WHAT THE FRACK? HYDRAULIC FRACTURING AND WATER CONTAMINATION: SOLUTIONS FOR THE FAYETTEVILLE SHALE PLAY

I. INTRODUCTION

Imagine you are a small farm owner and you are approached by a representative from a gas company. You are told that the land that you own sits atop a gas shale "play,"[1] and the company is willing to pay you $100,000 in leasing rights to drill on your land. You agree and sign a contract to this effect with the gas company. Not long after the drilling starts, you notice changes in your water; it has a strange odor, it has become discolored, and it has a different taste.[2] One day, by accident, you even learn that you can now light your water on fire.[3] You are frightened over what this means for you and your family but are under contract with the gas company that drilled the well. Your neighbors are having similar problems. You are considering taking legal action against the gas company. What do you do?

Residents who live near gas wells where hydraulic fracturing or "fracking" occurs commonly face this scenario. Hydraulic fracturing is a process in which a horizontal well structure[4] is drilled into a shale deposit.[5] Water, sand, and chemicals are pumped into the well under high pressure to break apart, or fracture, the shale around the well, which allows the natural gas to flow freely.[6] In the last sixty years, over one million gas wells have been drilled in this manner in the United States.[7] Gas drilling has become a more lucrative business in the United States because hydraulic fracturing[8] allows gas drillers to reach gas that was previously unreachable.[9] Seemingly overnight, U.S. gas reserves have increased tremendously.[10]

Both the Environmental Protection Agency (EPA) and oil and gas industry experts claim that hydraulic fracturing is proven and safe.[11] Landowners near these wells, however, have experienced water contamination that affects their daily lives and well-being.[12] For the most part, hydraulic fracturing is regulated by state law.[13] Arkansas is home to the Fayetteville Shale Play which spans much of the northern part of the state.[14] In Arkansas the practice is regulated by five different agencies including the Arkansas Department of Environmental Quality (ADEQ) and the Oil and Gas Commission.[15] Despite this intense regulation, some Arkansans are still experiencing problems.[16]

To resolve the water contamination issues faced by landowners in the Fayetteville Shale area, this note proposes that the Arkansas legislature should adopt regulations from similarly affected states to help prevent contamination problems from occurring in the future. Such legislation should require third parties to be notified by drillers when disposal wells are drilled; it should direct drillers to clean and recycle water used in the drilling process; it should direct drillers to disclose what is in fracking fluid; and finally, it should fund a study of the impact that fracking is having on the state.

First, this note explains what natural gas is and how hydraulic fracturing is used to extract it. Next, it summarizes Arkansas law regulating hydraulic fracturing and looks at some of the problems faced by landowners in areas where hydraulic fracturing has occurred. Then, the note will examine how other states have responded to these problems and will discuss how some of these methods could be used in Arkansas. Finally, this note will discuss some of the current legal remedies that are available for affected land owners.

II. WHAT IS NATURAL GAS AND HOW IS IT EXTRACTED?

In property law, natural gas is considered a mineral, a substance which has commercial value and that is "rare or exceptional."[17] Mineral ownership can be severed from surface ownership.[18] This is accomplished through leasing rights where the surface owner, as lessor, leases the right to extract and produce the natural gas to a lessee.[19]

"Natural gas [is] a chemical by-product of the decompos[ed] . . . organic plant and animal material [that] covered the earth's surface millions of years ago."[20] Over time, the byproduct was compressed under the surface in various rock formations thousands of feet below the surface.[21] Some of these formations, like shale, are less permeable than others.[22] The lack of permeability made it difficult for drillers to reach gas in such locations years ago; however, hydraulic fracturing and horizontal drilling have made reaching gas in shale formations easier to accomplish.[23]

A. The Traditional Method: Vertical Drilling

Before the development of the hydraulic fracturing method, gas wells were traditionally drilled through vertical drilling.[24] With the vertical method, wells were drilled straight down into a reservoir and gas was retrieved.[25] The vertical method proved to be useless for some shale formations like the

Fayetteville Shale Play, so a new method was needed.[26] Thus, horizontal drilling was born.[27]

B. The New Method: Horizontal Drilling and Hydraulic Fracturing

Shale formations are considered unconventional reservoirs because the gas-bearing rocks in the shale are impermeable without horizontal drilling and hydraulic fracturing.[28] This method was developed to accommodate drilling in urban areas such as the Barnett Shale in Texas, which is located in the Dallas-Fort Worth area.[29] Because Dallas is an extremely developed area, drillers developed this method to create fewer wells, but still obtain just as much gas from reservoirs.[30] Through horizontal drilling, drillers could drill one well head and several lateral, or horizontal, wells without littering the city streets with hundreds of vertical wells.[31] When combined with hydraulic fracturing, horizontal drilling achieves better rates of gas production.[32]

Hydraulic fracturing is a process by which fracturing fluids[33] and propping agents[34] are forced into the rock under high pressure.[35] During the drilling process, fracturing fluids and propping agents often sit in manmade storage pits until they are ready to be used or disposed of.[36] These pits are usually lined with plastic to help keep the fluid from seeping into the soil and groundwater.[37] The pressurized fluids fracture, or break apart the rock, allowing gas to be extracted.[38] After the drillers have extracted the gas, they are left with brine,[39] a substance saltier than seawater, and propping agents.[40] Both fluids are typically placed into injection wells,[41] thousands of feet below the surface, for disposal.[42]

C. Natural Gas in Arkansas: The Fayetteville Shale

Natural gas is used throughout the U.S. as an energy source to heat homes. Production rates of natural gas have increased throughout the U.S. with the discovery of new resources and with the development of new technologies.[43] Arkansas is playing a big role in this increase in production with the discovery of the Fayetteville Shale Play, a shale gas development located in north-central Arkansas, which has become the centerpiece of the Arkansas gas industry.[44] Prior to the 2001 discovery of the Fayetteville Shale,[45] natural gas was produced in Arkansas in the Arkoma Basin.[46] Since 2001, over 480 active natural gas wells have been established,[47] and it is estimated that there is enough gas in the Fayetteville Shale to last thirty years.[48] The

Fayetteville Shale has proven to be an economic boon for the state.[49] This note focuses on hydraulic fracturing because its positive economic impact on the state will inevitably have a negative environmental impact, causing legal ramifications for local landowners.

