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## Note

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*Joseph A. Dammel**

## I. INTRODUCTION

Hydraulic fracturing for natural gas is fundamentally altering the subsurface and societal landscapes where it is practiced. Nowhere is this more apparent than within the Marcellus Shale formation, the richest shale gas resource in the world, which underlies large swaths of the densely populated Eastern United States. The subsurface has long been "carved up, conveyed, used, bought, sold, and developed."[1] Much of this activity has centered upon the extraction of the fossil fuels used to power our modern life. Recent developments have rocked this landscape, bringing increasing scrutiny and opposition to the extraction of natural gas via hydraulic fracturing. Hydraulic fracturing, or "fracing," is a method of extracting natural gas[2] now occurring at an unprecedented scale in areas like Pennsylvania, largely unaccustomed to the oil and gas



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1. Alexandra B. Klass & Elizabeth J. Wilson, *Climate Change, Carbon Sequestration, & Property Rights*, 2010 U. ILL. L. REV. 363, 388–89.

2. Nicolle R. Snyder Bagnell & Stephanie L. Hadgkiss, *Eastern Shale Plays—A Game Plan for Success*, 55 ROCKY MTN. MIN. L. INST. 32-1, at 32-5 (2009).

industry.[3] The previously untapped resources now accessible via fracing create a potentially tremendous impact on national energy security and local economic well-being, but the practice is not without environmental risks. Further, it may be difficult to balance these risks and interests under traditional oil and gas regulatory regimes. A new approach to subsurface law and regulation is necessary in order to strike the right balance between public and private interests.[4]

Hydraulic fracturing is an extractive method used by oil and gas companies to open pathways in "tight" geologic formations so the oil or gas trapped within can be recovered at a higher flow rate, and thus generate greater financial returns. Fracing pumps a water-chemical mixture at high pressure into the ground, separating fractures within the rock and injecting small particles into the openings to prevent them from reclosing. The resulting passages allow the gas or oil to flow through a well to the surface.[5] Hydraulic fracturing acts as the key that unlocks previously trapped stores of gas. Recently, a confluence of factors has made hydraulic fracturing more economical[6] and developers have responded by purchasing mineral interests and drilling more wells.[7] This trend has been especially relevant in the world's largest shale gas reserve, the Marcellus Shale play,[8] which stretches over 95,000 square miles in the Eastern United States[9] and contains an estimated

3. *See generally id.* at 32-1 to -3 (describing the history of natural gas production in the Appalachian region as a period of boom and bust, with the recent development of the Marcellus Shale formation seen as having great potential for an area once thought to be past its prime).

4. This Note will generally associate public interests with environmental protection and private interests as resource-centric, economic interests.

5. *See infra* Part I.B for a more detailed explanation of the technical aspects of hydraulic fracturing.

6. *See* U.S. DEP'T OF ENERGY, MODERN SHALE GAS DEVELOPMENT IN THE UNITED STATES: A PRIMER 9 (2009) ("Three factors have come together in recent years to make shale gas production economically viable: 1) advances in horizontal drilling, 2) advances in hydraulic fracturing, and, perhaps most importantly, 3) rapid increases in natural gas prices . . . .") [hereinafter DOE PRIMER].

7. *See id.* at 50 (describing the new fracturing made possible by drilling advances).

8. A play describes the "extent of a petroleum-bearing geological formation." *Play Definition in Oil Gas Glossary*, OILGASGLOSSARY.COM, http://oilgasglossary.com/play.html (last visited Mar. 19, 2011).

9. *See* Bagnell & Hadgkiss, *supra* note 2, at 32-1.

489 *trillion* cubic feet (TCF) of recoverable natural gas.[10] For comparison, the United States consumed 22.7 TCF of natural gas in 2009.[11]

This Note will focus on hydraulic fracturing in Pennsylvania,[12] the epicenter of the Marcellus Shale controversy. Unlike some of the other states where hydraulic fracturing is practiced, Pennsylvania has relatively little recent experience in the extractive industries.[13] The state provides a case study for the nexus of energy, climate, and water issues, as well as the role of state and federal regulation. Part II of this Note will give an overview of the context surrounding hydraulic fracturing, as well as a brief technical primer on the process. Next, a discussion on the legal principles governing subsurface disputes will lead into a summary of state and federal regulatory action regarding fracing, with a focus on Pennsylvania's regulatory structure. Part III presents a summary of previously proposed changes to regulation of hydraulic fracturing and provides a collection of proposals that protect public concerns and bolster private interests. Natural gas is a critical chapter of our present and future energy story and hydraulic fracturing will be an important character as the rest is written. The great potential of this practice is bounded by significant public concern and scientific uncertainty. Moving forward, a clear and equitable legal and regulatory framework must buttress effective management of this important resource.

10. *See, e.g.*, Timothy Considine et al., An Emerging Giant: Prospects and Economic Impacts of Developing the Marcellus Shale Natural Gas Play 4 (Aug. 5, 2009), *available at* http://marcelluscoalition.org/wp-content/uploads/2010/05/EconomicImpactsofDevelopingMarcellus.pdf. (estimating that gas developers in Pennsylvania spent $2 billion on payments to landowners in 2008 and that 2,445 TCF of gas exists within the Marcellus Shale formation).

11. U.S. DEP'T OF ENERGY, ANNUAL ENERGY OUTLOOK 2011 EARLY RELEASE OVERVIEW 6 (2010) [hereinafter DOE EARLY RELEASE OVERVIEW].

12. Although several states fall within the Marcellus Shale formation, Pennsylvania is the focus of this Note because of the state's response to fracing and because the formation covers almost the entire state. Considine et al., *supra* note 10, at 10.

13. *See* Bagnell & Hadgkiss, *supra* note 2, at 32-2 (noting that despite the long history of the extractive industry in Pennsylvania, the state, by the mid 1960s had become an importer of gas).

## II. THE TECHNICAL, LEGAL, AND REGULATORY LANDSCAPE OF HYDRAULIC FRACTURING

### A. UNPACKING THE PIECES OF AN ENERGY PUZZLE

Natural gas constitutes approximately one quarter of energy use in the United States with demand mainly split between the industrial, electricity, commercial, and residential sectors.[14] Natural gas is used to heat buildings, generate electricity, and power industrial processes.[15] Consumption of natural gas is expected to remain relatively constant over the next two decades as unconventional resources[16] such as shale gas from fracing grow to replace diminishing conventional sources.[17] According to one government estimate, production of shale gas and coalbed methane is expected to double in the Northeast as a percentage of the total amount of natural gas produced by 2035.[18]

Natural gas has been drilled since the early 1800s and the ebb and flow of the industry has greatly affected the well-being, economic and otherwise, of communities dependent on the

14. *See* CLIMATE TECHBOOK: NATURAL GAS, PEW CTR. ON GLOBAL CLIMATE CHANGE 2 (2010), http://www.pewclimate.org/docUploads/Natural_Gas_09%2011%2017_clean_0.pdf [hereinafter PEW CTR.];
U.S. DEP'T OF ENERGY, ANNUAL ENERGY OUTLOOK 2010, at 56 (2010) [hereinafter DOE ANNUAL ENERGY OUTLOOK 2010].

