatile organic carbon substances in air."

Klotz says that the DEP tested her water in 2012 and said it was okay, but found high methane levels in it. She is currently engaged in legal action against the industry.

At this time, there is no state or federal drinking water standard for methane.

"We have seen absolutely no evidence that hydraulic fracturing itself, that is the well completion process of stimulating the shale, has caused groundwater contamination," says Department of Environmental Protection spokesman Kevin Sunday in an e-mail. "We have seen methane migration resulting from improperly cased and cemented wells. Such practices allow gas from shallow formations



Jenny Smitzer's water turned this color after drilling began in 2005 above her farm.

(there is gas in the ground in areas they are not seeking to extract) to migrate into aquifers or to surface. Our casing and cementing regulatory upgrades address this."

Sunday also says that new EPA rules require flaring or green completions to capture rogue methane emissions at the wellhead. "When there are issues, we take action – notably we fined an operator more than $1 million in a case involving methane migration. That was the largest penalty in the history of the state's drilling," says Sunday.

"Our regulations have resulted in improved performance by the industry, evidenced by an extremely comprehensive study from SUNY Buffalo that considered the period of 2008, when unconventional gas exploration was in its early stages in Pennsylvania, through mid-2011. The study found, among other things, that environmental incidences



Scott Ely and children Jared, Jessica, Justin, and Joshua hold a bottle of their poisoned water at their house in Dimock, Pennslyvania.



Carol French of the Pennsylvania Landowner Group for the Awareness and Solutions holds a jar of her brown polluted water from her well.

declined 60 percent between 2008 and August 2011."

Maria Payan, an advocate for small farmers in Pennsylvania and the cofounder of Peach Bottom Concerned Citizens Group (PBCCG), explains that a lot of people can't talk to the media about their contamination problems because they are in litigation, or have been advised against it by their lawyers.

"This is the problem with people not speaking, it has allowed the gas industry to repeatedly say that there has never been one case of contamination and the reason being that when people do sue, they have a nondisclosure. They can't talk, it's sealed in record," says Payan. Right now, PBCCG is preparing to file group suits against the gas corporations, but details are not yet public.

Carol French, of Bradford County, has also had water problems. Her family's health and her livelihood have been affected by the changes in her water. French has a conventional dairy.

"When the industry came here, we were all excited about leasing and stuff, you know. Everybody had leased, they had leased for 40 years. It might be a dollar, but it's the promise of a dollar – sometimes it never paid up so it was always a big joke. And if they did



Ray Kemble of Dimock has heavy metals identified in his water.



Craig Sautner in front of his house in Dimock, PA. He and his wife, Julie are suing Cabot Energy for poisoning their well.

pay back in the '70s, you would use it to pay the property tax. So when they came back around [in 2006], it was nothing new," says French. "They never said about drilling in the Marcellus Shale, the only thing new was that they were offering up $25 dollars an acre – that was the most they had ever, ever, offered. So what we did was sign and if you went to an attorney, they had no clue what was going on."

On August 29 of 2006, French signed the lease for $85 dollars an acre – a grand total of $13,600 dollars.

"March 15, 2011 is my doomsday," French says. "I turned on the faucet and my water was so heavy. It was white and heavy. I ran out to the barn and it was all on the drinking cups that my cows drink out of. We let the water set and a bunch of sand settled at the bottom of it. Then it would settle with a green mossy look on top of that, and then if you let it set for 3 hours, it gelled like jello."

She says this wouldn't happen every day. In the beginning, it would happen about once a week until it started happening more and more frequently. At one point, her water turned white for a solid week.



Gas fire in plastic container. Craig Sautner in Dimock, PA lights gas from his well he has captured in a gallon plastic water jug. His water is contaminated with methane gas, heavy metals and organic materials making it unsuitable for drinking or washing.

Soon after, they started getting rashes and her daughter got really sick from drinking the water. Their property is surrounded by nine wells within a 2-mile radius.

"So [my daughter] quit her job, found another job, and left me the day after Christmas," says French. "Three weeks later, she felt better again. When she came back to see me again, she broke out again just like I do. When I go out to see her, in about three days I am clear. I don't have the rashes anymore."

The Southwest Pennsylvania Environmental Health Project (SWPA-EHP), a nonprofit environmental health organization, has



Maryellen McConnell uses a respirator mask several times a week in and around her house because of methane poisoning. She has passed out many times and gone into the hospital. Her farm is on top of an area where the gas companies have decided to store the waste materials from the gas drilling in vast deposits underground.

been monitoring the health of individuals living near gas areas.