III. WHO REGULATES HYDRAULIC FRACTURING?

A. Federal Regulations

The gas industry faces regulations at almost every level of government. The Clean Water Act, which prohibits the discharge of pollutants into navigable waters, governs gas producers at the federal level.[50] The Safe Drinking Water Act (SDWA), which sets the standards for potable water, also regulates gas drillers.[51] In 2005, Congress passed the Federal Energy Policy Act, which amended portions of the Safe Drinking Water Act.[52] The amended portion pertains to the Underground Injection Control (UIC) provisions of the SDWA and removes hydraulic fracturing from the definition of underground injection.[53] An underground injection is the subsurface deposit of fluids by well injection.[54] The amendment specifically excluded from this definition "the underground injection of fluids or propping agents . . . pursuant to hydraulic fracturing operations related to oil, gas, or geothermal activities."[55] In removing hydraulic fracturing from the definition of underground injections, the federal government left such regulation largely up to the states.[56] Many commentators have debated whether this should have occurred.[57]

The UIC Program[58] protects aquifers from injection wells by setting minimum requirements for injection wells.[59] Class II injection wells contain fluids associated with oil and natural gas production.[60] When gas is brought to the surface it often contains brine.[61] "[Brine and the propping agents] can be very damaging to the environment and public health if [they] are discharged to surface water or the land surface."[62] "By injecting the brine and propping agents deep underground, Class II wells prevent surface contamination of soil and water."[63] Injection wells are overseen by either a state agency or one of the EPA's regional offices.[64] In Arkansas, injection wells are overseen by both the Arkansas Department of Environmental Quality and the Arkansas Oil and Gas Commission.[65]

B. State Regulations

In Arkansas, several organizations regulate hydraulic fracturing, including the Arkansas Department of Health (ADH),[66] the Arkansas Department of Emergency Management,[67] the Arkansas Natural Resources Commission,[68] the Arkansas Oil and Gas Commission (Commission), the ADEQ, and the Arkansas Pollution Control and Ecology Commission.[69] This note focuses on the last three agencies because they supply the majority of the regulation for hydraulic fracturing within the state.

1. *Arkansas Oil and Gas Regulations*

The purpose of the Commission is:

to serve the public regarding oil and gas matters, [to] prevent waste, [to] encourage conservation, and [to] protect the correlative rights of ownership associated with the production of oil, natural gas and brine, while protecting the environment during the production process, through the regulation and enforcement of the laws of the State of Arkansas.[70]

The Commission issues permits to drill for oil and natural gas,[71] and it authorizes procedures to plug and abandon wells to insure the protection of fresh water.[72] The Commission also issues permits to drill and operate Class II[73] UIC enhanced oil recovery injection wells and saltwater disposal wells,[74] and it conducts administrative hearings to enforce provisions of the oil and gas statutes.[75]

Pursuant to the SDWA's underground injection control program, Rule B-15 of the Commission requires that "fresh water sands [must] be fully protected by setting and cementing surface casing to prevent [them] from becoming contaminated with oil, gas, or salt water."[76] Casing made from heavy steel pipe and cement is used to seal off fluids as they are pushed down through the well.[77] The casing serves as a conductor of drilling fluid and as protection of potable water sources.[78] The regulation also states how far below the surface those casings must be placed based on the county in which the injection well is located.[79] Different gas fields have differing casing and injection well requirements based on the surrounding rock formation.[80] The Arkansas Oil and Gas Commission co-manages parts of the UIC program with the Arkansas ADEQ.[81]

Like Rule B-15, the Commission's Rule B-17 also seeks to prevent water contamination from gas well operations.[82] Rule B-17 regulates fluid stor-

age pits used by well operators in the drilling process.[83] These pits are typically lined with a synthetic material (a strong type of plastic liner) and used to store huge amounts of fluid like brine or fracking fluids.[84] Like rule B-15, the Commission enforces this regulation concurrently with ADEQ.[85] The regulation prohibits these fluids from being discharged onto the land or into state watercourses without the Commission's or ADEQ's knowledge.[86] Well operators that fail to adhere to this regulation may be subject to penalty under provisions of the state's Water and Air Pollution Control Act.[87]

When well operators are finished with the fluids, they may be disposed of in several ways.[88] First, they can be applied to land if the operator has an ADEQ permit.[89] Second, fluids can be disposed of at an approved National Pollutant Discharge Elimination System (NPDES) facility.[90] Third, the fluids can be injected into a Class II disposal well.[91] Fourth, water-based drilling fluids[92] can be pumped back down into the well bore.[93] Fifth, fluids that contain a high concentration of solids may be solidified and buried on site.[94] Finally, ADEQ and the Commission can approve of additional methods of disposal.[95]

2. *Arkansas Environmental Regulations*

The Arkansas Department of Environmental Quality is the primary environmental regulatory agency in Arkansas.[96] It serves as the EPA's delegate[97] for various programs including the underground injection control program.[98] The Arkansas Pollution Control and Ecology Commission ("APC&EC") is the actual environmental policy making body in the state, but ADEQ enforces the APC&EC's policies.[99] The Water Division of ADEQ enforces APC&EC Regulation 1,[100] which prevents gas and oil companies from allowing gas field wastes to escape or discharge onto the ground or to escape into fresh water.[101] It also requires these entities to maintain those wastes until they have submitted a disposal plan and have received permission to execute the plan from ADEQ.[102]

Some fluids produced in the fracking process are primarily water-based and contain few chemicals or oil and gas additives. In some cases, ADEQ allows water-based drilling fluids used in the fracking process to be released onto the surface of the land.[103] However, the fluids associated with drilling must meet certain chemical requirements before they may be applied to land.[104] Drillers who wish to apply the water to land must obtain a permit from ADEQ.[105] In order to obtain a permit, they must submit a plan to

ADEQ that was prepared by a professional engineer.[106] The water is then placed in pits for storage while it is tested to see if its chemical composition is safe for land application.[107] Once the levels are determined to be safe[108], the water can then be applied to commercial farm land through a sprinkler system.[109] "[Fluids] cannot be applied to land when the ground is saturated, frozen, or if precipitation is imminent."[110]

Despite the large amount of state legislation and entities that oversee drilling, there are still significant risks associated with hydraulic fracturing that have not been addressed.

IV. WHAT ARE THE PROBLEMS WITH HYDRAULIC FRACTURING?

In the early 2000's the EPA began collecting information on hydraulic fracturing.[111] The purpose of the study was to determine whether the injection of hydraulic fracturing fluids into gas wells had the potential to contaminate underground sources of drinking water.[112] After testing water in several locations around the country, the EPA determined that "the injection of hydraulic fracturing fluids into [gas] wells pose[d] little or no threat to [underground sources of drinking water] and [did] not justify additional study."[113] The gas industry often refers to this study when the safety of hydraulic fracturing is challenged.[114] It was after this study that Congress amended the SDWA's underground injection program to exempt hydraulic fracturing from the definition of "underground injection" and relinquished its regulation to the states.[115]

Despite the EPA and the gas industry's assurances that the practice is safe, many people who live near hydraulic fracturing sites are questioning the safety of hydraulic fracturing.[116] They blame hydraulic fracturing for many of the problems that are occurring to their property, ranging from spoiled water wells[117] to earthquakes.[118] With the growth of hydraulic fracturing and horizontal drilling in Arkansas, many landowners in the state are now having problems with their property that they have never faced before.[119]

In response to these problems and the increased media scrutiny in the industry, the EPA decided to conduct additional studies into the impact of hydraulic fracturing.[120] Recently, the EPA[121] and some states[122] requested that drilling companies disclose the chemical compounds found in their fracturing fluids.[123] Right now it is unclear which part, if any, of the horizontal drilling and hydraulic fracturing process is causing damage to property.[124] In

September and October of 2010, the EPA conducted testing in Wyoming and detected elevated levels of methane and fracturing fluid components in water samples.[125]