15. PEW CTR., *supra* note 14.

16. Conventional reservoirs produce gas from sands and carbonate formations in which the gas is stored in the pores of the rock after it seeps from the less permeable shale formations where it is sourced. DOE PRIMER, *supra* note 6, at 15. The well is drilled into the sand and carbonate formations and the gas flows to the surface. *Id*. Unconventional reservoirs require more energy and complex drilling (horizontal) to extract the gas, usually through fracing. *Id*. The three basic types of unconventional reservoirs, many of which are hydraulically fractured, are tight gas (low-porosity sandstones and carbonate reservoirs), coalbed natural gas (coal seams), and shale gas (like the Marcellus formation). *Id*.

17. *See* DOE ANNUAL ENERGY OUTLOOK 2010, *supra* note 14, at 56, 72.

18. *Id*. at 72. As an illustration of the rapidly-developing state of shale gas estimates, only 8 months after releasing an estimate that the country had 346 trillion cubic feet (TCF) of "technically recoverable unproved shale gas resources," the U.S. Department of Energy released another projection that more than doubled that total, to a new estimate of 827 TCF; estimated *production* from shale gas resources in 2035 has tracked a similar increase from the previous year's estimate. DOE EARLY RELEASE OVERVIEW, *supra* note 11, at 8.

industry.[19] The latest rush to extract shale gas using hydraulic fracturing has been a financial boon for many once caught in the ebb of the extraction industry or left out completely, but the potential environmental impacts—namely water contamination and resource depletion—have initiated a closer examination of the practice and its regulation.[20]

The Marcellus shale stretches across much of Pennsylvania and through portions of eight other surrounding states.[21] The Marcellus shale play is not the only significant shale formation at which hydraulic fracturing is performed. Texas has several shale gas basins, the most notable being the Barnett in the Fort Worth Basin and the Haynesville on the state's eastern border.[22] In Michigan, the Antrim shale formation, extending across the northern portion of the state, has been developed since the 1980s, and is unique among other gas-containing shales because it is shallow, thin, and contains a large amount of water.[23] And in Wyoming, the Hilliard-Baxter-Mancos formation stretches across the state's southwestern quadrant in the heart of the Rocky Mountains.[24] These formations exist at depths between 600 feet (Antrim) and 13,500 feet (Haynesville) and at a net thickness of between 50 feet (Marcellus) and 600 feet (Barnett).[25] Estimates of unconventional reserves present

19. *See* Considine et al., *supra* note 10, at 1–2.

20. *See, e.g.*, AMY MALL ET AL., NATURAL RESOURCES DEFENSE COUNCIL, DRILLING DOWN: PROTECTING WESTERN COMMUNITIES FROM THE HEALTH AND ENVIRONMENTAL EFFECTS OF OIL AND GAS PRODUCTION 14–21 (2007) (describing how oil and gas production activities can harm water supplies and providing examples from across the country); Clifford Krauss & Tom Zeller, Jr., *When a Rig Moves In Next Door*, N.Y. TIMES, Nov. 7, 2010, at BU 1 (comparing the opposition from many in the Marcellus Shale region to hydraulic fracturing to the enthusiastic reception of a poor county in Louisiana, which has received an influx of money from production royalties); Editorial, *The Halliburton Loophole*, N.Y. TIMES, Nov. 3, 2009, at A28 (calling for more regulation on the fracing industry after growing reports of water contamination associated with the practice) [hereinafter *Halliburton Loophole*]; Press Release, U.S. Envtl. Prot. Agency, EPA Initiates Hydraulic Fracturing Study: Agency Seeks Input From Science Advisory Board (Mar. 18, 2010) (announcing a plan for a 2-year, comprehensive, peer-reviewed study to investigate the impact of hydraulic fracturing on human and environmental health).

21. The other states are: Kentucky, Maryland, New Jersey, New York, Ohio, Tennessee, Virginia, and West Virginia. DOE PRIMER, *supra* note 6, at 21.

22. *See id.* at 18, 20.

23. *Id.* at 23.

24. *See Id.* at 8.

25. *Id.* at 17.

something of a moving target as advancements in technology and exploration typically cause initial estimates of the amount of recoverable gas to increase, sometimes dramatically, following the initial discovery and subsequent development of the formation.[26]

## B. HYDRAULIC FRACTURING, TECHNICALLY

First, it is important to understand the basics of the technology behind the controversy. Hydraulic fracturing technology was developed in Texas in the 1950s and was first used extensively in the Barnett shale play in Texas in the 1980s.[27] It has since become common industry practice and is used in an estimated 90% of the over 450,000 operating natural gas wells in the United States.[28] After the drilling and casing of the well, the process commences by injecting a high-pressure mixture of water and chemicals into a formation containing natural gas trapped in tight pore spaces in the rock.[29] The gas is released and travels through the newly opened fractures and flows towards wells collecting the gas.[30] Fracing makes formations economical where it would otherwise be too expensive or too unproductive to wrest gas from the tight shale formations.[31]

Two key technological advancements in recent decades have made production from unconventional gas reserves more profitable: advances in horizontal drilling and refining of

26. *See, e.g.*, Considine, *supra* note 10, at 4 (noting that the estimate of gas in the Marcellus shale increased from 1.9 trillion cubic feet in 2002 to 489 trillion cubic feet just five years later).

27. DOE PRIMER, *supra* note 6, at 13.

28. *See Energy Policy Act of 2005: Hearings Before the Subcomm. on Energy and Air Quality of the H. Comm. on Energy and Commerce,* 109th Cong. 115 (2005) (statement of Victor Carrillo, Chairman, Texas Oil and Gas Comm'n), *available at* http://www.access.gpo.gov/congress/house/pdf/109hrg/99906.pdf; *Number of Producing Gas Wells*, U.S. ENERGY INFO. ADMIN., http://eia.gov/dnav/ng/ng_prod_wells_s1_a.htmhttp://eia.gov/dnav/ng/ng_prod_wells_s1_a.htmhttp://eia.gov/dnav/ng/ng_prod_wells_s1_a.htm (last visited Mar. 19, 2011).

29. DOE PRIMER, *supra* note 6, at 56–64.

30. MALL ET AL., *supra* note 20, at 14.

31. J. Daniel Arthur et al., ALL Consulting, Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale 3 (Sept. 21, 2008) (transcript available at http://www.dec.ny.gov/docs/materials_minerals_pdf/GWPCMarcellus.pdf).

hydraulic fracturing itself.[32] Horizontal drilling allows the well driller to extend the well laterally across the gas-containing formation to achieve greater coverage of the resource.[33] It is more capital-intensive to drill horizontal wells than it is to drill vertical wells, but the tradeoff is greater production and a smaller footprint on the surface.[34] Once the well is drilled and the casing is in place, the hydraulic fracturing begins. A typical well requires two to four million gallons of water for the drilling and fracturing.[35] The water is mixed with proprietary chemicals and propping agents that help facilitate the process and hold the fractures open to ease gas flow.[36] The process proceeds in stages, with each stage fracturing another length of the horizontal well.[37] Once the process is complete, the fracing fluid is recovered, treated, and disposed.[38]

### C. ENVIRONMENTAL CONCERNS

Although the technical underpinnings of hydraulic fracturing are largely understood, at least by industry operators, the environmental effects are less known.[39] Across the country, reports of water contamination in areas where hydraulic fracturing is practiced have surfaced, blaming the industry for methane gas or other harmful substances now present in residents' water supplies.[40] One extensively reported

32. *See* PEW CTR., *supra* note 14, at 8.

