LEGAL ANALYSIS OF HYDROLOGIC FRACKING LAWS AND REGULATIONS IN THE UNITED STATES.

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INTRODUCTION

The rapid growth in the use of Hydraulic fracturing (fracking) in the U.S. has raised concerns over its potential impact on water resources, human health, and air quality. Public concerns have called upon federal, state, and local legislations to address the issues associated with fracking. The primary reason government officials are hesitant to act is due to the lack of scientific research in the area. Arguments are made on both sides of the spectrum. Proponents of fracking argue that this technology will produce cleaner energy production at higher levels and energy independence. Opponents are concerned with the large volume of water usage, possible underground water contamination, human health concerns associated with waste disposal, and air quality effects. A legal analysis of fracking on the federal, state, and local level in the U.S. focused around water resources, human health, and air quality ultimately demonstrates a trend of local governments enacting regulatory laws in large part due to public pressure. However, until the federal government presents substantial scientific findings regarding the effects of fracking it will be very difficult to create overarching comprehensive fracking legislation and regulations. This section addresses current and proposed legislations at the federal, state, and local level in the U.S.

BACKGROUND

Hydraulic fracturing, or "fracking," is a technique used to stimulate oil and natural gas production trapped in underground deep rock and shale formation.[1] The fracking process takes place after a well has been drilled and a steel pipe, or a casing, is inserted into the well hole.[2] Fracking fluid, a combination of large volumes of water, sand, and approximately 600 chemicals including Methanol, Lead, and Mercury, is then injected into the ground through the casing.[3] The mixture reaches the end of the well where the high pressure causes the deep rock or shale to crack creating openings or fractures where the natural gas or oil can flow into the well.[4] Once the fractures have been created, some of the fracking fluid begins to flow back to the surface while approximately 90% remains in the casing to hold open the fractures. [5] The material is commonly referred to as "flowback." In the end, the flowback is either lost in the fracking process or upon its return to the surface

[1] http://fas.org/sgp/crs/misc/R41760.pdf
[2] http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U6nlMhZbTwI
[3] http://www.dangersoffracking.com
[4] http://www.dangersoffracking.com
[5] http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U6nlMhZbTwI

is disposed of. [6]

ENVIRONMENTAL IMPACT: THE ENVIRONMENTAL COST AND BENEFITS

The environmental impacts of fracking on the environment can be broken down into the following categories: water use, underground and drinking water contamination, health issues, waste disposal, and air pollution.

The Cost

First, the process of fracking requires large amounts of water. [7] In 2010, the United States Environmental Protection Agency reported that 70 to 140 billion gallons of water are used to fracture 35,000 wells in the Unites States each year. [8] This is approximate the annual water consumption of 40 to 80 cities each with a population of 50,000. [9] Coalbed methane wells use from 50,000 to 350,000 gallons of water per well, and deeper horizontal shale wells can use from 2 to 20 million gallons of water during the fracking process of a single well.[10] The large amount of water being used raises concerns about the ecological impact to aquatic resources and inefficient water usage.[11] For example, the state of California is currently under "extreme" drought conditions.[12] Furthermore, the state generates approximately $45 billion a year from agriculture, an industry heavily reliant on water.[13] The demand of large amounts of water may cause drillers and consumers to compete for the limited amount of water resources.[14] As a result, in January 2014 the

[6] http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U6nlMhZbTwI

[7] http://yosemite.epa.gov/sab/sabproduct.nsf/0/D3483AB445AE61418525775900603E79/$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf

[8] http://yosemite.epa.gov/sab/sabproduct.nsf/0/D3483AB445AE61418525775900603E79/$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf

[9] http://yosemite.epa.gov/sab/sabproduct.nsf/0/D3483AB445AE61418525775900603E79/$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf

[10] http://yosemite.epa.gov/sab/sabproduct.nsf/0/D3483AB445AE61418525775900603E79/$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf

[11] http://www.alternet.org/environment/jerry-brown-faces-protests-over-fracking-support