Property owners who live near hydraulic fracturing gas wells around the country claim that they have suffered damages from these new drilling practices. In Dimock, Pennsylvania is a town that sits atop the Marcellus Shale.[126] Residents of Dimock have experienced many property issues that they attribute to hydraulic fracturing.[127] For example, one resident knew his well water had gone bad after he discovered it could be lit on fire.[128] Another Dimock resident's water well exploded.[129] The Pennsylvania Department of Environmental Protection (Pennsylvania DEP) conducted an investigation and found that Cabot Oil & Gas, a Texas gas drilling company, was the culprit.[130] Methane had seeped into the aquifer because of nearby gas drilling.[131]

The Pennsylvania DEP believed that too much pressure and cracks in the cement casing caused the gas to leak out.[132] The threat of explosions forced twenty families to leave their homes, and at least sixty water wells were contaminated.[133] Some residents are spending twenty dollars a week buying bottled water, some travel to other townships to obtain water, and some have stopped drinking the water altogether.[134] Some of the changes in the water included strange odors, foam, bubbling from methane, and an orange-ish color.[135] Water tests at homes showed elevated levels of iron, aluminum, bacteria, and methane.[136] Although Cabot denied that it was to blame, it still provided some residents with fresh drinking water.[137] There is currently a lawsuit pending against Cabot Oil & Gas that was brought by several Dimock residents for contaminating their water.[138]

Louisiana and Texas are experiencing other problems. In Louisiana, which sits atop the Haynesville Shale, homes have been evacuated due to blow out accidents, and sixteen cattle died after drinking chemicals that had flooded off a well pad during a storm.[139]

Fracking and horizontal drilling activity in urban areas also cause noise pollution.[140] In Fort Worth, Texas, a man sued Chesapeake Energy over excessive noise from compressor stations used as part of the natural gas drilling process near his home.[141]

Although the discovery of gas in the Fayetteville Shale has brought economic benefits to Arkansas, it has also brought burdens. People have concerns that are based on both speculation[142] and on real evidence that landowners have experienced in their day-to-day lives.[143]

One Arkansan, who lives in the Fayetteville Shale area, reported that since the fracking process began, his water has had sediment in it. Before the fracking started, his well ran fine, but once the fracking started, it ran dry, requiring him to haul his own water from his house to feed his livestock.[144] He built another well, but after a few more days of fracking, his water turned brown and had a strange odor.[145] He eventually had to hook into his city's water line, which cost about $3000.[146]

Other Arkansans that live in the Fayetteville Shale area blame hydraulic fracturing and gas drilling for recent earthquakes.[147] Earthquakes are not uncommon to Arkansas because Arkansas sits atop the New Madrid Fault line.[148] The fault runs from Cairo, Illinois through Eastern Arkansas.[149] Between 1811 and 1812, a series of devastating quakes shook the region.[150] The quakes ranged from 6.0 to 7.7 on the Richter scale.[151] Large waves were generated on the Mississippi River giving the appearance that the river was flowing backwards, fissures opened in the earth, and what few Anglo-American structures actually existed in the region were damaged.[152] Recently, quake activity has increased in the north central region of Arkansas.[153] These quakes were not as powerful as the 1812 quake.[154] Given Arkansas's geological history, some question whether disposal wells may be contributing to the quakes.[155] After many complaints that the earthquakes were tied to disposal wells, the Arkansas Oil & Gas Commission declared a moratorium on drilling in August of 2011.[156]

Although earthquakes are common in Arkansas, some scientists believe that subsurface geological activity like disposal wells and hydraulic fracturing can cause earthquakes.[157] The subsurface activity can cause changes in the rock formations enough so that quakes can be triggered.[158]

These stories are just a few examples of what is happening around the nation to people who live near hydraulic fracturing.

IV. REGULATORY CONSIDERATIONS FOR ARKANSAS

A. Arkansas Should Take Heed of Other State's Regulatory Reforms

The gas-industry regulations have failed to adequately protect the public from water contamination and other property damage. Over the past thirty years, the federal government has passed several pieces of legislation trying to protect drinking water from contamination but has left much of hydraulic-fracturing regulation up to the states.[159] States like Arkansas have

also created regulations to manage the industry and protect the public; however, the regulations may not be sufficient. Other states, such as Texas, have been using hydraulic-fracturing and horizontal-drilling techniques for much longer than Arkansas and therefore have had the opportunity to work out many of the regulatory problems.[160] Being relatively new to the technique, Arkansas should look to other states' regulations for guidance in its regulation of hydraulic fracturing.

Much of what Arkansas agencies have learned about hydraulic fracturing and horizontal drilling has come from Texas. Consequently, many of the few existing rules of the Arkansas Oil and Gas Commission are similar to the Texas Railroad Commission's rules.[161] Horizontal drilling was developed in the Texas Barnett Shale; therefore, Texas has a longstanding history in dealing with hydraulic fracturing.[162] In Texas, gas drillers have to follow specific requirements concerning cement casing for hydraulic fracturing.[163] These requirements, like those in Arkansas, are meant to protect drinking water from being contaminated by hydraulic-fracturing fluids.[164] The Texas Railroad Commission works with the Texas Commission on Environmental Quality to protect fresh water.[165] Like Arkansas, Texas also disposes of hydraulic-fracturing fluids through deep-well injections.[166] To do this, companies must first receive a permit from the Texas Railroad Commission.[167]

One difference between the Arkansas and Texas well-permit processes is that Texas requires drillers to notify third parties that may be affected by the disposal well.[168] These third parties may attend a commission hearing to challenge the permit application or raise any concerns before the application process is approved.[169] The Arkansas legislature should consider adding such a provision to its regulations.

Texas and Oklahoma have well-established oil and gas industries, and they lead the way in technology and development in the American oil and gas industry. When it comes to the disposal of fracturing fluids, they are no exception.[170] Since 2005, Devon Energy Corporation (Devon), a private Oklahoma company, has recycled fracturing fluids.[171] Although these fluids are ninety-nine percent water, they do contain a variety of chemicals, some of which may be harmful to humans.[172] In Texas, Devon uses mobile-heated distillation units to recycle the contaminated fracking water.[173] The water is distilled until it is free of waste, then Devon reuses the water for other fracking purposes.[174] The process costs forty percent more than traditional disposal methods, but the benefits to the environment outweigh its cost.[175]

Pennsylvania also disposes of wastewater through underground injections.[176] However, some companies working in the Marcellus Shale are considering recycling instead.[177] Recycling may be a better option for Arkansas given the recent seismic activity in the area.[178]

The distilled water recycled by this process is suitable for drinking, but is actually reused at other fracturing well sites.[179] The fracturing process requires a large amount of water.[180] In spite of its cost, recycling water is a better way that Arkansas could deal with the disposal of wastewater in the fracturing process.