33. J. Daniel Arthur et al., *supra* note 31, at 8 (comparing a vertical well's coverage of 50 feet with a horizontal well's coverage of up to 6,000 feet as an example of the benefits of horizontal wells).

34. *Id.*

35. *See* DOE PRIMER, *supra* note 6, at 64.

36. For a more detailed explanation of the fracing process, see generally *id.* at 56–64.

37. *See id.* at 60–61.

38. *See id.* at 66 (noting that the majority of the "flowback" water is recovered in hours to weeks, but sometimes months after the fracing process stops); *see also* NEW YORK DEP'T OF ENVT'L CONSERVATION, SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM 5–97 (2009), *available at* http://www.dec.ny.gov/energy/58440.html (reporting that a typical range of "flowback water," or frac water that flows out of the well upon completion of the frac job ranges from between 9 and 35 percent of the total fluid pumped; the remainder stays underground).

39. *See* Editorial, *Questions About Fracturing*, N.Y. TIMES, Sept. 20, 2010, at A30.

40. *E.g.*, Abrahm Lustgarten, *Officials in Three States Pin Water Woes on Gas Drilling*, PROPUBLICA (Apr. 26, 2009, 7:00 AM), http://www.propublica.org/article/officials-in-three-states-pin-water-woes-on-

example of contamination from the Marcellus shale region is a small town in Pennsylvania, Dimock, that has been forced to cope with widespread reports of methane found in the drinking water.[41] In that instance, the gas company, Cabot Oil and Gas Co., was required to build a 5.5-mile pipeline to bring clean water to the town at a cost of $11.8 million, and entered into a $4.1 million settlement with the state and residents of Dimock.[42]

A 2004 study by the Environmental Protection Agency (EPA) focused on the effect on drinking water supplies of hydraulic fracturing injection into coalbed methane[43] wells and found that *injection* of fracing fluids poses "little to no" threat to underground sources of drinking water and thus required no further study.[44] The study was criticized for its narrow focus on the effect of injection of the fracing fluids (and not for other related activities such as disposal or storage of the frac fluids on or near the surface) and for ignoring other environmental concerns such as water quantity, fish kills, and acid burns.[45] Importantly, this study focused on a different gas-containing formation (coalbeds), and was completed before the more recent

gas-drilling-426; Joaquin Sapien, *With Natural Gas Drilling Boom, Pennsylvania Faces an Onslaught of Wastewater*, PROPUBLICA (Oct. 43, 2009, 11:05 AM), http://www.propublica.org/article/wastewater-from-gas-drilling-boom-may-threaten-monongahela-river; Mark Levy, *Pa. Investigating Spill at Natural Gas Well Site*, BLOOMBERG BUSINESSWEEK (Nov. 23, 2010, 3:57 PM), http://www.businessweek.com/ap/financialnews/D9JM2L9O1.htm (reporting on a suspected leak of 13,000 gallons of fracing fluid that was impacting nearby waterways).

41. *See, e.g.*, Jad Mouawad & Clifford Krauss, *Dark Side of a Natural Gas Boom*, N.Y. TIMES, Dec. 7, 2009, at B1 (reporting on the trials of the residents of Dimock and placing that within the larger context of the shale gas boom happening in the Marcellus shale and in other locations around the country).

42. Press Release, Pennsylvania Department of Environmental Protection, Dimock Residents to Share $4.1 million, Receive Gas Mitigation Systems Under DEP-Negotiated Settlement with Cabot Oil and Gas (Dec. 15, 2010), *available at* http://www.state.pa.us/portal/server.pt?open=18&objID=1022650&mode=2.

43. Coalbed methane is another source of unconventional gas in which the trapped gas is physically adsorbed to the coal; hydraulic fracturing is used to release the gas. *See* U.S. ENVTL. PROT. AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS 2 (2004).

44. *Id.* at 16.

45. *See* 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, 134–37 (2009).

reports of contamination from Marcellus shale operations.[46] In 2010, acting on a Congressional mandate and increasing reports of water contamination, the EPA announced plans for a comprehensive "lifecycle" study on the practice to be completed in 2012.[47]

### D. LEGAL DOCTRINES AND CASES GOVERNING HYDRAULIC FRACTURING

The case law that governs hydraulic fracturing disputes primarily addresses property and tort law claims—not claims of environmental contamination from fracing,[48] though that may be changing.[49] Hydraulic fracturing presents a rather unique scenario because the technology opens up vast new reserves for exploration and discovery: regions with extraction operations once thought to be declining are now faced with a new subsurface use that may have difficulty integrating within existing and future subsurface interests.[50] This section will provide an overview of the significant legal doctrines in oil and gas law governing hydraulic fracturing, and more generally, other subsurface activities like geologic carbon dioxide ($CO_2$) sequestration. Detailed discussion of this area of law is relevant because it helps to highlight traditional notions of subsurface use, which may need to be updated to reflect newer activities in the near future.

#### 1. Notions of Ownership, Subsurface Trespass, and Other Remedies

Subsurface trespass is a common cause of action in the oil and gas field. It occurs when an element of an extraction activity, such as a directional well or fracture, interferes with

46. *See id.* at 141.

47. U.S. ENVTL. PROT. AGENCY, SCOPING MATERIALS FOR INITIAL DESIGN OF EPA RESEARCH STUDY ON POTENTIAL RELATIONSHIPS BETWEEN HYDRAULIC FRACTURING AND DRINKING WATER RESOURCES 2 (2010), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/0/3B745430D624ED3B852576D400514B76/$File/Hydraulic+Frac+Scoping+Doc+for+SAB-3-22-10+Final.pdf. *See infra* Part II.E.1 for further description of this study.

48. Wiseman, *supra* note 45, at 146.

49. *See, e.g.*, Fiorentino v. Cabot Oil & Gas Corp., 750 F. Supp. 2d 506, 508 (2010) (case charging a gas company with contamination of a Pennsylvania town's drinking water due to hydraulic fracturing).

