Hydraulic fracturing at Bousson Experimental Forest: Not simply a choice between the income and the environment

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As an institution heating all of its buildings with natural gas now being presented with the opportunity to lease a part of our land for natural gas drilling, we must realize that our power to alter the system as consumers is far stronger than our power to alter it as producers. As long as natural gas continues to be used as an energy source, it will need to be produced, either underneath Bousson, or another piece of land. With the money gained from leasing the land at Bousson, we could outfit our campus with energy-saving technology to decrease our consumption of natural gas for generations to come. As long as there is no surface disruption in the forest, drilling the ground underneath Bousson will most likely do no harm to any of the experiments taking place in the forest, and will provide students and faculty with research and educational opportunities to study natural gas drilling.

The popular documentary about hydraulic fracturing, *GasLand* depicts disturbing vignettes of the natural gas drilling industry and its negative effects on the environment, human health, and groundwater. Images of people lighting the water from their faucets on fire, animals and humans becoming ill and losing their hair, and streams bubbling methane, are all portrayed as effects of natural gas drilling, while the companies responsible and reaping the benefits are distant and unwilling to be contacted (Fox, 2010). As Allegheny College examines the possibility of hydraulic fracturing in the Utica Shale under Bousson Experimental Forest, the college needs to be sure to avoid the knee-jerk negative reaction caused by the claims of sources such as *GasLand* and evaluate this opportunity thoroughly Many possibilities lay in the ground under Bousson, and it would be a shame for this institution to ignore these possibilities due to unfounded fears and unproven claims.

High-Volume, Slick Water, Horizontal, Hydraulic Fracturing: The Process

With the process of hydraulic fracturing, also known as hydrofracking, natural gas can be obtained from tight shale formations, like the Utica Shale under Bousson. Prior to the creation of this technology, gas from shale formations had not been able to be effectively extracted. The first part of the process is to clear and level roughly 5 acres of land for the well pad, the site of the well and an area used for the storage of water, chemicals, and machinery throughout the drilling process. Drilling then begins vertically, for roughly 2-3 km underground. Then, drill bits are switched and new horizontal drilling technology allows the well to run through the shale layer horizontally, covering more area with a single well. As drilling is happening, the walls of the well are being surrounded by a cement casing, which is much thicker as the well is traveling through the underground aquifer, the source of groundwater for wells, to prevent contamination (United States Environmental Protection Agency, 2012).

After drilling is complete, an explosive charge is sent down deep into the horizontal section of the well to fracture the cement casing and the surrounding shale rock containing the natural gas. Next, millions of gallons of water are mixed with various chemicals that act

as lubricants, biocides, and friction reducers, among other purposes. This mixture, commonly referred to as fracking fluid, also contains fine-grained proppants; small particles that will help keep the fractures in the well open, allowing more gas to escape. This fracking fluid is then injected into the well at very high pressure, blasting apart the small fractures created by the explosive charges and releasing the gas held in the shale formation. Some of this fracking fluid will return to the surface as produced water, but most will remain down in the well (United States Environmental Protection Agency, 2012).

The Issues

Outside of the sort of "urban legend" claims made about evils hydrofracking, which have instilled a fear and mistrust about the industry in the general public, over the past five years we have begun to see academic sources come forward with insight on the issue. Even in these academic sources, however, there is heated debate and possible data misrepresentation. This being the case, we must sort through this data carefully in order to fully understand the effects hydrofracking under Bousson would have on the forest.

The issue of ground and surface water contamination, which is of utmost concern, is a prime example of this confusion. When the millions of gallons of water required to fracture a well are pumped into the ground, many are concerned about the possibilities of methane and many of the chemicals used in the process will make their way through the fractures in the rock into the groundwater aquifers. The documentary *GasLand* cited methane contamination in wells and methane bubbling up in streams, causing massive species die-outs, as proof of this process (Fox, 2010). If serious ecological damage were to happen in Bousson due to methane contamination, years of long-term research, such as Dr. Scott Wissinger's 23-year salamander study, could be harmed (personal communication, 2012).

Figure 1, which appeared in the scientific journal, Nature, depicts the hydraulic fracturing process and the ways in which groundwater can be contaminated. However, drilling happens 2-3 km below the ground with around 1500 m between the fracturing the aquifer. In that case, in this graphic, due to a distortion in scale, the drilling rig pictured on the left would be approximately 1 km tall. To give some comparison, this distortion would make the drilling rig roughly twice the height of the Empire State building (See Figure 2). This creates the misconception that the threat of groundwater contamination is far more eminent than it actually is by making the distances between the hydraulic fracturing and the aquifer appear shorter than it is in reality. The distorted scale in this graphic is a profound example of how many sources, even respected academic sources, can mislead us.