Much of the fear associated with hydraulic fracturing is a direct result of a lack of transparency and understanding about the drilling process. Many people who live in areas where hydraulic fracturing is taking place are concerned and want to know what is in hydraulic-fracturing fluid.[181] These fluids vary from company to company and from well to well.[182] The EPA has requested a disclosure of the chemicals from a few companies.[183] However, because hydraulic fracturing is regulated mainly at the state level, states like Arkansas should request full disclosure themselves and not wait for the EPA and Congress to act.[184] Wyoming is one state that has sought full disclosure of the chemicals used in fracking fluids.[185] Wyoming's oil and gas regulatory body, the Wyoming Oil and Gas Conservation Commission, created new rules requiring companies to disclose the chemicals that they use in fracturing fluids.[186] Arkansas should follow suit.[187]

Finally, the Arkansas legislature should commission state universities to conduct environmental, health, and economic studies to assess the impact that hydraulic fracturing is having on the state. Hydraulic fracturing is relatively new to Arkansas, and some of its effects on the state may not be felt for years to come. The state government has the human and financial resources to conduct a long-term study and discover what is happening in the communities where hydraulic fracturing is taking place. Arkansans deserve to know what is happening or what could happen to their communities. In order to make a fully informed decision as to whether to sign a gas lease, they need to be aware of the tradeoffs associated with gas drilling.

B. When Regulations Fail, What Remedies Does the Landowner Have?

While people are waiting for legislators and administrative agencies to enact effective laws to deal with hydraulic fracturing and horizontal drilling, they should be aware of the legal remedies necessary to protect themselves

from water contamination, noise pollution, and other issues associated with hydraulic fracturing.[188] Generally, land ownership includes ownership of the soil beneath the ground and to the heavens.[189] In protecting their property, owners can rely on traditional legal remedies such as trespass, nuisance, and strict liability. The availability of these remedies will depend on whether a landowner has a contract with a gas company.

One caveat to these remedies should be mentioned—it can be very expensive to show water contamination. In proving whether water is contaminated, landowners, gas companies, and government agencies focus solely on whether fracking fluids have contaminated well water.[190] If no chemicals from the fluids are found in the water, then the water is not contaminated, right? Unfortunately, some landowners have gas and other gas byproducts in their water that were not there before the drilling started.[191] This is why focusing on fracking fluid as the sole source of contamination is problematic.

It could be that the actual fracturing of the subsurface that is causing the contamination. Fracking is much like blowing into a glass of water with a straw. Things are moving around below the surface that no one can see. The fracturing of the subsurface could be pushing gas or other contaminates into water wells without anyone's knowledge. Proving causation is one major drawback to bringing a water-contamination claim. However, with that caveat in mind, the following are suggestions for how landowners can deal with water contamination caused by hydraulic fracturing.

1. *Landowner with a Gas Drilling Contract*

Landowners who have leased their gas rights to a gas company will have vastly different judicial remedies than landowners who have no relationship with the gas company. First, most landowner-lessors will be limited to the remedies specifically outlined in their contract.[192] Second, there are implied covenants in gas-leasing contracts that Arkansas courts have read into lease contracts to protect landowners (lessors) from the overreaching of gas drillers (lessees).[193] Additionally, Arkansas courts have found that gas drillers have "the implied duty to operate with due regard to the interests of the surface owner."[194] Moreover, upon completing any portion of the surface, gas drillers have an implied duty to "restore the land to the extent reasonably practicable."[195] In these cases, the gas driller has to act as any "prudent operator" would, meaning that the driller must be a competent producer

who behaves in good faith.[196] The prudent operator's goal is to maximize production.[197]

In claiming a breach of an implied covenant, a landowner-lessor can only use equitable remedies.[198] The landowner-lessor can seek cancellation of all or part of the lease; however, courts often condition cancellation upon "giving the lessee a last chance to drill new wells in a relatively short period of time before being stripped of [its] investment."[199]

2. *Landowners Without a Gas-Drilling Contract*

If the affected landowner is not under a contract with the gas driller, then the landowner has more judicial remedies available. One such remedy is trespass, a "[cause] of action to recover damages for an injury to one's property."[200] It has also been described as unauthorized intrusion or invasion of private premises of another.[201] Currently, there is no Arkansas case law dealing with the issue of trespass and hydraulic fracturing, but Texas courts have faced this issue on several occasions.[202]

Most recently, the Texas Supreme Court dealt with the issue of hydraulic fracturing and trespass in *Coastal Oil & Gas Corp. v. Garza Energy Trust*.[203] In *Coastal*, a property owner leased mineral rights of his property to Coastal, who owned an adjacent tract of property.[204] Coastal built gas wells on both the property owner's tract and the Coastal tract but was forced to abandon the well on the property owner's tract due to changes in Texas well spacing requirements.[205] Coastal continued to use hydraulic fracturing and horizontal drilling to extract gas from the well on its property.[206] The property owner sued claiming that Coastal's hydraulic fracturing trespassed upon their land and drained their well.[207] In addressing the issue of trespass, the court stated that had some of the proppants been deposited on the surface, the property owner would have had a claim.[208] However, the court rejected the claim that landowners own all the land above and below their property.[209] The court said that such a claim is unworkable in modern times given the advent of the airplane and oil and gas technology.[210] Ultimately, the property owner lost his claim because the court said that it had been precluded by the rule of capture.[211] This rule prevents trespass claims concerning gas drainage by hydraulic fracturing.[212]

Because trespass and hydraulic fracturing are new issues in Arkansas, Arkansas courts may look to Texas courts for guidance on the issue. However, the holding of *Garza* is limited to situations where hydraulic fracturing

affects gas drainage, not water-well contamination or even surface-level contamination.[213] Therefore, landowners in Arkansas who suffer surface or water well damage as a result of hydraulic fracturing should consider using the claim of trespass to protect their property.

Nuisance is another cause of action that Arkansas landowners should consider when seeking to protect their property from hydraulic-fracturing activity. "Nuisance is defined as conduct by one landowner that unreasonably interferes with the use and enjoyment of the lands of another."[214] "Equity will enjoin conduct that culminates in a private or public nuisance where the resulting injury to the nearby property and residents, or to the public, is certain, substantial, and beyond speculation and conjecture."[215] "The general rule is that, in order to constitute a nuisance, the intrusion must result in physical harm."[216] "[O]ne who creates a nuisance such as pollution of a stream is liable to lower riparian owners for the direct and probable consequence of the nuisance."[217]

In *Ratzlaff v. Franz Foods of Arkansas*,[218] a property owner brought a nuisance claim against a subsidiary of Tyson's Foods to recover damages for certain noxious wastes that were discharged into the sewer system.[219] The sewage later polluted a creek running on the plaintiff's property.[220] The complaint had been dismissed by the lower court, but the Supreme Court of Arkansas held that the company could be enjoined, and it remanded the case.[221]

Although gas-well activity was not involved in the *Ratzlaff* case, like the Ratzlaffs, a landowner whose water well is contaminated as a result of hydraulic-fracturing activity could bring a common-law nuisance claim against the driller. Additionally, it is a misdemeanor under the Arkansas Pollution and Ecology Commission Regulation 1 to allow fracturing fluids and fracturing wastes to enter fresh water.[222]

A final form of liability that landowners should consider is strict liability. Under the theory of strict liability, landowners are held liable for dangerous objects that they bring upon their property or dangerous activities that they engage in upon their property.[223] This liability is limited to the particular type of harm that could be caused by the activity.[224] If those dangerous things escape and cause damage, they will be liable regardless of whether the landowner was negligent.[225]

The issue of strict liability and gas law often deals with water wells running dry as a result of subsurface activities.[226] In most cases, the landowner has a water well which is damaged by underground seismic activi-

ty.[227] This was the case in *Pate v. Western Geophysical Co. of America*.[228] In that case the plaintiffs sought recovery for damages to a water well on their property.[229] They alleged that the defendant set explosives off underneath the ground which caused the well to run dry.[230] They claimed that the defendant was either negligent or strictly liable for its actions.[231] The defendant denied that there was a causal connection between its blasting operations and the damages that the plaintiff sustained.[232] The court rejected the defendant's argument and held them to be strictly liable for their actions.[233] Based on eyewitness testimony, the court held that the plaintiffs had shown more than merely coincidental causation.[234]

Like landowners in seismic-operations cases, landowners who face well damages as a result of hydraulic-fracturing activity should use the claim of strict liability against drillers who contaminate or damage their water wells.