50. *See* Bagnell & Hadgkiss, *supra* note 2, at 32-2 to -5.

another interest holder's property and causes harm.[51] "For oil and gas purposes, a subsurface trespass is the bottoming of a well on the land of another without his or her consent."[52] Two aspects of the hydraulic fracturing process—the fracture itself and the migrating plume of injected or displaced fluids—are subject to subsurface trespass claims. Further, case law in the oil and gas field has several ancillary doctrines and policy considerations that may impact the subsurface trespass claim.

a. "Heaven to Hell"

One of the oldest legal doctrines is *cujus est solum, ejus est usque ad coelum et ad inferos*, or, ownership of the land extends up to the sky and down to the center of the earth.[53] Ownership of the airspace was the first portion of this maxim to be discarded after the rise of air travel; otherwise, planes would commit thousands of tiny trespasses daily as they flew over private land.[54] As applied to the subsurface, this doctrine has resisted change, but its practical validity has been lost over time as subsurface use has become more complex and courts have had to decide whether ownership did in fact extend to the center of the earth.[55] Surface owners may now find it difficult to succeed on an alleged trespass involving the deep subsurface without existing or reasonably anticipated use of the affected porespace, which is the physical space within a rock formation within which gas or liquids can be stored.

b. The Rule of Capture

Unlike its now much-weakened counterpart *ad coelum*, the rule of capture is an ancient legal doctrine still relevant in present day subsurface trespass cases.[56] A typical definition of

51. *See, e.g.*, Starrh & Starrh Cotton Growers v. Aera Energy L.L.C., 63 Cal. Rptr. 3d 165, 170 (Cal. Ct. App. 2007) (defining subsurface trespass as migration of oil field wastewater into the groundwater porespace of another without that landowner's consent).

52. 38 AM. JUR. 2D GAS AND OIL § 306 (2010) (internal quotation marks omitted) (citations omitted).

53. BLACK'S LAW DICTIONARY 42 (9th ed. 2009) (ad coelum et ad infernos).

54. For a discussion on the development of this doctrine, *see* Klass & Wilson, *supra* note 1, at 386–89.

55. *See generally* John Sprankling, *Owning the Center of the Earth*, 55 UCLA L. Rev. 979 (2008) (discussing the history of the doctrine, as well as recent cases that have called its validity into question).

56. *See, e.g.*, Coastal Oil & Gas Corp. v. Garza Energy Trust, 268 S.W.3d

the rule of capture is that "there is no liability for drainage of oil and gas from under the lands of another so long as there has been no trespass."[57] The doctrine puts the onus on the landowner alleging trespass to actively develop their mineral interests, as they are faced with the possibility that a neighbor will drain the resources before they do. The policy behind this rule is one that encourages production of fossil fuel resources and discourages litigation. A recent case of an alleged subsurface trespass provides a good illustration of how the doctrine is applied in the context of hydraulic fracturing operations.

In *Coastal Oil & Gas Corp. v. Garza Energy Trust*, a case from the Supreme Court of Texas, royalty interest owners of a tight natural gas formation sued the operator of the wells on their land, Coastal Oil & Gas, for breach of implied covenants to develop the gas wells on their tract.[58] Coastal owned and operated adjacent tracts of land to the suing interest-holders.[59] After drilling an especially productive well on the interest-holders' land, the company began to drill wells on other tracts of land near the productive well in an alleged attempt to drain the gas from under the interest-holders' land and thus forego the royalty payments they would otherwise have had to make if the gas were produced from the interest-holders' well.[60] The interest-holders also alleged that the "incursion of hydraulic fracturing fluid and proppants into another's land two miles below the surface constitutes a trespass."[61]

The Texas court held that, although the depositing of proppants or a like material on the surface of the interest-holders' land would be a trespass, it noted the demise of the *ad coelum* doctrine in the application of the law of trespass: "The law of trespass need no more be the same two miles below the

1, 13 (Tex. 2008) ("The rule of capture is a cornerstone of the oil and gas industry and is fundamental both to property rights and to state regulation.").

57. BLACK'S LAW DICTIONARY 1448 (9th ed. 2009). Another definition, surprisingly, can be found in pop culture, "Here, if you have a milkshake, and I have a milkshake, and I have a straw—there it is, that's a straw, you see? You watching? My straw reaches across the room, and starts to drink your milkshake. I drink your milkshake! . . . I drink it up!" THERE WILL BE BLOOD (Paramount Vantage 2007) (oil prospector Daniel Plainview describing drainage).

58. *Garza Energy Trust*, 268 S.W.3d at 6.

59. *Id.* at 5.

60. *Id.* at 7–8.

61. *Id.* at 9.

surface than two miles above."[62] The court did not rule explicitly on whether hydraulic fracturing constituted a trespass, and noted earlier decisions in which it also declined to do so, but it did bar recovery of the interest-holders under the rule of capture.[63] In doing so, the court also suggested that to allow recovery for the value of gas lost to another's hydraulic fracturing would "usurp[] to courts and juries the lawful and preferable authority of the Railroad Commission to regulate oil and gas production."[64]

The rule of capture is not entirely draconian, for it offers a party alleging drainage of resources several options for recourse. That party can drill a well on its property to offset the alleged drainage.[65] Or, if the surface owner leases mineral rights, he can sue the mineral interest-holder for breach of implied covenants to protect against drainage.[66] Finally, an owner may offer to pool its resources with surrounding interest-holders, and if the offer to pool resources is rejected, the owner could apply to the Railroad Commission (or similar permitting agency) to force pooling of the shared gas or oil resource.[67] Importantly, "[t]he minerals owner is entitled, not to the molecules actually residing below the surface, but to a fair chance to recover the oil and gas in or under his land, *or* their equivalents in kind."[68]

c. The Negative Rule of Capture

The negative rule of capture addresses the injection of a material, such as fracing fluid, which migrates into another's property, potentially causing the displacement of a more

62. *Id.* at 11.

63. *Id.* at 12–13 ("In this case, actionable trespass requires injury, and [interest-holders'] only claim of injury—that Coastal's fracing operation made it possible for gas to flow from beneath Share 13 to the Share 12 wells—is precluded by the rule of capture. That rule gives a mineral rights owner title to the oil and gas produced from a lawful well bottomed on the property, even if the oil and gas flowed to the well from beneath another owner's tract.") (citations omitted).

64. *Id.* at 14–15. This last sentence has implications for the shielding of operator liability through permits and is discussed in further detail in Parts II.D.1.c, e and again in Part III.A.2.

65. *Id.* at 14.

66. *Id.*

67. *Id.*

68. *Id.* at 15 (emphasis in original) (internal quotation marks omitted).

valuable substance, such as natural gas, with a less valuable one, such as salty brine water.[69] The rule states that such an interaction is allowed as part of a "reasonable program of development" as long as it does not cause "injury to producing or potentially producing formations."[70] This rule applies to various injection operations, including secondary recovery operations, disposal of brine, gas storage, and carbon dioxide storage—basically any underground activity that injects material underground.[71] One important caveat and recent development of this rule is that the regulatory permitting of the injection activity does not *fully* insulate the injector from liability resulting from migration of valuable substances, as once believed.[72]

Several notable cases address this doctrine, albeit in different fashions. In *Railroad Commission of Texas v. Manziel*, the issue was "whether a trespass is committed when secondary recovery waters from an authorized secondary recovery project cross lease lines."[73] Here, the court held that a trespass did not occur and that "[t]he technical rules of trespass have no place in the consideration of the validity of the orders of the [Texas Railroad] Commission."[74] Other cases focus on the injury to the plaintiffs' formations that may override a regulatory permit to inject.[75] In *Boyce v. Dundee Healdton Sand Unit*, an Oklahoma case, a secondary recovery operation's fluid migrated under plaintiffs' land, from which they had been producing oil.[76] The defendants argued that the ratification of

69. WILLIAMS & MEYERS, OIL AND GAS LAW § 204.5. at 2 (LexisNexis 2010).

70. *Id*. (internal quotation marks omitted).