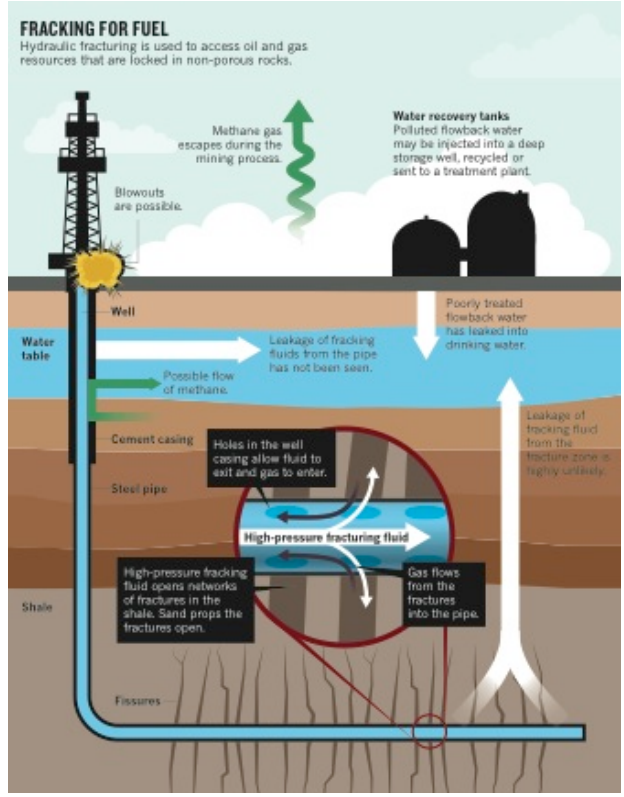

Figure 1: Distortion in graphic depicting drilling process and possible points of groundwater contamination (Howarth, Ingraffea, & Engelder, 2011).

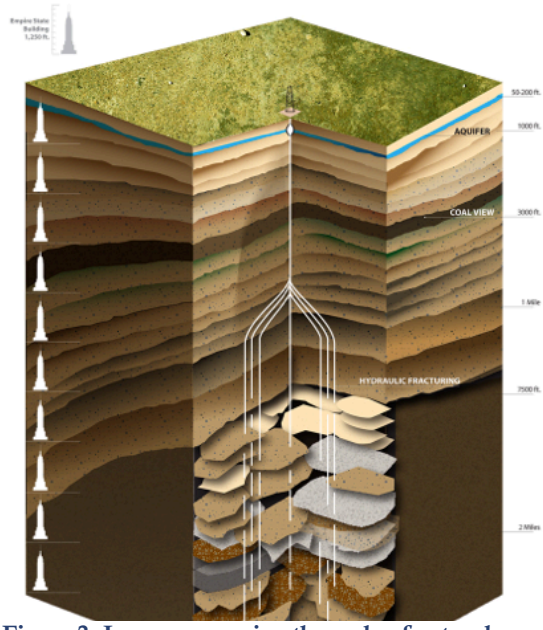

Figure 2: Image comparing the scale of natural gas drilling to the height of the Empire State Building, on left (Energy in Depth, 2010).

In fact, methane has been seeping up through the ground long before natural gas drilling began. An early local story from 1820's along Canadaway Creek in Fredonia, Pennsylvania, tells of a little girl and her father out collecting chestnuts by a creek. After being frightened by a bear, the only way the father could think to calm his daughter down was to wade out to a familiar spot in the creek, build a small chimney out of stones, and mesmerize her by setting it to fire

(McGraw, 2011). This same phenomenon of methane bubbling up in creeks and being lit on fire was documented in *GasLand* and was depicted as a very un-natural effect of natural gas drilling, while in reality, it has been documented for hundreds of years (Fox, 2010).

Thermogenic methane, a type of methane that originates deep underground, being found in drinking wells has also been cited as evidence of gas migration into aquifers due to hydraulic fracturing (Osborne, et al., 2011). However, thermogenic methane and brine from deep underground sources has also been found in water wells in areas unaffected by natural gas drilling. This suggests that pathways of fractures from these deep underground sources have already existed, and that possibility of hydraulic fracturing rapidly increasing the flow of these materials into aquifers is unlikely (Warner, et al. 2012).