[12] http://www.alternet.org/environment/jerry-brown-faces-protests-over-fracking-support

[13] http://www.alternet.org/environment/jerry-brown-faces-protests-over-fracking-support

[14] Amanda Skalski, Regulating Hydraulic Fracturing in Michigan: The Protection of Our Waters and Our People Hits Another Roadblock, 14 J. L. Society 277, 283 (2013)

organization, "Californians Against Fracking," delivered 100,000 public comments to the governor against the increased fracking occurring in the state. [15] Then in March 2014, thousands of Californians rallied in Sacramento once again demanding that the Governor ban fracking in the state. [16] No word on whether or not California governor will respond. Regardless of the state's conditions, using large water sources for fracking is diverging water from other industries where water is a critical component to their survival. Moreover, it is an inefficient way of using the limited amount of water recourses when states like California are experiences extreme drought. Instead, states should allow and promote water sustainability.

Another environmental impact is the possible contamination of underground and drinking water. Many chemicals in the fracking fluid are known toxins.[17] The possibility of pollution depends on several factors such as the proximity of the well to the drinking water supplies, the permeability of the formations, and the chemical composition used in the fracking fluid. [18] In general, water quality could diminish because of the higher concentrations of pollutants that may enter the well.[19] In 2004, the U.S. Environmental Protection Agency (EPA) released a final study evaluating the impacts to underground sources of drinking water by fracking coalbed methane wells.[20] The study found that ten out of eleven coalbed methane wells are located in part within underground sources of drinking water.[21] Furthermore, the EPA found that in some cases fracking fluids are directly injected into underground sources of drinking water during the course of normal fracking procedures.[22] The EPA's calculations show that at least nine fracking chemicals may be injected into or close to underground sources of drinking water at concentrations from four to almost 13,000 times the acceptable concentration of drinking water. [23] These threats to the quality of drinking water are only the beginning. As time passes, these chemicals can creates negative consequences for underground sources of drinking water. Expert testimony from, John D. Bredehoeft, professional hydrogeologist who spent 32 years with the U.S. Geological Survey, states;

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[15] http://www.missionandstate.org/blog/governor-gets-100000-anti-fracking-new-year-wishes/
[16] http://oaklandlocal.com/2014/03/fracking-is-worsening-the-drought-contaminating-water-community-voices/
[17] Amanda Skalski, Regulating Hydraulic Fracturing in Michigan: The Protection of Our Waters and Our People Hits Another Roadblock, 14 J. L. Society 277, 282 (2013)

[18] Amanda Skalski, Regulating Hydraulic Fracturing in Michigan: The Protection of Our Waters and Our People Hits Another Roadblock, 14 J. L. Society 277, 282 (2013)
[19] Amanda Skalski, Regulating Hydraulic Fracturing in Michigan: The Protection of Our Waters and Our People Hits Another Roadblock, 14 J. L. Society 277, 282 (2013)
[20] http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_ch05_basins.pdf
[21] http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_ch05_basins.pdf
[22] http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_ch05_basins.pdf
[23] http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_ch05_basins.pdf

> "Coalbed methane production in the Powder River Basin will destroy most of these water wells…that will render the water wells in the coal unusable because the water levels will drop 600 to 800 feet. The coalbed methane production in the Powder River Basic is predicted to be largely over by the year 2020. By the year 2060 water levels in the coalbeds are predicted to have recovered to within 95% of their current levels; the coalbeds will again become useful aquifers. However, contamination associated with hydrofracturing in the basin could threaten the usefulness of the aquifers for future use."[24]

Although, contamination of underground sources of drinking water is uncertain to occur, due to the high toxicity levels and possible impact to future water sources it necessary to show the upmost level of precaution.