"We've definitely seen a range of symptoms and probably the most prevalent health concern is related to respiratory problems. Also people are experiencing problems with nausea, vomiting, dizziness, possibly some neurological issues, gastrointestinal distress, and those are the top concerns including nosebleeds and things like that," says Raina Rippel, director of the Southwest Pennsylvania Environmental Health Project. "As best as we can tell, it's something that's occurred within the time stamp of the gas drilling activity taking place. So, whether or not it is related, our best guess it that yes, it is."

Rippel says that skin rashes, skin complaints, and some cardiac complaints are also common.

"Another recurring theme is the presence of benzene, toluene, ethyl benzene, and xylene. Benzene has been a proven carcinogenic VOC and it also causes central nervous system effects and if you ingest it, it can cause vomiting and the irritation of the stomach," says Rippel.

If the water can make humans sick, it can also make animals sick. The effect it has on livestock and food health puts the livelihood of farmers at risk.

"No one is doing anything about it, the Department of Agriculture isn't, the DEP isn't, and they know this is going on. It's like no one is even checking and it's really having an effect on farms," says Payan. "A lot of our farmers, especially in Northern PA, market their beef cattle to New York. We have a farm that was doing all organic wheat and they lost their New York contact, they won't buy from them anymore, because they live close to where the compressor stations are. They are scared that the wheat is contaminated."

French's cows have been drinking her water when is white and jello-like. She is still concerned about the overall quality of the milk.

"It's in my water and in my milk because [the cows] drink that water. It does not have to be white water, it's clear but it's still in there. Sometimes when I wash my face or my hair, it feels like needles poking at me. In the morning when I wake up, I'll have green stuff coming out of my eyes and my eyes are bloodshot," says French. "All my cows have stuff oozing out of their eyes – this is not normal for us and my cows have rashes just like we do. We've been having a hard time getting the cows pregnant, but we don't know why. I'm not going to say it's because of the water and I'm not going to say it's not."

Though French says that her milk has been tested and meets required standards, she worries that they are not testing it for all the chemicals needed given the changes in their environment.

"DEP will not touch my milk either or my water. They haven't tested nothing and they refuse to test it. I have a hired geologist on standby who will test our water for all chemicals, it costs $3,200 dollars, but it doesn't mean anything because the DEP needs test my water in order to force Chesapeake to deliver water to my house," says French.

"We're still suffering because our water is gone. Contamination knows no boundaries. This is what it's gonna cost me: I could lose my milk market because I am talking about this. I could lose my cows, the value of my cows – no one is gonna want to buy them. Claude is 60 years old and nobody wants to hire him, I am sure. Our property loses the value between 80 and 90 percent; all we invested in is our property – our farm.

"You have no money in the bank, so what do you do? We're sitting ducks, really. If we don't get water provided to us, we are gonna die of something. We can't move because you don't have any money. You can't sell your property because it's not worth anything. You can't sell your cows because they're not worth anything. You can't continue farming. And because I am concerned, I am sure it's gonna come back and bite us in the butt."

A scientific study entitled "Impacts of Gas Drilling on Human and Animal Health" by Michelle Bamberger and Robert E. Oswald, of Cornell University, found that "animals, especially livestock, are sensitive to the contaminants released into the environment by drilling and by its cumulative impacts. Documentation of cases in six states strongly implicates exposure to gas drilling operations has serious health effects on humans, companion animals, livestock, horses, and wildlife."

The study also found that of the seven cattle farms studied, an average of 50 percent of the herd was affected by death and failure of survivors to breed.

The contamination of drinking water is another highly debated issue. With different reports drawing different conclusions, legislators

and regulators have had a difficult time making final decisions.

"The Environmental Protection Agency announced that new tests of water surrounding natural-gas-drilling sites near Pavillion, Wyoming, have turned up results that are 'generally consistent' with earlier findings showing a link between contamination and hydraulic fracturing" in that area, says a Wall Street Journal article, "New EPA Finding Test Fracking Site" by Tennille Tracy. The U.S. Geological Survey was also involved in the research.

But when it comes to Pennsylvania's water, the data seems inconsistent.

Research conducted by a team from Duke University, published online in the Proceedings of the National Academy of Sciences in 2012, says that there's "no evidence of brine contamination" from shale gas exploration. Samples from groundwater aquifers in six different counties were analyzed to draw these conclusions.

The same team of researchers published another paper in the Proceedings of the National Academy of Sciences earlier on where they found methane contamination of drinking water near gas-well drilling and hydraulic fracturing sites.