Fracking at Bousson: A Critical Look

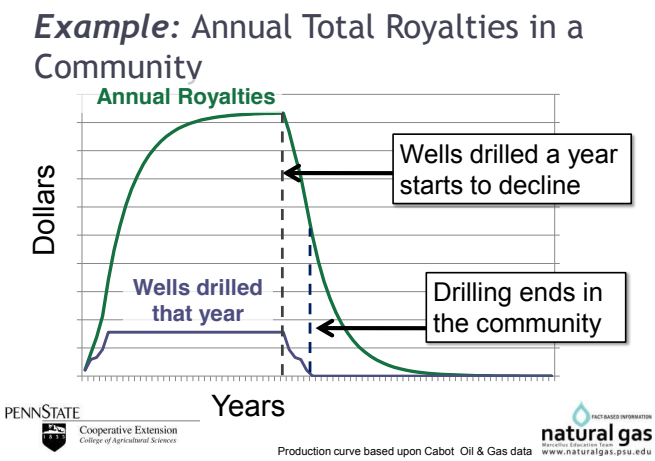

Figure 3: The "boom and bust" cycle associated drilling (Kelsey, 2011).

Looking at these sources, we can see that many of the fears associated with hydraulic fracturing happening under our feet are unfounded. A process that happens more than a mile below the ground has very little chance of affecting what is happening on the surface. If, then, Allegheny College were to allow a natural gas company to drill a well pad on the property of our neighbor and run a well horizontally under Bousson, the possibility of a negative effect on research and teaching at the forest is quite low.

There are a large number of other possible negative impacts on the region due to natural gas drilling. Many economists foresee a “boom-and-bust” economic cycle, where jobs and money enter a region while wells are being drilled, only to leave at their completion (see Figure 4). Another water issue deals with inadequate water management and wastewater treatment at plants (Rahm & Riha, 2012), as well as the threat of possibly inducing earthquakes by disposing of wastewater in underground injection wells

(Committee on Induced Seismicity, 2012). Others worry about the effect of heavy truck traffic on rural roads (see Figure 3). However, when reviewing these impacts, we need to be conscious of that fact that our ability to alter environmental and community impacts, as a single property owner in the Utica Shale region, is rather low. Whether we are open to natural gas drilling or not, drilling for the Utica Shale has already begun in Crawford County and changes in our community, for better or for worse, are already happening.

Figure 4: Road damage due to heavy truck traffic from drilling (Scheetz, n.d).

If Allegheny College really wishes to take an influential stance against natural gas production, we must quit demanding that it be produced for our use. All of our campus buildings are heated with natural gas. Is it not a bit hypocritical to state that we are against natural gas extraction when we are such a supporter of its use?

This institution's environmental guiding principles state that, "Allegheny College strives to be a community in which the earth's natural resources are used and sustained in manners that safeguard the health and survival of present and future generations " (Environmental Guiding Principles, n.d.) I propose that, rather than simply skirting the issue and convincing ourselves that a decision not to allow hydrofracking at Bousson is somehow "environmentally-friendly", we take this opportunity to actually move towards becoming the community we have set out to be.

While there is some discrepancy in the exact numbers, leasing the land under Bousson Experimental Forest has the possibility of bring millions of dollars in revenue to this campus. If that money were designated to be used for projects that lower the college's natural gas consumption, we could combat natural gas-related issues at the source. Better insulating and outfitting our buildings in geothermal technology would decrease natural gas consumption and heating bills drastically for the generations of Allegheny students to come.

The Bousson Experimental Forest has been designated as a research and education tool for the college. If drilling in the area surrounding Bousson were to commence during

the school year, there would be an opportunity for classes to visit drilling sites and see the process in person. As an Allegheny student who has studied the hydraulic fracturing process and its effects in two separate classes, I can attest to the value visiting a well pad during the drilling period would have added to my experience and understanding of the subject. Many people have preconceived notions, both founded and unfounded, about the effects of drilling on a region, and being able to watch the process unfold will equip our students with a first-hand knowledge beyond the classroom experience. Being present at the drilling site would give students a deeper understanding of the process by allowing us to see, hear, and experience the drilling process in a way that no classroom explanation or video clip ever could. Already, we have students preforming independent studies and senior comprehensive projects on the effects of natural gas drilling in the area, and using drilling at Bousson as a teaching tool will allow for more study of this subject.

Many students and faculty members at Allegheny College are opposed to natural gas drilling at Bousson on the principle that it can do harm to our environment and our community. However, the issues of natural gas drilling cannot be resolved by opposing its production. Only with decreasing consumption of natural gas can we begin to solve the problem. Leasing the land under Bousson gives this college the opportunity to do just that, by providing us with the funds to outfit our campus with features that lower our natural gas consumption for years to. As long as no surface disruption occurs, research already happening at Bousson will most likely no be harmed, and new opportunities for students and faculty to study more deeply the effects of hydraulic fracturing on a region will arise. With funds provided by leasing the land under Bousson, we will have the power to make the most positive impacts we can.

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