

# STAY OUT OF THE FRACKING WATER!

*Susan Williams*

"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."  
- Commonwealth of Pennsylvania Constitution, Natural Resources and the Public Estate, Article 1, §27.

Hydraulic fracturing, also known as "fracking," involves injecting fluids at high pressure into underground rock formations to blast them open and increase the flow of fossil fuels. The technique has been around for many years and has been used, mostly without incident, in hundreds of thousands of natural gas wells.

But today the risks have multiplied exponentially as the wells are drilled deeper and stretched vertically and horizontally to get at remote deposits. The technique has become especially controversial in Pennsylvania, the epicenter of a big push for the natural gas locked in Marcellus Shale, a formation stretching from West Virginia to upstate New York. This formation is the world's second largest gas field, and was previously unreachable until deep horizontal fracking techniques were developed.

When a well is fracked, there is a mixture of water, sand and a concoction of chemicals injected into the well's bore hole to ultimately break up (fracture) the rock formation, thus releasing the gas into the bore hole. This injection of chemicals often occurs near drinking water wells, rivers, reservoirs and streams.

Several companies, including Halliburton, manufacture the fracking

chemical mixtures, and they have closely guarded their secret concoctions as "proprietary information." The gas industry arranged for an exemption from the Federal Clean Water Act that permits them to keep their frack chemical formulae proprietary. This is called the Halliburton Loophole.

This loophole means that when there is a spill of frack fluids and it enters the soil or surface water or intrudes into a water well, there is only a general understanding of what is in there. Halliburton continues to fight against the EPA requiring disclosure of fracking chemicals.

Some of the known chemicals in fracking fluid are: diesel fuel, which contains benzene, ethylbenzene, toluene, xylene, naphthalene and other chemicals; polycyclic aromatic hydrocarbons; methanol; formaldehyde; ethylene glycol; glycol ethers; hydrochloric acid; radium; and sodium hydroxide.

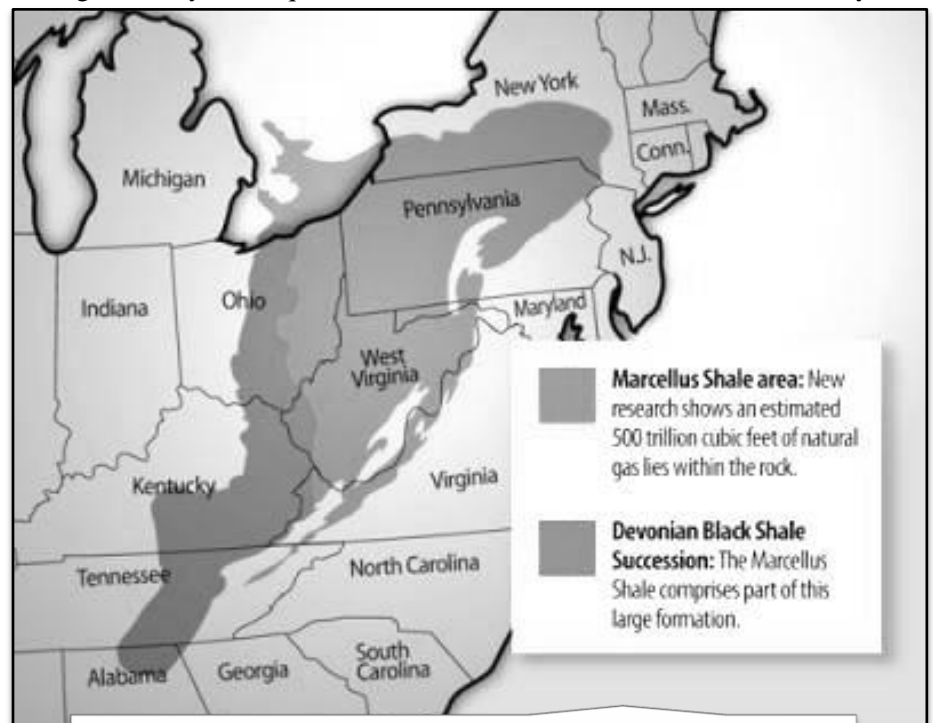
A report released by Congress found that drilling companies sometimes injected chemicals that even they could not identify. It also found that more than 650 of the chemicals used in fracking were carcinogens. Very small quantities of

proven carcinogens such as benzene, are capable of contaminating millions of gallons of water. These chemicals can be injected at concentrations that are anywhere from 4 to almost 13,000 times the acceptable concentration in drinking water.