"It's an intensive effort to measure background water quality so that as hydraulic fracturing proceeds we'll have that information to point to any changes in water quality," explains Jared Bales, Chief of Science and Research for Water at the U.S. Geological Survey. "Generally our measurements are groundwater and surface water. In some cases, for example in Pennsylvania, we are collecting aquatic biota to get an indication of the stream health and we are also making geomorphological measurements because I think there's some concern that runoff from the pads might either be generating higher sediment loads or perhaps because of some concern that produced waters might be affecting the channels."

Bales says that there are a number of studies going on right now across the country. There's research and data collecting being done in Pennsylvania, New York, Indiana, Ohio, North Carolina, Arkansas, North Dakota, Montana, and some work planned in Colorado and Wyoming.

"I've seen some things in the press where people are interpreting the data to support their agendas, but I think the final verdict on [the water in Pennsylvania] is not out. The EPA is going to use their data in their process, the analysis will be peer-reviewed and I think that will be the final interpretation on that," Bales says.
The USGS collects data and submits it for peer review Once it is reviewed, it is made public to everyone at the same time.

In a different part of Pennsylvania, Fayette County, live Linda and David Headley. When they bought their farm in 2005-2006, they didn't know there was a lease on their land. They only knew that they didn't own their gas rights, so when the gas company came in to drill, they were caught by surprise. They have five wells on their property and have also seen methane migration on their land.
Looking out her window, Linda Headley describes what she sees while on the phone for the interview.

"I see security, I see equipment, I see the pipeline, I see two wells and a driveway that's torn up," she says. "I have to watch my son 24/7 because these people come in and you don't know who they are and you don't know what they are gonna do. There have been two explosions. It sounded like gunshot, gunshot, gunshot and then there were two real loud explosions – what are they? I don't know. When they had to do hydraulic fracturing drilling underneath the creek to put the pipeline through, they didn't come in and said, 'Hey, this is going to shake your house, you need to check your house out.' It shook the marble off my fireplace."

Her 4-year-old, like many others living near the wells, gets rashes while her 16-year-old also gets nosebleeds, and has muscle and joint pain. Linda Headley herself has a bad cough she calls "gas cough." "The maintenance on [the wells] is horrendous. They leak. The one here instead of fixing it, they call dumping it, and there's one day that three times that day they had dump it. They throw back all the crap out of it and it's 700-feet from our house," Headley explains. "We have the methane migration and it ruined our drinking spring. The ground where the frack pits were, grass don't grow. We got pipelines now and along with the pipelines you have farm security – 24/7. There's a stranger in my yard all the time and they don't have to tell us their name."

Headley says that the horses from that well have irritated eyes and one has a blind spot. They get nosebleeds and their hooves have been soft. Her 4-year-old's health has also declined. He has unexplainable belly cramps, gets rashes, and has lost weight. Her



Sherrie Vargson lights her kitchen sink water on fire. Methane in her well has caused her health problems. The well is just 100 feet from her house.



Maryellen McConnell looks out her window using a respirator mask.

16-year-old gets rashes, nosebleeds, and has muscle and joint pain. Her husband gets joint pain, muscle pain, and rashes.

The Headleys got paid for one of the pipelines below their land, but there are three.

"We got paid $70,000 and it ain't worth it. They told us it was a 6" line and that they would be gone in a month. It's 6 months and it's a 16" line. They tore up well over 50 feet. They lied," says Headley. She can't take, "the stress of the people being around, this industry is nothing but a bunch of liars. I have a stranger sitting on my land and I can't make him leave. There's nothing I can do. It's one of those things where I wish I had never seen this place. We are into it so deep and so heavy, we've got a mortgage on it, you can never sell it."

Headley is afraid to let her son go outside to play because of all the equipment and the strangers on her property.

According to the industry, gas companies only post 24/7 security on farms if they are concerned about the safety of their wells and equipment.

She is not the only one who wishes the gas industry would go away. "They took one year to drill one well in all those 30-40 pads in this area," says Ferullo about Bradford County. "They have to come back and drill five more in each one of them, so how long is that going to take? It's going to take years! It's nothing but confusion when they are here. I can't sleep, it's diesel fumes, it's pollution. I wish they wouldn't never came here."

Even if a gas company's lease on a person's land expires, they can still drill because the lease agreement says that as long as a well can produce gas, the company has the rights to it. Once one well has been drilled that produces gas, they can come back at later times to drill the rest.

Ron Gulla, of Washington County, lost his farm in a lawsuit against Range Resources, one of the several gas companies drilling in Pennsylvania. He has the second horizontal well drilled in Pennsylvania. He owned a 141-acre farm that was drilled in 2005, 2006, and 2007. There were two vertical and two horizontal wells on the property.