71. *Id.* at 2–3.

72. *See id.* at 3–4 (noting that while permitted operations are afforded some protection from liability, there are several cases in which the operator was found liable for trespass or nuisance causes of action when injected fluids harmed another's subsurface interests even when the injections were permitted by a regulatory agency).

73. R.R. Comm'n v. Manziel, 361 S.W.2d 560, 567 (Tex. 1962).

74. *Id.* at 568–69.

75. *See, e.g.*, Morsey v. Chevron U.S.A., Inc., 779 F. Supp. 150, 153 (D. Kan. 1991) (holding that a regulatory order does not shield a party from liability if the permitted operations cause harm to another); Mowrer v. Ashland, 518 F.2d 659, 662 (7th Cir. 1975) (holding that if an activity introduces a risk of serious harm to the property interests of others, it should be held to a strict liability standard for that harm).

76. Boyce v. Dundee Healdton Sand Unit, 560 P.2d 234, 235 (Okla. Civ. App. 1977).

the oil and gas agency's unitization order, which allowed the defendants to implement secondary recovery techniques, also shielded them from liability.[77] The court held that ratification of the unitization order did not constitute consent to damage from the secondary recovery operation and thus did not insulate the defendants from liability for the damage.[78]

d. Ownership Theories

Whether the rule of capture is followed in a jurisdiction depends in part on the theory of ownership the jurisdiction adopts. The majority rule is called "ownership-in-place" and it holds that the mineral interest owner has present possession of the oil and gas in place and the right to use the surface to develop the interest. However, if the oil and gas flows out from under the interest holder's land, the interest terminates.[79] "Nonownership" theory is the minority rule, and it states that a severed mineral interest holder does not have a right to possess the oil and gas described in the deed—that interest holder has only the right to explore and develop the interest.[80] This would seem to lead to an easy case for subsurface trespass in ownership-in-place jurisdictions and an impossible one in jurisdictions that follow the nonownership theory, since the affected interest would not actually be in the interest holder's possession when the alleged trespass occurs. However, in practice, courts make little differentiation in nonownership jurisdictions, which generally follow the subsurface trespass rule of ownership-in-place jurisdictions and allow for relief if a mineral interest is harmed.[81]

77. *Id.* at 238.

78. *Id.*

79. BLACK'S LAW DICTIONARY 1215 (9th ed. 2009).

80. *Id.* at 1156; *see also* Terry Ragsdale, *Hydraulic Fracturing: The Stealthy Subsurface Trespass*, 28 TULSA L.J. 311, 314 (1993) (stating the definition of nonownership theory, significant jurisdictions that follow the theory, and the theory's origins).

81. *See* Ragsdale, *supra* note 80, at 327 (describing the potential conflict of nonownership jurisdictions applying subsurface trespass and the willingness of courts in those jurisdictions to apply the doctrine of ownership-in-place instead); *see also* Gregg v. Delhi-Taylor Oil Corp., 344 S.W.2d 411, 416 (Tex. 1961) (holding, in one of the earliest hydraulic fracturing cases, that fractures or veins extending onto another's land constitute "entry upon another's land" and thus trespass); Pac. W. Oil Co. v. Bern Oil Co., 87 P.2d 1045, 1050–51 (Cal. 1939) (holding that gas wells deliberately drilled close to the boundary of respondent's land to draw oil was a trespass).

A Pennsylvania case from the early 1980s presents an interesting application of ownership theory in an ownership-in-place jurisdiction. In *U.S. Steel Corp. v. Hoge*, the dispute centered around a gas rights owner's attempt to hydraulically fracture the coal interest owner's coal to extract coalbed methane gas.[82] The surface owner had, in 1920, severed the coal rights and granted them to U.S. Steel Corp. with a deed containing a provision that the surface owners "hereby *reserve the right to drill and operate through said coal for oil and gas* without being held liable for any damages."[83] The surface owner later severed the oil and gas rights in the late 1970s and granted the rights to another party that had planned to hydraulically fracture the coal-owner's coal to extract the gas.[84]

The question was whether the owner of the coal also owned the gas held within the coal seam, or if the gas interest-holder owned the gas.[85] The court began by describing its ownership-in-place doctrine: "The fact that gas is of a fugacious character does not prevent ownership in it from being granted prior to its being reduced to possession. We have long recognized that gas may be owned prior to being recovered from its natural underground habitat."[86] The court then classified gas interests as *ferae naturae*, or akin to a wild animal, because of the ability of gas to move from one location to another, unencumbered by human-made boundaries.[87] This distinction meant that the owner of the interest, whether wild animal or natural gas, was the owner of the land or geologic formation on or within which that interest resided.[88] Thus the coal interest-holder, U.S. Steel, had rights to the gas contained within the coal it owned, and the gas interest-holder had rights to the gas surrounding the coal formation, including the right to drill through the coal formation to reach the underlying gas.[89] Finally, in addressing the temporal aspect of the deed, the court noted that it was not

82. U.S. Steel Corp. v. Hoge, 468 A.2d 1380, 1382 (Pa. 1983).

83. *Id.* (emphasis in original).

84. *Id.*

85. *Id.*

86. *Id.* at 1383.

87. *Id.* at 1387 (quoting Westmoreland & Cambria Natural Gas Co. v. DeWitt, 18 A. 724, 725 (Pa. 1889)).

88. *Id.* at 1388 ("In accordance with the foregoing principles governing gas ownership, therefore, *such gas as is present in coal must necessarily belong to the owner of the coa*l, so long as it remains within his property and subject to his exclusive dominion and control.") (emphasis in original).

89. *Id.* at 1389.

perpetual, but "[r]ather, the coal owner's interest in that situs has been regarded as being in the nature of an estate determinable, which reverts to the surface landowner by operation of law at some time subsequent to removal of the coal."[90]

A recent Kansas case highlights the different approaches courts take when deciding ownership of resources in a geologic formation.[91] With very similar facts to *Hoge*, *Central Natural Resources, Inc. v. Davis Operating Co.* involved a dispute between a coal interest-holder and a gas interest-holder who was drilling for coalbed methane.[92] In an action for quiet title, the coal owner asked the Kansas court to follow the "container theory" of coalbed methane ownership that they argued was adopted in *Hoge*.[93] The court declined to do so and instead interpreted the intent of the original parties to the severance deed as granting only the solid coal to the grantee, as coalbed methane was believed to be a valueless waste gas of the coal mining process in the 1920s.[94]

This discussion on ownership theories highlights the differences (or lack thereof) between jurisdictions practicing one theory or the other. It also underscores the idiosyncratic nature of oil and gas law and the difference between theory and practice. Finally, it provides important context for the debate on hydraulic fracturing, since the practice invites a more complex discussion on the nature of ownership than traditional oil and gas disputes.

e. The Fracture and the Flood

Subsurface trespass cases involving hydraulic fracturing tend to hinge upon one of two processes: either the creation of the fracture or the flood of injected (or displaced) fluid.