According to an EPA study, and studies conducted by the oil and gas industry themselves, between 10 and 40% of the fracturing fluids remain in the formation, which means the fluids could continue to be a source of groundwater contamination for years to come.

As paddlers, we should be very concerned not just about these chemicals but also about the volume of clean water that has been, and will continue to be, withdrawn and consumed from our rivers, reservoirs, and lakes for fracking. Each well normally requires millions of gallons of water. Cumulative effects that withdrawals will have on the aquatic ecosystems, availability of public drinking water supplies, fire-fighting water supplies and, for we paddlers, recreational waters, are unknown. Pennsylvania is subject to periods of low water and drought, making this issue remarkably important.

As a child, I could freely



The Marcellus Shale formation, the world's second largest gas field

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jump off a bridge, less than a mile from my house, into a beautiful deep pool of water in the Loyalsock Creek. At the time of this printing, and consistently throughout the past year as drilling has moved deep into my area, I could walk across Loyalsock Creek in that exact same spot and not get my knees wet. It is believed that over 20,000 gallons a day, every day, are taken from my creek for fracking. We can't paddle rivers that cease to exist.

Throughout the past year, many people have arrived at their cabins in the forested hills of Pennsylvania to find official notices on their front doors, "Danger. Do not occupy dwelling." Springs that are the only source of water for these cabins are contaminated by toxic waste from the gas wells. How long before we see prohibitions on paddling what is left of Pennsylvania's waters?

Because fracking uses millions upon millions of gallons of water, a single well can throw up a million gallons of wastewater laced with carcinogens. Gas industry wastewater, with high levels of radioactivity, is sent to sewage treatment plants which cannot remove radioactive materials. These plants discharge the processed wastewater into rivers and streams. An official from the Johnstown, PA, facility said his plant usually accepted 50,000 to 100,000 gallons of drilling wastewater per day.

The real threat is that the radionuclides from drilling wastewater that is being sent through sewage treatment plants will settle in the sediment at the bottom of our rivers. Pennsylvania regulators have made no mention of any plans to test river sediment or to restrict deposits of sludge from these waste treatment plants that are accepting drilling waste.

Samples taken from the Monongahela River (near Pittsburgh) by Pennsylvania officials came from a point upstream from the two sewage treatment plants on that river. Because the sampling site is upstream,



One of Chesapeake Energy's Marcellus Shale wells sits high on a bluff over the Susquehanna River in Windham Township, Wyoming County, PA

© 2010 Donald Gilliland, The Patriot-News, courtesy pennlive.com

discharges from those two plants are not captured in the state's monitoring samples.

The Marcellus Shale Coalition, a natural-gas industry group, announced that it would create a \$100,000 fund to support heightened water testing. Contrast that \$100,000 with the \$132.2 million the oil and gas industries spent on their lobbying efforts in 2008 alone.

As gas producers have tried to find new ways to get rid of their waste, they actively seek reassurances from state and federal regulators that the industry's exemptions from federal laws on hazardous waste are broad enough to protect them.

The Pennsylvania Oil and Gas Association, an industry trade group, wrote to regulators to confirm that drilling waste would remain exempt from the federal law governing hazardous materials. The association said it was asking in case companies sought to distill the waste into salt for de-icing roads. This has immense significance. If drillers lose the exemption from federal law that allows their waste not to be considered hazardous, they would have to reveal the waste's toxicity. Federal regulators left the exemption intact.

When asked, state regulators declined to comment on this because it concerns a federal, not state, exemption. Federal officials said the salt was regulated by the states. Note that when there is a spill or other release of wastewater on a site, the cleanup crews are usually wearing hazmat outfits. I doubt they do this as a fashion statement.

In case you think this is just a private property matter, a Marcellus Shale drilling rig could be coming soon to a state park near you. In mid-February, 2011, the DEP quietly rescinded a policy requiring an environmental-impact review prior to Marcellus natural gas drilling in most of Pennsylvania's state parks. The policy required a review of threatened and endangered species habitat, water resources, public recreation areas, wetlands and floodplains, air quality, noise and road placement and construction methods.