Next, health concerns have risen due to the human exposure to fracking chemicals. Workers, spill responders, health care providers, and people living near facilities can ingest chemicals that have spilled or entered drinking water sources through direct skin contact or by breathing vapors from the flowback. In 2010, Theo Colborn and three co-authors published a paper entitled Natural Gas Operations from a Public Health Perspective.[25] Colborn and her co-authors summarized health effect information for 353 chemicals used to drill and fracture natural gas wells in the United States. Health effects were broken into 12 categories, skin, eye and sensory organ, respiratory, gastrointestinal and liver, brain and nervous system, immune, kidney, cardiovascular and blood, cancer, mutagenic, endocrine disruption, other, and ecological effects.[26] Although Colborn focuses on chemicals used in natural gas development, the chemicals used for fracking wells are very similar. Fracking fluid chemicals such as methanol, phosphonium, and ethanol are all consistent with those found in natural gas development. Thus, all humans that are or could be exposed to fracking chemicals could experience many health effects unless flowback is properly disposed off. However, waste disposal is another environmental issue resulting from fracking.

Waste disposal is on the rise due to an increase in fracking practices. Large amounts of waste and flowback are posing a major waste management challenge for many fracking sites. Flowback consist of many toxic and radioactive materials that are difficult to treat and expensive to dispose of. [27] If left untreated, waste can contaminate other surfaces and

[24] http://www.earthworksaction.org/files/publications/Bredehoeft_Testimony_Hydraulic_Fracturing-sm.pdf
[25] Theo Colborn, Carol Kwiatkowski, Kim Schultz, & Mary Bachran (2011): Natural Gas Operations from a Public Health Perspective, Human and Ecological Risk Assessment: An International Journal, 17:5, 139-1056
[26] Theo Colborn, Carol Kwiatkowski, Kim Schultz, & Mary Bachran (2011): Natural Gas Operations from a Public Health Perspective, Human and Ecological Risk Assessment: An International Journal, 17:5, 139-1056
[27] http://md.water.usgs.gov/publications/fs-2009-3032/

living organisms. For example, the state of Pennsylvania has been faced with the challenge of disposing millions of gallons of toxic flowback. In 2008, it was discovered that Pennsylvania rivers and streams were contaminated with high levels of dissolved solids from flowback.[28] As fracking continues and increases, waste levels will also increase. States will be faced the challenge of ensuring and regulating that fracking companies do not discharge waste into their water sources. Not only is it directly polluting different ecosystems and its biodiversity, but it can also contribute to an increase in human health and water issues as previously discussed.

Finally, another environmental impact from fracking is the degradation of air quality as drilling increases. In areas of high drilling, substantial levels of benzene have been measured in the air near shale gas well. [29] Another contributor to the decrease in air quality has been attributed to the potential toxics emissions of flowback. Shales contain a numerous organic hydrocarbons and fracking fluid also contains toxics that are injected underground, a combination of both sources of pollutants could potentially emit dangerous toxics into the atmosphere.[30] A known chemical found in fracking fluid is methanol. The EPA reports that "chronic inhalation or oral exposure to methanol may result in headache, dizziness, giddiness, insomnia, nausea, gastric disturbances, conjunctivitis, visual disturbances (blurred vision), and blindness in humans."[31] Ultimately, continued emission of chemicals during the flowback process is detrimental to air quality.

Opponents of fracking stress all of the possible environmental issues that fracking is associated with. While scientific proof is not easily available, opponents suggest the U.S. take a precautionary approach until further research can be achieved.

Benefits

Hydraulic facturing, or "fracking" supporters emphasize the importance of a cleaner energy future, as it is practically impossible to convert to renewable energy today. They further maintain that a conversion to renewables is unlikely within the next decade or two, because of the increase in commercial consumption and its correlation to the increase in fossil fuel extraction.[32] The United States, alone, used 312 million quads of energy per

[28] http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U6nlMhZbTwI
[29] Earthworksaction, Reckless Endangerment While Fracking the Eagle Ford (2013), http://www.earthworksaction.org/files/publications/SUMMARY-RecklessEndangerment.pdf
[30] http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U6nlMhZbTwI
[31] U.S. Environmenal Protection Agency. Integrated Risk Information System (IRIS) on Methanol. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
[32] Amy Meyers Jaffe, Exec. Director for Energy and Sustainability, UC Davis; Bob Weinhold, "The Future of Fracking," Environmental Health Persepectives, Vol. 120, No. 7, July 2012

person in 2011.[33]