In *Gregg v. Delhi-Taylor Oil Corp.*, the Texas Supreme Court held that the trial court, upon motion by the owner of the surrounding land, could enjoin the owner of a tract of land from

90. *Id.* at 1384 (citations omitted).

91. Cent. Natural Res., Inc. v. Davis Operating Co., 201 P.3d 680, 686–87 (Kan. 2009).

92. *Id.* at 683.

93. *Id.* at 684–686 (the "container theory" states that the grantee of the coal interest owns everything, including gas, contained within the coal formation(s)).

94. *Id.* at 684–85, 691.

fracturing his land to recover gas.[95] The court noted that Gregg planned to drill 9,400 feet to reach the gas-bearing formation, but was unable to say whether the resulting fractures would extend into the surrounding formation, which was owned by Delhi-Taylor.[96] The question became, then, whether the trial court had the power to issue an injunction to determine whether the fractures entered into the surrounding land and, if so, to enjoin Gregg from proceeding with gas production.[97] The court held that the trial court *did* have this power, noting that no difference exists between a directional well entering another's subsurface property and fractures from a hydraulic fracturing doing so.[98] Additionally, the court noted that the rules promulgated by the Railroad Commission of Texas allowing trespass in waterflooding or other secondary recovery operations are not applicable in fracturing cases.[99] Other cases have also addressed the issue of fractures extending into another owner's land, sometimes inconsistently.[100]

Waterflooding of underground formations is a method of enhanced recovery where injected water effectively "pushes" gas and oil towards a production well, akin to wringing the "sponge" of a formation to extract as much as possible. In *Manziel*,[101] the issue was "whether a trespass is committed when secondary recovery waters from an authorized secondary recovery project cross lease lines."[102] The court referenced the *Gregg* opinion, which left open the question of whether an "authorized" activity crossing lease lines would be considered a trespass.[103] It concluded that if the Railroad Commission of Texas, in an effort to prevent waste, "authorizes secondary recovery projects, a trespass does not occur when the injected,

95. Gregg v. Delhi-Taylor Oil Corp., 344 S.W.2d 411, 412 (Tex. 1961).

96. *Id.* at 415.

97. *Id.* at 415.

98. *Id.* ("While the drilling bit of Gregg's well is not alleged to have extended into Delhi-Taylor's land, the same result is achieved if in fact the cracks or veins extended into its land and gas is produced therefrom by Gregg. To constitute a trespass, entry upon another's land need not be in person, but may be made by causing or permitting a thing to cross the boundary of the premises.") (internal quotation marks omitted) (citations omitted).

99. *Id.* at 419.

100. *See, e.g.*, Zinke & Trumbo, Ltd. v. State Corp. Comm'n, 749 P.2d 21, 28 (Kan. 1988) (holding that a fracture treatment must be considered when determining value of drained oil for a proration order).

101. *See supra* notes 73–74 and accompanying text.

102. R.R. Comm'n v. Manziel, 361 S.W.2d 560, 567 (Tex. 1962).

103. *Id.* (citing *Gregg*, 344 S.W.2d at 411).

secondary forces moves across lease lines."[104]

A Kansas case further establishes the ability of permitted injection operations to cross property lines free of subsurface trespass concerns. In *Crawford v. Hrabe*, the lessee and operator of oil and gas wells sought to enjoin the owner of the property from cutting water lines that carried salt water from other plots of land to be injected as part of a secondary recovery operation.[105] The owner of the land objected to the injection of water produced from wells off-site, as the lease allowed only "water produced on said land" for injection to enhance production.[106] However, the regulatory agency issued an order that allowed for secondary recovery in order to prevent waste and allow additional oil to be recovered from the disputed well.[107] The court deferred to the agency's order in holding that "the injection of salt water was necessary . . . in order to sustain production."[108]

f. Societal Good

Substantial deference is accorded to activities that are determined by states to be in the public interest to prevent economic waste and ensure maximum levels of production.[109] For plaintiffs alleging harm, this preference towards production and elimination of waste means a higher bar for recovery.[110] In Pennsylvania, the Oil and Gas Conservation Law states that, "[i]t is . . . an expression of policy to be in the public interest to foster, encourage, and promote the development, production, and utilization of the natural oil and gas resources in this

104. *Manziel*, 361 S.W.2d at 568.

105. Crawford v. Hrabe, 44 P.3d 442, 444–45 (Kan. 2002).

106. *Id.* at 447.

107. *Id.* at 451.

108. *Id.* at 452.

109. *See, e.g.*, Anschutz Corp. v. Wyo. Oil & Gas Conservation Comm'n, 923 P.2d 751, 755 (Wyo. 1996) (describing the purpose of the state's law on oil and gas production as establishing regulation to prevent wasted resources); Mobil Exploration & Producing U.S. Inc. v. State Corp. Comm'n, 908 P.2d 1276, 1282 (Kan. 1995) ("The statutes governing the production and conservation of natural gas in Kansas empower the K[ansas] C[orporation] C[ommission] to prevent waste . . . .").

110. Sometimes this even means that the surface owner is unable to recover anything. *See, e.g.*, R.R. Comm'n v. Manziel, 361 S.W.2d 560, 568 (Tex. 1962) (holding that the public necessity of secondary recovery operations outweighs individual harm and that if subsurface trespass was a valid cause of action, secondary recovery operations would cease).

Commonwealth . . . in such manner as will encourage discovery, exploration, and development without waste."[111] The emphasis on the public good has been a bulwark of oil and gas law for over a century, although competing "public goods" such as environmental and human health invite further discussion on the continuing applicability of the dominance of oil and gas for the public good.

2. The LEAF decision and its reverberations

In 1997, the Eleventh Circuit decided an important case. Although effectively undone by Congress, it still affects the current discussion of hydraulic fracturing. In *Legal Environmental Assistance Foundation v. U.S. EPA*, an environmental group from Alabama—Legal Environmental Assistance Foundation (LEAF)—sought to force the EPA to withdraw approval of Alabama's Underground Injection Control (UIC) program.[112] The UIC program has its roots in the Safe Drinking Water Act's (SDWA) mandate to protect public underground sources of drinking water.[113] The Act allows states to apply for primary enforcement responsibility,[114] pending EPA approval, if the state chooses to run its own program using the EPA standards as a regulatory floor.[115] This is precisely what Alabama did in 1982 (for Class II injection wells)[116] and in 1983 (for Class I, III, IV, and V wells).[117] The EPA approved the applications in both instances, ceding primary regulation to the state.[118] Over a decade later, in 1994, LEAF petitioned the EPA to withdraw approval of the Alabama UIC program because it alleged that the program did not regulate hydraulic fracturing.[119] The EPA denied the petition, declaring that hydraulic fracturing fell outside of the definition

111. Pennsylvania Oil and Gas Conservation Law, 58 PA. STAT. ANN. § 401 (historical note) (1996).

112. Legal Envtl. Assistance Found. v. U.S. Envtl. Prot. Agency, 118 F.3d 1467, 1469 (11th Cir. 1997).

113. Safe Drinking Water Act, 42 U.S.C. § 300h(b)(1) (2006).

114. 42 U.S.C. § 300h–1(b).