Pennsylvania's Governor Tom Corbett did not oppose this action. The rescission was not subject to advance public comment. Nearly \$1 million in oil and gas industry contributions went to Governor Corbett during his campaign (more than all of his competitors combined) and he has now put the industry in

charge of regulating itself.

In Pennsylvania, regulators do not perform unannounced inspections to check for signs of spills. Gas producers report their own spills, write their own spill response plans and lead their own cleanup efforts.

There is also little tax on the industry as the governor and legislature struggle to work out whether to tax natural gas extracted from the Marcellus Shale. Corbett has steadfastly opposed a tax, but has suggested he would review a proposal for a "local impact fee." Governor Corbett said, when arguing against a proposed gas-extraction tax, that regulation of the industry had been "too aggressive."

Pennsylvania Senator Mary White (R-21) knows that our state forests have a valuable sustainable forestry designation. The designation could be lost with more drilling. She said, "The state forest is, after all, the state forest. It isn't the state oil field."

And get this, there is also mention made of state-owned airports as potential sites for gas drilling. In the event of an emergency landing, a failed takeoff or other aircraft incident or accident, proximity to a gas well, pipeline, or compressor station could be, to put it lightly, a significant hazard.

It is no secret that I am opposed to fracking. I own 105 acres in Lycoming County, on which sits the house I grew up in, a barn, and a warehouse. The property overlooks the Loyalsock Creek valley, and with no neighbors around it is a serene and green retreat. I inherited this property from my dad. He spent a lifetime planning for his property to be preserved as a public park after his and my deaths. About a year before he died, a gas company representative met with him alone, influenced an old man with dementia to sign a contract without me (a lawyer) looking at it, and slickly connived my dad into giving away the gas rights on our property. My dad would have never entertained this in his pre-dementia days. Now I get calls every few weeks

requesting I sign a permit to begin drilling. Over my dead body.

As in all things, great minds can disagree and **Ron Kaiser**, USCA Delegate from Pennsylvania who, like me, is situated on many acres of prime Marcellus drilling territory, is pro-drilling. Ron believes that, if done correctly, fracking will help everyone. He believes that forcing the gas industry to drill safely and correctly will not cripple the industry and notes that, if there is money to be made, the gas industry will comply. Ron states that "if there is enough natural resource of gas in the ground, they will drill and they will abide by the regulations." Ron wonders what studies are done to assess oil drilling impact upon the water and land. He believes that adverse oil drilling impact might go unnoticed because of our dependence on oil. Ron also mentioned the environmental impact of strip mining. Ron and I have discussed this several times, and he often advocates, "I am still saying if gas drilling is done right, and there are no political pay-offs, and DEP does its job by the law, or the right laws are passed, then all can benefit."

U.S. Senator Robert Casey, Jr. (D) from Pennsylvania agrees with Ron, stating "natural gas drilling offers Pennsylvania tremendous economic opportunities if we do it right. Pennsylvanians have a right to know the chemicals used in fracking that could make their way into drinking water and other water sources. Emergency response and worker safety at well sites must continue to improve. And more must be done to ensure that jobs in the fracking industry go to Pennsylvanians and not workers from out-of-state."

**Scott Stenberg**, USCA member from Moravia, NY, emailed me, "Susan, as we discussed awhile back over a couple of beers, I'm not opposed to natural gas extraction. Lynne and I have a gas lease on our farm and would be happy if gas was discovered underneath and we collected a 13% royalty on it for the

rest of our lives. Our country needs the fuel and our community needs the financial security productive gas wells can provide. That said, I expect that any gas extraction done anywhere (my farm or a farm in PA) be done with the utmost respect and care for the environment. I'm happy with New York's decision to place a moratorium on fracture extractions so that it can study the problem and develop and implement the necessary regulations to protect the environment."

But how can rigorous new environmental standards be imposed on an industry entrenched in what is the gas equivalent of a 1800s gold rush? The federal government is only now beginning to undertake a review of the chemicals that are used in hydraulic fracturing. Demands for greater regulation face powerful opposition from the natural gas companies.