V. CONCLUSION

Arkansas's natural gas industry has grown tremendously over the past few years as a result of the development of the Fayetteville Shale. This growth is due in large part to changes in technology, such as hydraulic fracturing and horizontal drilling, which allow gas drillers to reach resources in the Fayetteville Shale.[235] This growth has come with some environmental cost to water supplies in areas where drilling is taking place.[236]

In order to deal with problems that landowners may face with fracking in the Fayetteville Shale, the Arkansas legislature should adopt legislation from other states that have faced similar problems with fracking. First, the legislature should require gas drillers to disclose the chemicals used in their fracking fluid. Second, the legislature should allow third parties to be notified when disposal well permits are issued so that they can contest the permits. Third, the state should require that some, if not all, water used in the fracking process be recycled, thereby preserving the state's water resources. Finally, the state should fund a comprehensive study of the environmental, health, and economic impact that the Fayetteville Shale is having on the state.

While these issues are still being debated in the legislature, landowners that suffer water well contamination should use existing judicial remedies to protect themselves. These remedies will differ depending upon whether the landowner has a lease contract with a gas driller or not. If the landowner

does not have a lease contract, nuisance, trespass, and strict liability can be used as potential causes of action.

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1. A shale play is a shale gas development. Thomas A. Daily, *Lawyering the Fayetteville Shale Play – Welcome to My World*, ARK. LAW., Spring 2009, at 10, 10, *available at* http://issuu.com/arkansas_bar_association/docs/arkansas_lawyerspring09?mode=embed.

2. Slingshot, *Another Well Ruined by "Fracking,"* ARK. FOR GAS DRILLING ACCOUNTABILITY (March 27, 2010, 9:47 AM), http://a4gda.blogspot.com/2010/03/another-well-ruined-by-fracking.html.

3. Sarah Hoye & Steve Hargreaves, *'Fracking' Yields Fuel, Fear in Northeast*, CNN.COM (Sept. 3, 2010, 7:06 AM), http://www.cnn.com/2010/US/09/02/fracking/index.html.

4. A horizontal well structure is a gas well that is initially drilled vertically and then turned and drilled horizontally. HOWARD R. WILLIAMS ET. AL., MANUAL OF OIL AND GAS TERMS 447 (14th ed. 2009).

5. Daily, *supra* note 1, at 11.

6. *Id.*

7. *Id.*

8. *Id.*

9. Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115, 124–26 (2009).

10. Hoye & Hargreaves, *supra* note 3.

11. *Id.*

12. Wiseman, *supra* note 9, at 127–34 (discussing reports of petroleum smelling fluid, water loss, and soapy water).

13. *Id.* at 142–46.

14. Daily, *supra* note 1, at 10–11.

15. Michelle Cauley & John Peiserich, *An Overview of the State and Federal Environmental Regulation of the Oil and Gas Development of the Fayetteville Shale*, ARK. LAW., Spring 2009, at 14, 15–16, 43–44, *available at http://issuu.com/arkansas_bar_association/docs/arkansas_lawyerspring09?mode=embed*.

16. Slingshot, *supra* note 2.

17. Thomas A. Daily & W. Christopher Barrier, *Well, Now, Ain't that just Fugacious!: A Basic Primer on Arkansas Oil and Gas Law*, 29 U. ARK. LITTLE ROCK L. REV. 211, 212 (2007) (quoting S. Title Ins. Co. v. Oller, 268 Ark. 300, 302, 595 S.W.2d 681, 683 (1980)).

18. *Id.* at 213.

19. *Id.* at 213–214.

20. Daily, *supra* note 1, at 11.

21. *Id.*

22. *Id.*

23. *Id.*

24. *Id.*

25. *Id.*

26. Daily, *supra* note 1, at 11.

27. *Id.* at 11. Drillers prefer to drill in porous, permeable rock formations. *Id.* The gas in such formations is easier to retrieve. *Id.* Tight formations like shale are less porous and thus much more difficult to retrieve gas. *Id.*

28. J. Daniel Arthur, Brian Bohm, Bobbi Jo Coughlin, & Mark Layne, *Hydraulic Fracturing Considerations for Natural Gas Wells of the Fayetteville Shale*, ARKANSAS OIL AND GAS COMMISSION 1, 3 (2008), http://www.aogc.state.ar.us/ALL%20FayettevilleFrac%20FINAL.pdf.

29. Laura C. Reeder, *Creating a Legal Framework for Regulation of Natural Gas Extraction from the Marcellus Shale Formation*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 999, 1006 (2010); *See also* Arthur et al., *supra* note 28, at 2–9 (discussing the development of horizontal drilling in the Barnett Shale).

30. Arthur et al., *supra* note 28, at 2–3.

31. *Id.*

32. Daily, *supra* note 1, at 11.

33. Arthur et al., *supra* note 28, at 12–14. Fracturing fluids are primarily made up of water, but they include many chemicals and additives ranging from acid and gel to sodium chloride and antifreeze. *Id.*

34. Cauley & Peiserich, *supra* note 15, at 14. Propping agents or proppants are sand or resin coated sand that is used to prop open the cracks in the shale so that natural gas can flow out of the wellhead. *Id.*

35. WILLIAMS ET AL., *supra* note 4, at 448–49.

36. GASLAND (HBO Documentary Films 2010).

37. *Id.*

38. WILLIAMS ET AL., *supra* note 4, at 448–49.

39. *Class II Wells – Oil and Gas Related Injection Wells (Class II)*, U.S. ENVTL. PROTECTION AGENCY (last updated May 9, 2012), http://water.epa.gov/type/groundwater/uic/class2/index.cfm. Brine is water that is extremely high in salinity. It is often extracted in connection with oil and gas production. WILLIAMS ET AL., *supra* note 4, at 98.

40. U.S. ENVTL. PROTECTION AGENCY, *supra* note 39.

41. Injection wells are used to store water, gas, waste, or other fluid underground. WILLIAMS ET AL., *supra* note 4, at 471–72.