115. 40 C.F.R. § 145.21 (2010).

116. Class I wells inject waste, Class II wells inject fluids associated with oil and gas production and hydrocarbon storage, Class III wells inject solution mining fluids, Class IV wells inject hazardous or radioactive waste, and Class V wells govern all other injected material. 40 C.F.R. § 146.5 (2010).

117. *Legal Envtl. Assistance Found.*, 118 F.3d at 1470.

118. *Id.*

119. *Id.* at 1471.

of underground injection because, according to its interpretation, the UIC program applied only to wells whose "principal function" was the injection of fluids.[120] The 11th Circuit performed a *Chevron* analysis[121] on the EPA's interpretation and determined that the statutory definition of "underground injection" did indeed include hydraulic fracturing.[122] The ruling required Alabama to submit an application to the EPA to regulate hydraulic fracturing under the UIC program, which it eventually did in 1999 through an alternative demonstration program (which LEAF unsuccessfully contested) contained in the SDWA.[123]

After the ruling, some commentators predicted severe repercussions for the fracing industry, both in uncertain liability and increased costs of compliance.[124] Soon, an industry-friendly legislative remedy was proposed that would overturn the court's decision and exempt hydraulic fracturing from the SDWA.[125] In 2005, a provision in the Energy Policy Act explicitly amended the SDWA to exempt hydraulic fracturing fluids, with the exception of diesel fuel, from regulation.[126] Further discussion on the regulation of injected material is found in the following section.

120. *Id.*

121. *Id*. at 1473–78; Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc., 467 U.S. 837, 842–43 (1984) ("First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress.").

122. *Legal Envt'l Assistance Found.*, 118 F.3d at 1474–75 ("The process of hydraulic fracturing obviously falls within this definition, as it involves the subsurface emplacement of fluids . . . .").

123. *See* Legal Envt'l Assistance Found. v. U.S. Envt'l Prot. Agency, 276 F.3d 1253, 1256 (11th Cir. 2001). The court did, however, order the EPA to consider more fully whether hydraulic fracturing of coalbeds fell under class II well regulation. *Id.* at 1264.

124. Markus G. Puder, *Did the Eleventh Circuit Crack "Frac"? — Hydraulic Fracturing After the Court's Landmark LEAF Decision*, 18 VA. ENVTL. L.J. 507, 538–43.

125. *Id.* at 547–49 (noting that a rider had been attached to an appropriations bill to exempt hydraulic fracturing from federal regulation but that the rider was dropped from the bill before passage).

126. Energy Policy Act of 2005, Pub. L. No. 109-58, § 322, 19 Stat. 594, 694 (2005) ("The term 'underground injection' . . . excludes . . . the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations . . . .").

## E. REGULATING THE SUBSURFACE

The courts are not the only forum discussing and changing the law of hydraulic fracturing. In many ways, regulatory agencies have a much greater impact on the day-to-day operations of hydraulic fracturing than courts do. They are the entities that review new well drilling and hydraulic fracturing projects and, at the state level, have been at the forefront of developing and enforcing requirements related to hydraulic fracturing. States have enjoyed this prominence due in part to the 2005 exemption of hydraulic fracturing from federal regulation[127] and because of the history and expertise of states in regulating the oil and gas industry.

### 1. Federal Regulation

The purpose of the SDWA is "to assure that water supply systems serving the public meet minimum national standards for protection of public health."[128] One of the main provisions of the SDWA is language that enables the EPA to create the Underground Injection Control (UIC) program to regulate injection of material that could impair underground sources of drinking water.[129] The law allows states to assume "primacy" of regulation, pending EPA approval; if a state does not wish to regulate (as is the case for Pennsylvania, among others), the EPA regulates directly.[130] The UIC program regulates all injection, except for the injection of natural gas for storage and hydraulic fracturing fluids.[131] The EPA may not establish requirements for many oil and gas production-related fluids unless such regulations are "essential to assure that underground sources of drinking water will not be endangered by such injection."[132] However, states may require oil and gas companies to have UIC permits for these activities, a requirement for Pennsylvania wells.[133]

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127. Energy Policy Act of 2005, Pub. L. No. 109–58, § 322, 19 Stat. 594, 694 (2005).

128. H.R. REP. NO. 93-1185, at 1 (1974).

129. *See* 42 U.S.C. § 300f (2006) (enabling language for regulation); 40 C.F.R. § 146 (2010) (UIC program).

130. 42 U.S.C. § 300h (2006) ("Regulations for State programs").

131. 42 U.S.C. § 300h(d)(1)(B) (2006).

132. 42 U.S.C. § 300h(b)(2) (2006).

133. 25 PA. CODE § 78.18(a) (2010) ("(a) A person may not drill a disposal or enhanced recovery well or alter an existing well to be a disposal or enhanced recovery well unless the person: . . . Submits with the well permit application

2. State, Regional, and Municipal Regulation

In Pennsylvania, the Pennsylvania Department of Environmental Protection (PDEP) and the Bureau of Oil and Gas Management (OGM) within the PDEP regulate oil and gas extraction in the state.[134] A prospective driller must secure a permit and a form of financial assurance (such as a bond) for the planned well before drilling can commence.[135] The permit requires that the applicant prepare a disposal plan for the storage and treatment of production-related fluids, including fracing fluid, and submit the approved UIC Class II permit application from the EPA.[136] The main statutes governing the regulation of oil and gas activities are the Coal and Gas Resource Coordination Act, the Oil and Gas Conservation Law, and the Clean Streams Law.[137] Interstate commissions and municipalities also control aspects of the oil and gas industry, primarily water usage on the basin-level and land use, respectively.[138] In 2009, the PDEP took 628 enforcement actions on gas wells in the state for violations found after inspection.[139] For comparison, the table below shows enforcement staff, wells overseen, and enforcement action taken in 2009 for Texas, Michigan, Wyoming and Pennsylvania. The enforcement staff and enforcement actions vary widely from state to state.

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a copy of the well permit, approved permit application and required related documentation submitted for the disposal or enhanced recovery well to the EPA under 40 C.F.R. Part 146 (relating to underground injection control program).").

134. *See Bureau of Oil & Gas Management Home Page*, PA DEP'T OF ENVTL. PROT., http://www.dep.state.pa.us/dep/deputate/minres/oilgas/oilgas.htm (last visited Jan. 27, 2011).

135. *See* 25 PA. CODE § 78.71–111 (2010).