Energy is a fundamental need for day-to-day life. In fact, a key determinant of the percentage of the population falling below the poverty line and of child mortality is access to fuel. When asking the question of where to get that fuel, the fact of the matter is that all forms of energy production, renewables included, have an environmental impact.[34] Fracking supporters lean on the argument that access to fuel and the associated standard of living issues are, on balance, more important than the limited differences in fuel production. Renewable energies have wastewater disposal and land use issues, just like fossil fuels. Natural gas, comparatively, is cleaner and more efficient than other fossil fuels, emitting 80 percent less nitrogen oxides, less sulfur dioxide, very few particulates, and no mercury.[35] Further, electricity generation from natural gas is less water-intensive than other fossil fuels, and the science surrounding fracking-induced water pollution is uncertain at best.[36] The Energy Institute at the University of Texas found no direct link between fracking and groundwater pollution. Thousands of feet of rock and compressed soil separate groundwater from natural gas deposits and it has been hard to prove a conclusive link between contaminated drinking water and fracking, since groundwater can be contaminated by many sources.[37] The Institute concluded that human and technical error (above-ground spills, wastewater mishandling, and leaking drill casings) could be sources of groundwater pollution.[38]

Fracking supporters maintain that if there the scientific community was certain about the detrimental environmental impacts of fracking, then the Environmental Protection Agency would have enacted the appropriate federal legislation. According to Dr. Terry Engelder, fracking actually mirrors the natural process where "high-pressure magma, water, petroleum and gases deep inside the Earth . . . crack rock, helping to drive plate tectonics, rock metamorphism and the recycling of carbon dioxide between mantle and the atmosphere."[39] Supporters highlight the scientific difference between risks and harzards, where hazard refers to the inherent nature of a substance or practice that is capable of causing harm, while risk is the probability that harm will occur under specific conditions.[40] Fracking may pose a limited hazard to the environment, but the risk posed by the practice depends on human and technical error.

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[33] U.S. EIA
[34] Pless
[35] Jacquelyn Pless, Natural Gas Development and Hydraulic Fracturing: A Policymaker's Guide, National Conference of State Legislatures, 2012
[36] Pless…
[37] "EPA Tackles Fracking" by John Manuel, Environmental Health Perspectives Vol. 118, No. 5, May 2010
[38] Energy Institute at University of TX.
[39] Engelder, Terry, "Natural Gas: Should Fracking Stop." Nature, 477: 271-275. Sep. 2011.
[40] Janet E. Kester, PhD, *Bombardiere v. Schlumberger Technology Corporation*

Most important to legislators is the economic argument that fracking will not only lead to a financial revitalization but it will also potentially lead to energy independence. With capitalism operating on supply and demand, the fact that there is a world demand for cheap energy is incredibly important for countries looking to gain the competitive market advantage. Spending on exploration and development through the world has already increased by $18 billion in 2013.[41] The United States Energy Information Administration projects that the United States could become a net exporter of liquid natural gas by 2016 and an overall exporter of natural gas by 2020.[42] The current natural gas supplies within the United States, with proper extraction, could make the United States a competitor in the energy export market.[43] Furthermore, not only could the United States become a net exporter of natural gas, but the U.S. could also close the energy consumption and energy production gap with fracking. In 2011, the U.S. consumed over 97 quadrillion quads of energy while only producing 78 quads.[44] The 18 quad differences were made up in energy imports, but this does not need to be the case.

To sum up the benefits of fracking argument: fracking is a viable energy production method to meet the current and future local and foreign energy demands.

FEDERAL LEGISLATION

The United States Environmental Protection Agency (EPA) is authorized under the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), and the Clean Air Act (CAA) to regulate parts of the fracking practices. The case, Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., held that the EPA must monitor and regulate fracking practices since they are in fact underground injections. [45] However, Congress soon after enacted the Energy Policy Act of 2005, declaring fracking except from the SDWA. As a result of the act, the EPA no longer has to regulate fracking. However, through the CWA and CAA, fracking industries are prohibited from discharging pollutants freely. Currently there is a proposed bill called "The FRAC Act," that if passed will impose strict federal regulations on fracking operations.