42. U.S. ENVTL. PROTECTION AGENCY, *supra* note 39.

43. Arthur et al., *supra* note 28, at 2.

44. Daily, *supra* note 1, at 10.

45. Arthur et al., *supra* note 28, at 7.

46. Daily, *supra* note 1, at 10. The Arkoma Basin is an area of gas production that runs from McAlester, Oklahoma to Russellville, Arkansas. *Id.* at 42 n.2. The Arkoma Basin's reservoirs are nearly depleted, and drilling activity in the area has slowed. *Id.* at 10, 42 n.2.

47. Arthur et al., *supra* note 28, at 7.

48. *Id.* at 2.

49. *Id.* at 19 (over $54.6 million in state taxes were generated from gas drilling in 2007).

50. Clean Water Act of 1972, 33 U.S.C. § 1251 (Supp. 2006).

51. Safe Drinking Water Act of 1974, 42 U.S.C. §300f–300j (Supp. 2006).

52. Energy Policy Act of 2005, 42 U.S.C. § 300h (Supp. 2006).

53. Cauley & Peiserich, *supra* note 15, at 43.

54. 42 U.S.C. § 300h(d)(1)(B)(ii).

55. *Id.*

56. Cauley & Peiserich, *supra* note 15, at 43.

57. *See generally* Angela C. Cupas, *The Not-So-Safe Drinking Water Act: Why We Must Regulate Hydraulic Fracturing at the Federal Level*, 33 WM. & MARY ENVTL. L. & POL'Y REV. 605 (2009) (noting the exemption and argues that federal government needs to regulate hydraulic fracturing); Laura C. Reeder, *Creating a Legal Framework for Regulation of Natural Gas Extraction from the Marcellus Shale Formation*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 999 (2010) (explaining that federal regulations do not cover hydraulic fracturing and proposing that states should work together in the Marcellus shale region to regulate the practice); Wiseman, *supra* note 10 (explaining that states are left to regulate hydraulic fracturing and arguing that EPA should do further study on fracturing and that Congress should revisit its exemption of hydraulic fracturing from the Safe Drinking Water Act).

58. The Arkansas Pollution Control and Ecology Commission's (APC&EC) Regulation 17 governs underground injection control in the state of Arkansas according to EPA regulations. 014 ARK. CODE R. § 04.7-17.101 (LexisNexis 2010). However, APC&EC Regulation 1 governs Class II wells. 014 ARK. CODE R. § 04.1-1 (LexisNexis 2010). Class II wells are used to inject fluids that are used in the production of oil and natural gas. UNITED STATES ENVTL. PROTECTION AGENCY, *supra* note 39. Disposal wells are a type of Class II wells. *Id.* Brine and other fluids that are used in the production of natural gas are injected into disposal wells. *Id.*

59. *Basic Information about Injection Wells*, U.S. ENVTL. PROTECTION AGENCY (last updated May 4, 2012), http://water.epa.gov/type/groundwater/uic/basicinformation.cfm.

60. U.S. ENVTL. PROTECTION AGENCY, *supra* note 39.

61. *Id.*

62. *Id.*

63. *Id.*

64. *Id.*

65. 014 ARK. CODE R. § 04.7-17.301(B) (LexisNexis 2010).

66. *Laboratory Services*, THE ARKANSAS DEPARTMENT OF HEALTH, http://www.healthy.arkansas.gov/programsServices/healthlab/Pages/Services.aspx#enviro (last visited Nov. 27, 2010). The ADH works with the EPA to protect public drinking water in Arkansas by conducting regular water quality analysis of water samples from water sources around the state. *Id.* The ADH also serves as the state's response laboratory to chemical threats. *Id.*

67. Cauley & Peiserich, *supra* note 16, at 16. The Arkansas Department of Emergency Management is responsible for emergency notification in case of a chemical release. *Id.* Oil and gas companies are required to report chemical use and storage to this agency. *Id.*

68. THE ARK. NAT. RESOURCES COMMISSION, http://www.anrc.arkansas.gov/ (last visited Nov. 27, 2010). The mission of the Arkansas Natural Resources Commission is to manage and protect water and land resources. *Id.*

69. Cauley & Peiserich, *supra* note 15, at 15–16.

70. *Our Mission*, ARK. OIL & GAS COMMISSION, http://www.aogc.state.ar.us/mission.pdf (last visited Nov. 27, 2010).

71. *Id.*

72. *Id.*

73. 014 ARK. CODE R. § 04.7-17.401 (LexisNexis 2010); U.S. ENVTL. PROTECTION AGENCY, *supra* note 39.
74. ARK. OIL & GAS COMMISSION, *supra* note 70.
75. *Id.*
76. 178 ARK. CODE. R. § 1-B-15 (LexisNexis 2012).
77. WILLIAMS ET AL., *supra* note 4, at 122.
78. *Id.*
79. 178 ARK. CODE R. § 1-B-15 (LexisNexis 2012).
80. *Id.*; *see also* J. Daniel Arthur et al., *supra* note 28.
81. *Id.*
82. 178 ARK. CODE R. § 1-B-17 (LexisNexis 2012).
83. *Id.* at § 1-B-17(c)(19).
84. *Id.* at § 1-B-17(f)(2)(B)(i).
85. *Id.*at § 1-B-17(b).
86. *Id.* at § 1-B-17(e).
87. *Id.*
88. 178 ARK. CODE R. § 1-B-17(h) (LexisNexis 2012).
89. *Id.* at § 1-B-17(h)(1)(A).
90. *Id.* at § 1-B-17(h)(1)(B).
91. *Id.* at § 1-B-17(h)(1)(C).
92. A water-based drilling fluid is drilling fluid that contains fresh waters rather than diesel or crude oil as its liquid component. *Id.* at §1-B-17(c)(25).
93. *Id.* at § 1-B-17(h)(1)(D).
94. 178 ARK. CODE R. § 1-B-17(h)(1)(E) (LexisNexis 2011).
95. *Id.* at § 1-B-17(h)(1)(F).
96. Cauley & Peiserich, *supra* note 15, at 15.
97. An EPA delegate is an organization designated by the EPA to implement EPA programs. *ADEQ: Who We Are and What We Do*, ARK. DEPARTMENT OF ENVTL. QUALITY, http://www.adeq.state.ar.us/whoweare/default.htm (last visited Feb. 20, 2011).
98. Cauley & Peiserich, *supra* note 15, at 15.
99. *Id.*
100. *Id.* at 15–16.
101. 014 ARK. CODE R. § 04.1-1(4) (LexisNexis 2010).
102. *Id.* at § 04.1-1(5).
103. Arthur et al., *supra* note 28, at 17.
104. *Id.* at 17.
105. *Id.*
106. *Id.*
107. *Id.*
108. It must have a chloride concentration of less than 5,000 parts per million. *Id*.
109. Arthur et al., *supra* note 28, at 17.
110. *Id.*
111. *Public Comment and Response Summary for the Study on the Potential Impacts of Hydraulic Fracturing of Coalbed Methane Wells on Underground Sources of Drinking Water*, U.S. ENVTL. PROTECTION AGENCY 1, 1 (June 2004), http://www.epa.gov/safewater/uic/pdfs/cbmstudy_attach_uic_resp_to_comments.pdf.