A former lawyer with Pennsylvania's DEP argues that the state was caught off guard by the rapid expansion of shale gas drilling. The laws on the books were drawn up in an era of shallow wells and the regulators were not equipped to deal with the technological advances of hydraulic fracturing or with the increased volume. Last year alone, oil and gas companies such as Shell, Chevron, Reliance, Exxon Mobil, and BG Group poured \$17.9 billion (yes, with a "B") into projects in the area last year.

In Pennsylvania, drilling companies were issued about 3,300 Marcellus gas-well permits last year, up from just 117 in 2007. According to the Marcellus Shale Association, an industry group, 1,415 new wells were drilled in Pennsylvania alone. The companies have publically admitted they expect to drill more than 50,000 new wells over the next two decades. What they are talking about is a 22,000 square mile gas field across Pennsylvania that will affect all of our rivers.

Environmental groups and journalists have exposed several persistent dangers: leaks in wells

owing to faulty casing or migration through layers of rock, breaches in the above-ground tanks meant to store used drilling chemicals, and a rise in air emissions.

A team at Cornell University challenged one of the fuel's main selling points, that shale gas is a low-carbon fuel. The study found that the carbon footprint for shale gas was far greater than conventional oil or gas or even coal.

Natural gas is mostly methane, which is a much more potent greenhouse gas, with 105 times more warming impact, pound for pound, than carbon dioxide. Robert Howarth, Cornell University's David R. Atkinson Professor of Ecology and Environmental Biology, said that even small leaks make a big difference. He estimated that as much as 8 percent of the methane in shale gas leaks into the air during the lifetime of a hydraulic shale gas well, up to twice what escapes from conventional gas production.

Tony Ingraffea, the Dwight C. Baum Professor of Engineering at Cornell, explains, "We are highlighting unconventional gas because it is a contemporary problem for us in upstate New York, and because there is a big difference between developing gas from an unconventional well and a conventional well, for the mere reason that unconventional wells are bigger." He also noted that the hydraulic fracturing process lends itself to more leakage because it takes more time to drill the well, requires more venting and produces more flowback waste. He added, "What we're hoping to do with this study is to stimulate the science that should have been done before. In my opinion, corporate business plans superseded national energy strategy."

The dangers are real. In calendar year 2010, DEP inspectors conducted 634 inspections that found 1227 violations of environmental laws, with 308 of those violations resulting in the Department taking enforcement action. In January of



Container trucks with fracking liquids at a drilling site, Dimock, PA

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2011, the last month for which an inspection and violation report is publicly available, DEP performed 30 inspections, and found 68 violations of environmental laws resulting in six enforcement actions.

Eight of the drilling companies with representatives on the Pennsylvania Governor's Marcellus Shale Advisory Commission were cited with environmental violations last year. One of them led the state in violations. Companies represented on the commission donated more than \$790,000 to Corbett's campaign. The violations range from administrative oversights to illegal discharge of industrial waste. About one in six wells had problems.

Recently, one of our worst nightmares came true. According to Chesapeake Energy's spokesman Brian Grove, "At approximately 11:45 p.m. on April 19, an equipment failure occurred during well-completion activities, allowing the release of completion fluids from a well at a location in Leroy Township, Bradford County, Pa. . . . An undetermined amount of water has flowed off the location. Crews are working to minimize any impacts to the nearby Towanda Creek."

Amy Souers Kober of American Rivers (an organization that the USCA proudly supports) translates Chesapeake's PR statement: "At approximately 11:45 p.m. on April 19, a catastrophe occurred as we bored into the earth, allowing the release of toxic and carcinogenic fluids from a well at a location in Leroy Township, Bradford County, Pa. . . . An underestimated amount of toxic fluids has flowed into the source of drinking water for millions of people. Crews are working to minimize any impacts to our ability to continue operating without government oversight."

Local news sources all reported thousands of gallons of fracking fluid spewed over and beyond the well pad. An equipment failure allowed flowback fluids to wash onto the well pad in volumes that overwhelmed the multiple containment precautions in place.

Chesapeake, one of the state's biggest shale gas producers, will use a mix of plastic, ground-up tires and heavy mud to plug the well, an operation that echoes BP's "top kill" effort to seal its ruptured Gulf of Mexico oil well last year.

Catastrophes are not isolated

or infrequent. On May 10, 2011, according to the PA DEP, a pipeline accident and heavy rains led to bentonite clay and an opaque gray-white foam polluting at least 25 miles of Buffalo Creek in western PA, stretching into the Ohio River.