[41] U.S. Energy Information Administration
[42] Pless/ U.S. Energy Information Administration
[43] Hong N. Huyn, "The U.S. race to export LNG," Natural Resources & Environment. 27.2 (Fall 2012): p51, copyright 2012 ABA
[44] U.S. EIA
[45] Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., 400 F.3d 1278, 1279 (11th Cir. 2005)

Clean Water Act (CWA)

Federal regulations concerning the disposal of flowback are governed primarily under the CWA. The CWA prohibits the discharge of pollutants by "point sources" into the "waters of the United States," unless the discharge complies with other CWA provisions.[46] Under the CWA, anyone seeking to discharge a pollutant into waters of the U.S. must first obtain a permit from either the EPA or an authorized state agency. The CWA requires the EPA or permit writers to consider both the technology available to control pollutants and limits that will meet water quality standards.[47] This is one way that fracking pollutants in water sources are being regulated and monitored by the Federal government. However, as seen in previous cases, high levels of pollutants are still being found in a number of rivers and streams. The EPA should take a stricter role in investigating and regulating the discharges of pollutants into water sources.

Safe Drinking Water Act (SDWA)

The SDWA was enacted in 1974 to regulate "public water systems," primary through EPA drinking water standard, as well as monitoring and reporting requirements.[48] Secondly in regards to fracking, the SDWA seeks to protect underground sources of drinking water by prohibiting underground injection of fluids without permit.[49] Under the SDWA, the EPA established minimum requirements for state Underground Injection Control (UCI) programs that inspect, monitor, record keep, and report requirements.[50] The UCI program makes states responsible for granting UCI permits and ensuring that underground injections of fluid did not contaminate sources of drinking water.[51]

Prior to, Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., the EPA did not consider fracking an underground injection. The EPA argued that "underground injection" did not include wells using the fracking process, because "the principal purpose of these wells is not the underground emplacement of fluids; their principal function is methane gas production."[52] The court rejected the EPA's interpretation, arguing that the plain meaning of "underground injection," as well as the legislative history regarding the passage of the SDWA, "required the regulation of all underground injection activities," including hydraulic

[46] Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, 531 U.S. 159 (2001)
[47] 42 U.S.C. § 300h(d)(1)(B)(ii) (West 2011)
[48] 42 U.S.C.A. § 300g (West)

[49] 42 U.S.C.A. at § 300h(b)(1)(a)
[50] 40 C.F.R. pt. 145 (2010)
[51] 42 U.S.C.A. at § 300h(b)(1)(b)
[52] Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., 400 F.3d 1278, 1279 (11th Cir. 2005)

fracturing.[53] However in 2004, the EPA released a study focused on the process of fracking and its potential affects. The EPA determined "that the injection of hydraulic fracturing fluids into (coal bed methane) wells poses little or no threat to underground sources of drinking water."[54] Despite this finding, the EPA identified chemicals used in fracking as "constituents of potential concern."[55]

After, Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., and the EPA's 2004 fracking study, Congress passed the Energy Policy Act of 2005. The Energy Policy Act, in part, amended the SDWA's definition of "underground injection" to exclude "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations." [56] As a result, states no longer require companies to seek permits before engaging in fracking operations, as part of their UIC program. Ultimately, the Energy Policy Act of 2005 resulted in a lack of federal regulation of the fracking industry mainly because of the lack of scientific research available to otherwise prove.

Clean Air Act (CAA)

The 1970 CAA was passed in an effort to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare."[57] The CAA establishes limits for "major pollution sources" called the National Emission Standards for Hazardous Air Pollutants (NEHAPS).[58] When numerous small sources of air pollution, such as are under common control and in close proximity they are treated as a "major source" subject to strict Clean Air Act technology requirements. [59] Oil and gas production is known to produce toxic air pollution.[60] However, the CAA exempts oil and gas wells.[61] As a result of this exception, the EPA cannot regulate the fracking industries emissions.