112. *Id.*
113. *Id.*
114. Hoye & Hargreaves, *supra* note 3.
115. Federal Energy Policy Act, 42 U.S.C. §300h (Supp. 2006).
116. Shelley DuBois, *EPA on Fracking: "we can only do so much,"* CNNMONEY.COM (Sept. 17, 2010 1:17 PM), http://money.cnn.com/2010/09/16/news/fracking_EPA.fortune/index.htm ("But residents in places where fracking occurs have raised concerns that the processes isn't regulated enough – that it leaches dangerous chemical into groundwater and contaminates it with methane gas").
117. *Id.*
118. Kelly Dudzik, *Is "fracking" Causing Earthquakes Near Fayetteville Shale?*, FOX16.COM (Nov. 23, 2010, 2:22 PM), http://www.fox16.com/news/local/story/Is-fracking-causing-earthquakes-near-Fayetteville/CLvzJp9U3Ui4rrpkAsNy-w.cspx.
119. Slingshot, *supra* note 2.
120. *EPA to hold final hearings on 'Fracking,'* CNN.COM (Sept. 13, 2010, 8:18 AM), http://www.cnn.com/2010/US/09/13/epa.gas.extraction/index.html?iref=allsearch.
121. Angela Modany, *EPA Requests Fracking Chemicals from Nine Companies*, DC BUREAU.ORG (Sept. 22 2010), http://www.dcbureau.org/20100916984/bulldog-blog/epa-requests-fracking-chemicals-from-nine-companies.html.
122. Mead Gruver, *Wyo. Fracking Rules Take Effect with Few Problems*, BLOOMBERG BUSINESSWEEK (Sept. 24, 2010, 8:19 AM), http://www.businessweek.com/ap/financialnews/D9IE9EE00.htm.
123. Modany, *supra* note 121.
124. Sarah Hoye, *EPA releases results of Wyoming water well testing*, CNN.COM (Aug. 31, 2010, 9:04 PM), http://www.cnn.com/2010/US/08/31/wyoming.epa.water/index.html (hereinafter Hoye, *EPA releases*); Sarah Hoye, *Report: Chemicals Found in NE Pennsylvania Water Wells*, CNN.COM (Oct. 15, 2010, 7:13 PM), http://www.cnn.com/2010/US/09/17/pennsylvania.fracking/index.html?iref=allsearch (hereinafter Hoye, *Report*).
125. Hoye, *EPA* releases, *supra* note 124.
126. Laura Legere, *Nearly a Year After a Water Well Explosion, Dimock Twp. Residents Thirst for Gas-Well Fix*, THETIMES-TRIBUNE.COM (Oct. 26, 2009), http://thetimes-tribune.com/news/nearly-a-year-after-a-water-well-explosion-dimock-twp-residents-thirst-for-gas-well-fix-1.365743.
127. *Id.*
128. Hoye & Hargreaves, *supra* note 3.
129. Legere, *supra* note 126.
130. *Id.*
131. *Id.*
132. *Id.*
133. *Id.*
134. *Id.*
135. Legere, *supra* note 126.
136. *Id.*
137. *Id.*
138. Hoye & Hargreaves, *supra* note 3.

139. Cllifford Krauss & Tom Zeller Jr., *When a Rig Moves in Next Door*, THE NEW YORK TIMES (Nov. 6, 2010), http://www.nytimes.com/2010/11/07/business/energy-environment/07frack.html.

140. Marice Richter, *Fort Worth Man Sues Chesapeake over Gas Drilling Noise*, WFAA.COM (Aug. 15, 2009, 4:44 PM), http://www.wfaa.com/news/local/64519502.html?unconfirmed=1.

141. *Id.*

142. *See* Dudzik, *supra* note 118.

143. *See* Slingshot, *supra* note 2.

144. *Id.*

145. *Id.*

146. *Id.*

147. Dudzik, *supra* note 118.

148. U.S. Geo. Survey, *New Madrid Earthquakes 1811-1812*, USGS.GOV, http://earthquake.usgs.gov/earthquakes/states/events/1811-1812.php (last modified Nov. 1, 2012).

149. *Id.*

150. *Id.*

151. *Id.*

152. *Id.*

153. Dudzik, *supra* note 118.

154. *Swarm of Unexplained Earthquake Strikes Arkansas*, FOXNEWS.COM (Feb. 17, 2011), http://www.foxnews.com/scitech/2011/02/17/unexplained-earthquake-surge-strikes-arkansas/.

155. Dudzik, *supra* note 118.

156. ARK. OIL & GAS COMM'N, ORDER NO. 180A-2-2011-07, CLASS II COMMERCIAL DISPOSAL WELL OR CLASS II DISPOSAL WELL MORATORIUM (2011), *available at* http://www.aogc2.state.ar.us/Hearing%20Orders/2011/July/180A-2-2011-07.pdf.

157. Christopher Joyce, *How Fracking Wastewater is Tied to Quakes*, NPR.ORG (Jan. 5, 2012), www.npr.org/2012/01/05/144694550/man-made-quakes-blame-frakcing-and-drilling?sc=17&f=1001.

158. *Id.*

159. *See* Clean Water Act of 1972, 33 U.S.C. § 1251 (Supp. 2006); Safe Drinking Water Act of 1974, 42 U.S.C. §300f–300j (Supp. 2006); Wiseman, *supra* note 9.

160. Arthur et al., *supra* note 28, at 2–3.

161. *Id.* The Texas Railroad Commission is Texas' oil and gas industry regulatory body.

162. *Id.*

163. 16 TEX. ADMIN. CODE § 3.13 (2010).

164. *Id.*

165. *Id.*

166. *Id.* at § 3.9.

167. *Id.* at § 3.46.

168. *Id.* at § 3.9.

169. 16 TEX. ADMIN. CODE § 3.9.

170. John-Laurent Tronche, *Devon Energy Awarded for Barnett Shale Water Treatment*, FORT WORTH BUS. PRESS (Nov. 24, 2008, 5:00 AM),

http://www.fwbusinesspress.com/main.asp?Search=1&ArticleID=9039&SectionID=45&SubSectionID=99&S=1.

171. *Recycling Efforts in North Texas Reduce Water Needs*, DEVON ENERGY, http://www.devonenergy.com/CorpResp/initiatives/Pages/Initiatives-WaterRecycling.aspx (last visited Nov. 20, 2010).

172. Arthur et al., *supra* note 28, at 13.

173. Tronche, *supra* note 170.

174. Jeff Ray, *Gas Drilling Company Recycling "Fracking" Water*, CBSDFW (Oct. 13, 2011, 3:51 PM), http://dfw.cbslocal.com/2011/10/13/gas-drilling-company-recycling-fracking-water/.

175. DEVON ENERGY, *supra* note 171.

176. 25 PA. CODE § 78.125 (2011).

177. James Loewenstein, *Residents Oppose Water Treatment Facility for Hydraulic Fracturing in Wysox Twp.*, THEDAILYREVIEW.COM (Oct. 8, 2010), http://thedailyreview.com/news/residents-oppose-water-treatment-facility-for-hydraulic-fracturing-in-wysox-twp-1.1045519.