"They baited me with another farm, but the farm was leased. I told them I wanted nothing to do with their drilling or their leasing," says Gulla. "They introduced me to their realtor and he was supposed to do a title search on the property and a long story short, the farm was 165-acres and it was leased back in March of 2006. I am in court right now suing the realtor and the realtor company. This thing is so corrupt it's unbelievable."

Range Resources could not be reached for comments.

"Everything changed. My whole life changed," says Gulla. Well sites, it's like a little city. There's people up and down your driveway 24/7 and you have no idea who they are, where they are from, what their record is, what their past is. Garbage is everywhere, whatever they eat, whatever they drink – it's out the window, on your property. They defecate on your property. My 3-acre pound turned black. It killed all the vegetation and it killed the cat tails. Now, if I were drinking water out of that pound, or growing crops and needed irrigation, that water would've killed everything in my fields."

Gulla explained that a lot of people signed the leases because the gas company told them it would give them 300,000 cubic feet of gas free per year.

But he adds, "No one gets free gas because it's wet. You cannot burn the gas. You have to process the gas and in that process of freezing out the other by-products – propane, hexane, etc. – the landowners get absolutely nothing for that."



Drilling operation outside of Elk Lake, Pennsylvania.



Craig and Julie Sautners front yard in Dimock, PA.

In addition to the by-products of wet gas, locals are also concerned about diesel emissions, the containment of silica sand dust at the wells, and impoundment pound contamination.

"We know that one of the biggest concerns and probably one of the simplest things to address would be the diesel emissions that are associated with this," says Rippel, of the Southwest Pennsylvania Environmental Health Project. "Beyond that, there are certain things we certainly would hope to not see, such as aerosolizing the water that is being held in impoundment pounds. We would have concerns about any obvious exposure pathways where you're taking an impoundment that probably has some sort of level of toxic contamination in it and actually aerosolizing it into the air so that is a direct exposure for people nearby."

Gas companies are required to adhere to federal and state diesel emission laws. But there are no laws on the containment of silica dust, which is used

"There is no reason why they can't keep the silica sand dust contained," says Ferullo. "I think that now [people] are seeing the detriment to the area, the traffic, the fumes. If you took a survey today, you would see a lot of people changed their minds [about the industry]."

Vermont was the first U.S. state to ban fracking. Gov. Peter Shumlin signed the bill in May of 2012, according to CNN. New York has postponed a decision on fracking until more research on the safety of shale gas drilling can be completed. The New York decision, which was anticipated for the end of 2012, has been delayed until 2013.

"It needs to stop. It needs to stop and let the scientists, the professors, the academics get out there and start testing the soil, testing the air, testing around these well sites like they should be doing. There are a lot of things happening and they are seeing a lot of negative things as far as contaminated air, contaminated soil, contaminated water and the industry just keeps covering everything up. This is a complete takeover, that's what people got to realize," says Gulla.

Concerned citizens are crying out for more research and protective measures from legislators and regulators to help protect them. In order to update its study of the potential impacts of hydraulic fracturing on drinking water resources, the U.S. Environmental Protection Agency said it would be accepting data and analyses from the public through April 2013 to supplement its data. The EPA says "it hopes the information will help to ensure EPA is current on evolving hydraulic fracturing practices and technologies as well as inform current and future research."


Cemetery and brine tanks in Bradford County.



Gas flares over a church in Pottersville, Pennsylvania.

Ariane Rasmussen

Ariane Rasmussen is a multimedia journalist. She has worked as a freelance reporter for the Connecticut Post and as a designer and copy editor for Hearst Connecticut newspapers. This is the third story she has done for Vision Project.

Les Stone

Les Stone continually works with Vision Project. During the last two decades, the critically acclaimed photographer has chronicled the human cost of conflict in Iraq, Afghanistan, Israel, Kosovo, Liberia, Cambodia and Haiti, among other war zones. The winner of several World Press Photo Awards and Picture of the Year Awards, Stone has covered stories often ignored by the mainstream media. Stone's work has appeared in the pages of National Geographic, Time, Life, Newsweek, Stern and Fortune and many others. He has been involved in a number of book projects: The Palestine and the Arab-Israeli Conflict, Haiti: Dangerous Crossroads and A Day in the Life of the United States Armed Forces.

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VISION PROJECT Inc.

Vision Project is an organization dedicated to the development of investigative journalism, documentary photography, multimedia, film, and education.

The goal of Vision Project is to produce documentary material and educational programs that encourage understanding and awareness about a broad variety of social issues. This information and programming are made available to the general public with a particular focus on members of the younger generation.

Vision Project seeks to reinforce the social, cultural, and historical contribution that visual documentary work contributes to society. To reach these goals, we have assembled a group of talented professionals with extensive expertise in photography, web technology, journalism, video, design, and education.

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