The Fracturing Responsibility and Awareness of Chemicals Act of 2011 and 2013 (FRAC Act)

The SDWA and CAA do very little regulate the fracking industry. Due to public

[53] Legal Envtl. Assistance Found., Inc. v. U.S. E.P.A., 400 F.3d 1278, 1279 (11th Cir. 2005)
[54] U.S. Envt'l Prot. Agency, EPA 816-R-04-003, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004).
[55] U.S. Envt'l Prot. Agency, EPA 816-R-04-003, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004).
[56] 42 U.S.C. § 300h(d)(1)(B)(ii) (West 2011)
[57] 42 U.S. Code § 7401
[58] Earthworks, Loopholes for Polluters- The Oil and Gas Industry's Exemption to Major Environmental Laws, http://www.earthworksaction.org/files/publications/FS_OilGasExemptions.pdf
[59] http://www.edcnet.org/learn/current_cases/fracking/federal_law_loopholes.html
[60] http://www.edcnet.org/learn/current_cases/fracking/federal_law_loopholes.html
[61] http://www.epa.gov/air/caa/

concern since the enactment of the Energy Policy Act of 2005, the first FRAC Act was introduced in 2011. The FRAC Act would impose federal regulation on hydraulic fracturing operations by repeal the SDWA's current fracking exception, and also requiring fracking operators to disclose hydraulic fracturing chemicals.[62] The FRAC Act would have two major impacts on the regulating of the fracking industry. First, fracking companies would be required to obtain UCI permits and demonstrate that injection of fracking fluids would not endanger any underground sources of drinking water.[63] Secondly, it would require that fracking companies disclose fracking chemicals being used.[64] Through the FRAC Act, the federal government will gain the authority to regulate the fracking industry. Unfortunately, the FRAC Act of 2011 "died" in committee."[65] On June 11, 2013, Senator Robert Casey Jr., reintroduced the FRAC Act. Since its introduction, the bill has not passed to committee. The FRAC Act has a 9% chance of actually getting past committee and a 1% chance of being enacted.[66] If the FRAC Act was to be enacted, this could be a pathway for the Federal government to impose stricter regulations on fracking industries.

STATE LEGISLATION

The issue of scientific uncertainty that stunts federal legislation from strongly restricting or banning fracking pervades the state legislatures as well. The best available technology is not enough and the cost is too much. Some states, however, have shown progressive regulations that limit natural gas extraction or incentive greener energy sources. Overall, the general trends of state legislation seem to be increasing transparency, imposing severance taxes and impact fees to generate revenue, protecting water quality, and continuing to improve the scientific knowledge base with consistent monitoring.[67]

The Oil and Gas Conservation Commission of the State of Colorado, for example, changed their rules of practice and procedure in Order No. 1R-114 so that all operators must maintain a Chemical Inventory by well site for each chemical product used.[68] Not only do operators have to disclose the type of chemicals they are using, but they also have to disclose the amount of all chemicals used in the fracking process. Colorado's disclosure rule is one of the country's most comprehensive as it attempts to address the "trade secret" loophole. While many states are proposing or have enacted some sort of fracking chemical disclosure rule, a major flaw exists in the current regime: operators do not have to disclose

[62] FRAC Act, H.R. 1084, 112th Cong. § 2(a) (2011); FRAC Act, S. 587, 112th Cong. § 2(a) (2011).
[63] FRAC Act, H.R. 1084, 112th Cong. § 2(a) (2011); FRAC Act, S. 587, 112th Cong. § 2(a) (2011).
[64] FRAC Act, H.R. 1084, 112th Cong. § 2(a) (2011); FRAC Act, S. 587, 112th Cong. § 2(a) (2011).
[65] https://www.govtrack.us/congress/bills/112/s587
[66] https://www.govtrack.us/congress/bills/113/s1135#overview
[67] http://www.ncsl.org/documents/energy/frackingguide_060512.pdf
[68] http://cogcc.state.co.us/

the chemicals they are using if the chemical product can be classified as a Trade Secret.[69] In Order 1R-114, Colorado maintains trade secret protection in that operators do not have to disclose the particular chemical(s) used, but they do have to disclose the ingredient's chemical family. While one hundred percent transparency does not exist quite yet, Colorado's 2011 disclosure rule is a progressive step towards it.