178. Joyce, *supra* note 157.

179. *Id.*

180. Arthur et al., *supra* note 28, at 16 (gas wells in the Fayetteville Shale uses 50,000 bbls, or barrels of water); DEVON ENERGY, *supra* note 171 (claims that Texas requires four million gallons of water per well).

181. Jack Z. Smith, *Project Will Compile Information on Chemicals Used in Fracking*, STAR-TELEGRAM (Oct. 15, 2010), http://www.star-telegram.com/2010/10/15/v-touch/2550585_project-will-compile-information.html.

182. Arthur et al., *supra* note 28, at 14.

183. Modany, *supra* note 121.

184. Presently, there are several bill proposals before the Arkansas legislature that address the environmental impact of hydraulic fracturing. Walter G. Wright, *Arkansas General Assembly Update*, ENVIRONMENTAL, ENERGY, AND WATER BLOG (Feb. 16, 2011), http://www.mitchellwilliamslaw.com/arkansas-general-assembly-update. One proposal would create a landowners bill of rights regarding natural gas drilling activities. H.B. 1400, 88th Gen. Assemb., Reg. Sess. (Ark. 2011).

185. Gruver, *supra* note 122.

186. *Id.*

187. Currently, there is proposal before the Arkansas legislature that would require full disclosure of the chemicals used in fracking fluid. H.B. 1396, 88th Gen. Assemb., Reg. Sess. (Ark. 2011).

188. Air pollution is another issue in areas near drilling pads. *See* Adam J. Bailey, *The Fayetteville Shale Play and the Need to Rethink Environmental Regulation of Oil and Gas Development in Arkansas*, 63 ARK. L. REV. 815, 828–29 (2010).

189. Warren J. Ludlow, *Property Rights vs. Modern Technology: Finding the Right Balance in a World of Energy Shortages*, 1 ROCKY MTN. MIN. L. FOUND. 14 (2005).

190. *See, e.g.*, H.B. 1396, 88th Gen. Assemb., Reg. Sess. (Ark. 2011) (an Arkansas legislator proposes a bill that would reveal the chemicals used in fracking fluids); Sarah Hoye, *EPA Seeks Companies' Data About Natural Gas Extraction Chemicals*, CNN.COM (Sept. 9, 2010, 5:52 PM), http://www.cnn.com/2010/US/09/09/epa.gas.extraction/index.html?irf-

allsearch (the EPA requests that companies reveal the chemical composition of fracking fluid); Hoye, *Report*, *supra* note 124 (some Pennsylvania residents worry whether chemicals in fracking fluid could contaminate water wells).

191. *See*, e.g., GASLAND (HBO Documentary Films 2010) (gas byproducts found in some wells); Hoye, *EPA releases*, *supra* note 124.

192. Dailey & Barrier, *supra* note 17, at 228.

193. *Id.* at 238–40.

194. *Id.* at 239 (citing McFarland v. Taylor, 76 Ark. App. 343, 346–47, 65 S.W.3d 468, 471 (2002)).

195. *Id.* (citing Bonds v. Sanchez-O'Brien Oil & Gas Co., 289 Ark. 582, 585, 715 S.W.2d 444, 446 (1986)).

196. *Id.* (citing Amoco Prod. Co. v. Ware, 269 Ark. 313, 319, 602 S.W.2d 620, 623 (1980)).

197. *Id.* at 239–40 (citing Amoco Prod. Co. v. Ware, 269 Ark. 313, 319, 602, S.W.2d 620, 624 (1980)).

198. Dailey & Barrier, *supra* note 18, at 240 (citing Ark. Oil & Gas Inc. v. Diamond Shamrock Corp., 281 Ark. 207, 209, 662 S.W.2d 824, 825 (1984)).

199. *Id*. (citing Ark. Oil & Gas Inc. v. Diamond Shamrock Corp., 281 Ark. 207, 209, 662 S.W.2d 824, 825 (1984)).

200. Ludlow, *supra* note 189 (citing WILLIAMS ET. AL., *supra* note 4, at 1128).

201. *Id.*

202. *See* R.R. Comm'n of Texas v. Manziel, 361 S.W.2d 560 (1962) (holding that trespass does not occur when the Railroad Commission approves hydraulic-fracturing activity); Gregg v. Delhi-Taylor Oil Corp., 344 S.W.2d 411 (1961) (holding that only courts could decide whether a trespass had a occurred, not the Texas Railroad Commission); Geo Viking, Inc. v. Tex-Lee Operating Co., 817 S.W.2d 357 (Tex. App. 1991) (holding that fracking was a trespass).

203. 268 S.W.3d 1, 4 (2008).

204. *Id.* at 5.

205. *Id.* at 5–6. Well spacing determines the number and location of wells over an oil or gas reservoir, as a conservation measure. WILLIAMS ET AL., *supra* note 4, at 1178.

206. *Garza*, 268 S.W.3d at 6.

207. *Id.* at 6.

208. *Garza*, 268 S.W.3d at 11.

209. *Id.*

210. *Id.*

211. *Id.* at 12–13.

212. *Id.* at 17.

213. *Id.* at 17.

214. Aviation Cadet Museum, Inc. v. Hammer, 373 Ark. 202, 207–208, 283 S.W.3d 198, 203 (2008) (citing Goforth v. Smith, 338 Ark. 65, 79, 991 S.W.2d 579, 587 (1999)).

215. *Id*. at 208, 283 S.W.3d at 203 (citing *Goforth*, 338 Ark. at 79, 991 S.W.2d at 587.

216. *Id.*, 283 S.W.3d at 203 (citing Se. Ark. Landfill, Inc. v. State, 313 Ark. 669, 673, 858 S.W.2d 665, 667 (1993)).

217. Ratzlaff v. Franz Foods of Arkansas, 250 Ark. 1003, 1005, 468 S.W.2d 239, 241 (1971) (citing Spartan Drilling Co. v. Bull, 221 Ark. 168, 252 S.W.2d 408 (1952); Smith v. Magnet Cove Barium Corp., 212 Ark. 491, 206 S.W.2d 442 (1947)).
218. *Id.*, 468 S.W.2d at 241.
219. *Id.* at 1003, 468 S.W.2d at 240.
220. *Id.*, 468 S.W.2d at 240.
221. *Id.* at 1004–05, 468 S.W.2d at 242.
222. 014 ARK. CODE R. § 04.1-1(10) (LexisNexis 2010).
223. RESTATEMENT (SECOND) OF TORTS §§ 519–520 (2010).
224. *Id.* at § 519.
225. *Id.* at § 519 cmt. d.
226. RICHARD W. HEMINGWAY, THE LAW OF OIL AND GAS 172 (West Publishing Co. 3rd ed. 1991)
227. *Id.*
228. 91 So. 2d 431 (La. Ct. App. 1956).
229. *Id.* at 431.
230. *Id.* at 431–432.
231. *Id.* at 431.
232. *Id.* at 433–34.
233. *Pate*, 91 So. 2d at 433–34.
234. *Id.* at 432–34.
235. Arthur et al., *supra* note 28, at 3.
236. Slingshot, *supra* note 2.