MarkWest Energy Partners had an incident called a "frack out." Workers used the clay bentonite and the unidentified foaming agent to help bore a hole for a pipeline under the creek in Blaine, Washington County, PA. The two substances seeped up into the streambed and were stirred up during heavy rains.

Emergency officials in W.Va. responded to reports of foaming and traced it to the Pennsylvania state border, where firefighters traced it into Blaine.

State officials are waiting for MarkWest to send data safety sheets for the chemicals they were using at the site. In the meantime, 25 miles of waterway contain an unknown fracking substance in an unknown quantity.

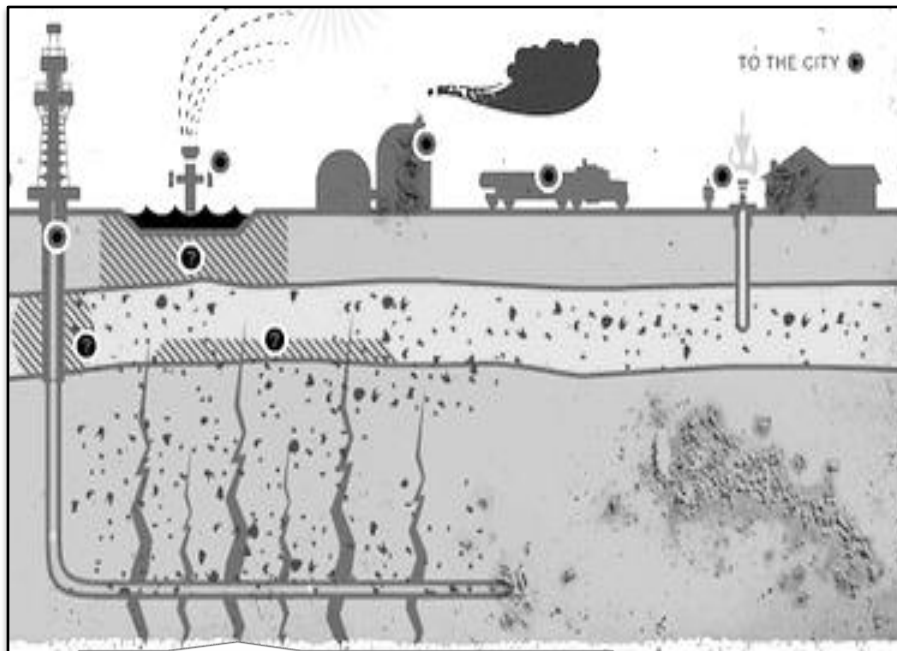
**Ron Kaiser** comments, "We have to ask, if compared to oil spills and oil well disasters, is the gas drilling any less hazardous? How much impact did the Exxon Valdez and off shore drilling have on the world environment? The over

harvesting of trees in the rain forest effects the world oxygen supply. If proper drilling is not done there could be heavy fines imposed. But the companies that do a good job and have a positive impact should not be punished. If there are less payoffs offs and greed, and less looking the other way, then the gas exploration can be beneficial to everyone."

**Rick Henrich**, a USCA member and owner of Rock River & Trail Outfitters Inc., Lock Haven, PA, raised these points, "My stand on the Marcellus Shale gas drilling is: Like any other industry that came through the area in the past 200 years the gas industry is the current major issue. The logging industry left the land naked and destroyed for many years to follow. The coal industry came along and after their departure the mines flooded and destroyed the creeks and rivers in the area. The government at the time either didn't have the proper regulations in place or just allowed what happened to happen. We now paddle on streams all through the area that are dead (no fish or plant life). The gas industry has been a part of this area for many years. With any industry there are going to be accidents, deaths, well spills, and truck accidents that spill contaminated water on the road. No

one complained when we cut a swath miles long through the woods to run gas lines and power lines so we could be better served. With that said, as long as the state does its job (DEP, DCNR) and the permitted sites are inspected and kept safe, the industry can co-exist with the paddlers and other outdoorsmen/women in the area. I shuttle paddlers all over the area and I paddle all of the local creeks and rivers and in the past few years have not noticed any inconvenience other than truck traffic. Water levels in the summer have been bad but not because of the Marcellus Shale. It's because of lack of rain. If you want to make a difference start riding your bike, leave the car at home. Stop saving trees, burn wood for heat, trees are renewable. All the kayaks, canoes and fancy boats we paddle are made from a petroleum base (oil) so think about what you want before you pick a battle. Stop shopping at the mall and shop local stores. The mega pig and cattle farms in the mid-west make more of an impact on the environment than the gas industry does."