Another goal state legislatures have been working towards is revenue generation through severance tax structure changes and impact fees. While the majority of states already impose some form of severance tax, with 31 actually requiring levy taxes on oil and gas extraction, some states are either changing the amount they tax or are imposing impact fees.[70] Idaho, for example, enacted House Bill 379 in 2012, which increased the tax levied and imposed on all oil and gas produced in the state from 2% to 2.5% of the market value.[71] On the east coast, Pennsylvania enacted House Bill 1950, establishing an impact fee based on the previous year's average natural gas price.[72] Not only do these new tax laws increase state revenue, but they also decentivize natural gas extraction to a limited but symbolic extent.

In terms of water quality protection and consistent monitoring, California, passed its first fracking bill, SB-4, in 2013. The bill requires that the state complete an Environmental Impact Report (EIR) by 2015 and that the Division of Oil, Gas, and Geothermal Resources (DOGGR) regulate fracking operators through a permitting process.[73] This permitting process will require operators to monitor water quality, air quality, well spacing, and conservation areas, allowing the state to keep fracking operations honest and protect ecosystem integrity while allowing resource extraction.[74] And with the surface and groundwater tracing, the amount of available scientific data on the environmental consequences of the practice will allow other state and eventually the federal legislature to make scientifically-informed reforms. While California has this water quality monitoring requirement, many states have been reluctant to enact similar requirements.[75] New York, for example, proposed groundwater tracing laws, but the states legislature killed the bill less than a year after it was proposed.[76]

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[69] http://www.ncsl.org/documents/energy/frackingguide_060512.pdf
[70] http://www.ncsl.org/documents/energy/frackingguide_060512.pdf
[71] http://legislature.idaho.gov/legislation/2012/H0379.pdf
[72] http://www.legis.state.pa.us/cfdocs/billinfo/BillInfo.cfm?syear=2011&sind=0&body=H&type=B&bn=1950
[73] http://leginfo.legislature.ca.gov/faces/billVotesClient.xhtml
[74] http://www.conservation.ca.gov/dog/Pages/Index.aspx
[75] http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Capabilities/North-America-Capabilities/USA/Oil-and-Gasoline-Testing/Oil-and-Gas-Production-and-Midstream-Support/Fracking-Regulations-by-State
[76] http://www.ncsl.org/documents/energy/frackingguide_060512.pdf;

Overall, states appear to be moving toward responsible fracking that includes a greater degree of transparency and monitoring in order to find an agreeable middle ground between economic and environmental interests. It is likely that once the EPA releases its comprehensive study on fracking and its environmental effects by the end of this year (2014) and takes a more formal stand on the practice, many state legislatures will adjust their environmental regulations accordingly.

CONCLUSION AND RECOMMENDATIONS

While Federal and State legislations have not successfully banned fracking practices, with the exception of Vermont who banned fracking in 2012, local legislations have demonstrated the most success when it comes to banning and regulating fracking.[77] A number of cities across the U.S. have enacted ordinances banning fracking. Cities in New Yorks and California among them Canandaigua[78], Kirkland[79], Santa Cruz[80], and Beverly Hill[81] have all banned fracking practices. Even Texas, known to be a fracking friendly state, has passed ordinances in Dallas were fracking has been restricted within 1,500 feet of any homes, schools, and churches.[82] In order to enact such ordinances, community members have played a big role by submitting public comments and speaking during public comment meetings.[83] One of the main reasons why banning has been very successful on a local level is due to the publics direct commitment to the wellbeing of their overall community and wellbeing. The people who are speaking about the contaminations and pollutants are directly experiencing the effects of fracking.[84] Through their testimony they are able to persuade local representatives about the need to ban fracking even though fracking scientific research is not available on a federal level. Based on the analysis of federal, state, and local legislatures considering the cost and benefits of fracking, it is ultimately recommended that fracking be highly regulated or completely banned. Although proponents make several argues that should not overlooked, due to the lack of scientific research, it is wise to take a precautionary approach until further research has been done. The EPA is set to announce its final fracking study in late 2014. They are currently asking people to submit public comments.[85] Once the EPA releases their study, it can perhaps make way for stricter regulatory laws on all levels on the Federal level.