In contrast, **Stephen Winston**, a USCA paddler from Driftwood, PA, comments: "The sheer volume of water displaced by fracking is enough to make high water into impassable rock formations on most creeks and streams in Pennsylvania. Being blessed this year with a guarantee of rain in extra amounts until mid-June we still face a dilemma. Here on the Sinnemahoning we have the beautiful 12 miles of the Cameron County Classic course plus easily 20 more miles of excellent paddling, but we have a Marcellus Shale operation opening in Sterling Run. The millions of displaced gallons of water could halt the paddling in between rain storms." Stephen continues, "**David McCracken**, with the Susquehanna just downhill from his outfitting business in Shawville, has shown me just how much this kind of displacement really does to the general water depth. It's imminently unfair and stops much of the business



How fracking contaminates groundwater

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done by David with his casual paddling day trade. David's trade doesn't pollute or contaminate or pose serious health risks. His business promotes health, confidence and fun. Is it the volume of dollars [from the gas industry] that we all know pollutes and kills wild life as well as endangers our health by exposure to the petrospectrum of subterranean chemistry. Despite all the tests and their manipulated data there are none of us who feel the basic chemistry is anything but destructive and carcinogenic."

Pennsylvania environmental regulators say they spend as little as 35 minutes reviewing each of the thousands of applications for natural gas well permits they get each year from drillers intent on tapping the state's lucrative and vast Marcellus Shale reserves. And the regulators say they do not give any additional scrutiny to requests to drill near high-quality streams and rivers even though the waterways are protected by state and federal law. Staffers in the state DEP testified behind closed doors in March of 2011 as part of a lawsuit filed by residents and environmental groups over a permit that DEP issued for an exploratory gas well in northeastern Pennsylvania, less than a half-mile from the Delaware River and about 300 feet from a pristine stream. Supervisors acknowledged they did not take into account that the test well would be drilled within the federally protected wild and scenic Delaware River corridor.

DEP has denied few requests to drill in the Marcellus Shale formation. Of the 7,019 applications that DEP has processed since 2005, only 31 have been rejected, which is

less than one-half of one percent.

On the bright side there are several "risk assessments" underway by various agencies. The downside is that, to date, none are complete and none have in their plans to look at the cumulative impacts of deep shale drilling. One of the studies underway is being conducted by the US EPA. This study is looking only at the effects of hydrofracking, but it is hardly past the point of having selected the panel of scientists and others who will review the final report and data that back it up. The study is not due to be completed for close to two years.



A common sight in Pennsylvania now  
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**Bob Snook**, USCA member and president of PACK (Pennsylvania Association of Canoe and Kayak Racing), said, "If drilling and fracking is done properly and adequately managed by regulatory oversight, I am not opposed. The extreme negative positions comparing drilling to coal and timber operations historically are extreme, as also appear to be feelings that water usage and contamination will ruin our water resources. Problems will occur such as the Bradford incident, road damage, truck noise, etc., but we cannot stop what is considered progress in pursuing the American

dream, which requires ever increasing amounts of energy. A very positive side effect, which I rarely hear voiced, is that we may well see some preservation of rural land that would otherwise have become urban sprawl. The small farmer, with lease and/or royalty possibilities, may now have a retirement income, without selling his land, most often for subdivision/development-which I believe would have had a greater negative environmental impact than the gas operations."

Bob continues, "I am also very concerned re: the various taxing bodies view of their possible

"windfall." If we manage to create an adversarial relationship with the gas industry, we'll all lose. I think as a final note- we need to recognize that the gas industry is here, and will be for the next 30 years or so. The key is to focus on how to reasonably co-exist."

I'm all in favor of co-existing, but I am troubled that no other industry in the United States has been granted so much freedom from fundamental environmental and human health and welfare laws as the oil and gas industry. As a

result of these and other exemptions, little unbiased scientific information exists regarding the cumulative environmental impacts from drilling in the Marcellus Shale formation.