[77] http://www.leg.state.vt.us/docs/2012/Acts/ACT152.pdf
[78] http://www.democratandchronicle.com/story/news/2014/06/06/canandaigua-fracking-ban/10079289/
[79] http://townofkirkland.org/content/Laws/View/49:field=documents;/content/Documents/File/131.pdf
[80] http://www.reuters.com/article/2014/05/21/california-fracking-idUSL1N0O700J20140521
[81] http://www.huffingtonpost.com/2014/04/24/beverly-hills-fracking-ban_n_5208377.html
[82] http://rt.com/usa/dallas-passes-fracking-restrictions-178/
[83] http://www.buffalonews.com/feed/amherst-town-board-agrees-to-draft-a-local-law-banning-fracking-20140429%20
[84] http://www.publicherald.org/archives/16845/investigative-reports/energy-investigations/
[85] http://www.epa.gov/otaq/fuels/renewablefuels/documents/rfs-waiver-request-comment-extension.pdf

APPENDIX I

Current State Regulations

- California Senate Bill No. 4, Oil and gas: well stimulation.
- Colorado Order 1R-114, Fracking disclosure rule: type and concentration of each chemical.
- Idaho House Bill 464, Only the state has the authority to prohibit oil and gas extraction.
- Illinois Public Act 098-0022, Fracking regulatory act.
- Indiana House Bill 1107, Disclosure of hydraulic fracturing treatments.
- Kansas House Bill 2526, Commission has authority to make fracking disclosure rules.
- Maryland House Bill 1123, Establishes presumptive impact area around wells and requires replacement of water supplies.
- Maryland House Bill 828, Oil and gas professionals must be licensed.
- Marryland House Bill 854, Financial assurance requirements for new and modified wells.
- New Jersey Senate Bill 2576, One-year moratorium on fracking to conduct air and water quality impacts.
- New Jersey Assembly Resolution 112 and Senate Resolution 98, Supports federal FRAC Act.
- North Carolina Senate Bill 76, Fracking operators must obtain a permit.
- North Carolina Senate Bill 820, Commission tasked with developing regulatory framework.
- North Dakota House Bill 1134, Tax emption amendments to encourage gas use.
- North Dakota House Concurrent Resolution 3053a, Supports the relaxation of EPA fracking regulation.
- Ohio Senate Bill 315, Fracking regulatory act.
- Ohio House Bill 133, Fracking allowed on public lands.
- Ohio House Bill 59, Fracking radioactive waste disposal regulation.
- Pennsylvania House Bill 1950, Public fracking chemical disclosure.
  , Local authorities limited in their ability to zone and regulate natural gas drilling.
  , Restricts well location, requires reporting, and addresses civil penalties and emergency response.
- Pennsylvania Senate Bill 259, Royalty payments and lease pooling.
- Pennsylvania Senate Bill 1263, Six-year moratorium on gas drilling in South East part of state.

- South Dakota House Concurrent Resolution 1005, Supports state-regulated fracking.
- Texas House Bill 3328, Fracking chemical disclosure.
- Texas House Bill 2767, Fracking waste treatment and recycling for beneficial use.
- Utah SCR 12, Supports state-regulated fracking.
- Vermont House Bill 464, Statewide prohibition of fracking and associated waste water.
- West Virginia House Bill 401, Fracking regulatory act.

*Note: All listed bills have been enacted and codified. This, however, is not an exclusive list of all current state legislation. It very likely does not include **all** current state fracking laws.*