**Ken Gerg**, USCA Delegate, former PACK president and former USCA vice-president, had this to say, "Number one, the more I see the people involved in this the scarier it is. Number two, there are no environmental regulations in place at this time. Number three, we don't know what will happen with fracking this stuff, they've gone too far and too fast with no regulations and they are

not taxed. (Governor) Corbett said there would be jobs created, but these jobs are not the kind of jobs you want. I had a lease here but it expired 4/11 and I'm now out of it. I'm opposed. They are out of control. We get no revenue from it and once the damage is done we can't repair it. We don't know what will happen to the environment. It's like coal. They stripped the area and ruined the trout streams. Stripping was unregulated and now we're paying the price."

Regarding the wastewater from fracking, Ken commented, "That fracking water in trucks, those guys just drive off, open a valve and put the stuff on the roads, how do you regulate that? The treatment plants can't handle it. There are too many crooked individuals in it and they're not doing it right. If we regulate to the extent necessary for it to be done properly, where are we going to get the money for that if we're not taxing the industry?"

Imagine the scenic and historic vistas of Pennsylvania's rivers and lakes mentioned in our Constitution. Now there are multiple tanker trucks syphoning the water, overshadowed by towering hydraulic

fracturing rigs. Will we be able to continue paddling our waters? Will there even be enough water to paddle? Will parents consider it safe for their children? Will the birds and wildlife that Pennsylvania is so famous for go elsewhere because of the environmental disturbance? It is too soon to know the answers to these questions, and it is too bad they even have to be asked. I can't pretend to have a solution for our nation's energy crisis, but I believe hydraulic fracturing is not it, not now. In the end, will we uphold the constitution of our great Commonwealth and conserve our pure waterways for generations yet to come? Or will we have fracked up our future and only be left to stay out of the fracking water?

To view WNEP video of the Bradford disaster, go to:  
[tinyurl.com/WNEP-Scranton](http://tinyurl.com/WNEP-Scranton)  
 Contact Susan at [ladyjustice@erols.com](mailto:ladyjustice@erols.com)  
[www.pennkayaker.com/ladyjustice](http://www.pennkayaker.com/ladyjustice)  
[www.facebook.com/ladyjusticesusan](http://www.facebook.com/ladyjusticesusan)

Sources:  
 Marcellus Shale Association; Marcellus Shale Coalition; Pennsylvania Independent Oil and Gas Association; Chesapeake Energy Corporation; Halliburton; Columbia University; Cornell University; Swarthmore College; Widener University School of Law;

33 U.S.C. §1251 (Federal Clean Water Act); 42 U.S.C. 300f et seq. (Federal Safe Drinking Water Act); 42 U.S.C. §§7401-7671g (Federal Clean Air Act); USDA Forest Service; US Environmental Protection Agency, Oil and Gas Management Division; Pennsylvania Department of Conservation and Natural Resources; Pennsylvania Department of Environmental Protection; Governor's Marcellus Shale Advisory Commission; Greater Johnstown Wastewater Authority; Office of United States Senator Robert P. Casey, Jr. (D); Office of Governor Tom Corbett; Office of Pennsylvania Senator Mary Jo White (R-21); American Rivers; Catskill MountainKeeper; Delaware Riverkeeper; Loyalsock Creek Watershed Association; ProPublica; StormwaterPA; Susquehanna River Basin Commission; Associated Press; Huffington Post; Inquirer Harrisburg Bureau; New York Times; Patriot News; Pittsburgh Tribune-Review; WNEP, Scranton, PA.

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The FRACK COUNTRY BLUE\$ Guide to  
**PA Outdoor Recreation**

**THEN**                      **AND NOW**

1. Build a campfire with ~~wood~~. WELL WATER
2. Hike along beautiful, scenic ~~trails~~! PIPELINE SWATHS
3. Enjoy boating on Pine Creek's ~~white water~~. AIRFOAM HD
4. Hunt ~~turkey, bear, and deer~~. GRAVEL TRUCKS HUNT YOU!!
5. Climb a ~~rock face~~! GAS DERRICK
6. Fall asleep listening to the ~~wind in the trees~~. NATURAL GAS COMPRESSOR STATIONS
7. Breathe deep the ~~clear fresh air~~. PHOTOCHEMICAL SMOG
8. Wander by the light of a billion ~~stars~~. GAS FLARES