136. §§ 78.18, 78.51, 78.55.

137. Coal and Gas Resource Coordination Act, 58 PA. STAT. ANN. § 501 (1996); Oil and Gas Conservation Act, 58 PA. STAT. ANN. § 401 (1996); Clean Streams Law, 35 PA. STAT. ANN. § 691 (1996).

138. *See generally* Laura C. Reeder, Note, *Creating a Legal Framework for Regulation of Natural Gas Extraction from the Marcellus Shale Formation*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 999, 1015–20 (2010) (summarizing various regulatory entities in Pennsylvania responsible for oil and gas production).

139. Abrahm Lustgarten & Sabrina Shankman, *Pennsylvania Drilling Tracker*, PROPUBLICA, http://projects.propublica.org/gas-drilling-regulatory-staffing/states/PA (last visited Mar. 21, 2011).

**Table 1:** A comparison of enforcement staff and action taken on natural gas wells in four states[140]

| State | Enforcement Staff | Gas Wells | Enforcement Actions in 2009 |
|---|---|---|---|
| Pennsylvania | 76 | 77,310 | 628 |
| Texas | 105 | 273,660 | 549 |
| Michigan | 36 | 16,493 | 36 |
| Wyoming | 11 | 33,490 | N/A |

States and other entities have taken other action in response to concerns related to hydraulic fracturing activities. To provide a few examples, in New York, a temporary moratorium was passed that banned fracing until May 2011 to give the Legislature more time to investigate the practice and attendant environmental concerns.[141] Then Governor Ed Rendell of Pennsylvania issued a moratorium on gas leasing in State Forest lands in October 2010.[142] A new Wyoming rule requires comprehensive disclosure of fracing fluids currently considered to be trade secrets by industry.[143] In November 2010, the city council of Pittsburgh voted unanimously to ban natural gas drilling within city limits, the first city in

140. Abrahm Lustgarten & Sabrina Shankman, *How Big is the Gas Drilling Regulatory Staff in Your State?,* PROPUBLICA, http://projects.propublica.org/gas-drilling-regulatory-staffing (last visited Mar. 21, 2011) (interactive feature showing regulatory staff in various states).

141. Abrahm Lustgarten & Nicholas Kusnetz, *New York Passes Temporary Ban on Hydraulic Fracturing*, PROPUBLICA (Aug. 4, 2010, 4:17 PM), http://www.propublica.org/article/new-york-senate-passes-temporary-ban-on-hydraulic-fracturing.

142. Press Release, Edward G. Rendell, Governor of Pa., Governor Rendell Signs Moratorium Protecting Sensitive State Forest Land from Future Natural Gas Leases (Oct. 26, 2010), *available at* http://www.dcnr.state.pa.us/news/newsreleases/2010/1010-sfdrillingmoratorium.htm.

143. *See, e.g.*, Nicholas Kusnetz, *Wyoming Fracking Rules Would Disclose Drilling Chemicals*, PROPUBLICA (Sept. 14, 2010, 4:17 PM), http://www.propublica.org/article/wyoming-fracking-rules-would-disclose-drilling-chemicals.

Pennsylvania to take such an action.[144] Finally, the Delaware River Basin Commission, a government agency created by an interstate compact and consisting of four states—Delaware, New Jersey, New York, and Pennsylvania—recently released draft rules that would require permits for hydraulic fracturing operations in the basin.[145] The plan requires financial assurance of $125,000 per well, approval of water sources and disposal methods, and well pad siting requirements.[146]

An alternate method of regulation that doesn't involve permitting or more traditional routes of control over industries is to require public disclosure of certain information from industry. Disclosure of chemicals used by industrial facilities is one way to control the social costs of economic production, costs not borne by the consumer and thus not optimized by the producer.[147] The Toxic Release Inventory (TRI) program, which began in 1986 with passage of the Emergency Planning and Community Right-to-Know Act (EPCRA)[148] and is administered by the EPA, is the a well-known example of such a program.[149] The TRI program does not, however, cover the disclosure of chemicals involved in the area of oil and gas extraction.[150] But in spite of the historical reluctance of oil and gas companies to disclose information about the chemicals used in hydraulic fracturing, there are signs that this is beginning to

144. *See* Joe Smydo, *City OKs Ban on Gas Drilling*, PITTSBURGH POST-GAZETTE (Nov. 17, 2010, 12:00 AM), http://www.post-gazette.com/pg/10321/1103877-53.stm.

145. Proposed Amendments to the Water Quality Regulations, Water Code and Comprehensive Plan to Provide for Regulation of Natural Gas Development Projects, 76 Fed. Reg. 295 (proposed Jan. 4, 2011) (to be codified at 18 C.F.R. pt. 410).

146. *See* DRBC Draft Natural Gas Development Regulations "At-A-Glance" Fact Sheet, DEL. RIVER BASIN COMM'N (Dec. 9, 2010), http://www.state.nj.us/drbc/naturalgas-draftregs-factsheet.pdf.

147. William F. Pedersen, *Regulation and Information Disclosure: Parallel Universes and Beyond*, 25 HARV. ENVTL. L. REV. 151, 151 (2001) (noting that in an attempt to control these social costs, Congress and agencies have begun to develop disclosure programs with the goal of assisting individual choice through access to information).

148. Emergency Planning and Community Right-to-Know Act, 42 U.S.C. §§ 11001–11050 (2006).

149. *See* Pedersen, *supra* note 147, at 152 (describing the TRI program as "the oldest, most established, and best publicized federal social cost disclosure program").

150. *See* 40 C.F.R. § 372.23 (2010) (listing the covered industries under EPCRA).

change.

Most notably, some states have woven chemical disclosure requirements into their well permitting processes.[151] Wyoming was the first state to institute disclosure requirements when its Oil and Gas Conservation Commission finalized rules that went into effect September 15, 2010.[152] Pennsylvania also requires disclosure in the state's oil and gas well permitting rules, although the language is not as explicit as Wyoming's rule.[153] It has been considered a significant accomplishment that a state like Wyoming, long-known for its ties to the fossil fuel industry, is leading the charge towards more transparency.[154]

There has also been recent action by industry or industry groups related to disclosure. In late 2010, the Ground Water Protection Council (GWPC)[155] and the Interstate Oil and Gas Compact Commission (IOGCC)[156] announced development of a public, voluntary, industry-supported online registry to compile information regarding chemicals used in hydraulic fracturing operations.[157] Finally, the federal government recently

151. *See* Hannah Wiseman, *Regulatory Adaptation in Fractured Appalachia*, 21 VILL. ENVTL. L.J. 229, 271–74 (2010) (describing the disclosure requirements of states within the Marcellus Shale and noting that while all states have permit requirements of basic disclosure (covering disposal, location of well, and location in relation to water), only New York and Pennsylvania have explicitly mandated chemical disclosure).

152. *See* 055 003 WYO. CODE R. § 45(d) (2010) ("The Owner or Operator shall provide . . . for each stage of the [hydraulic fracturing] well simulation program, the chemical additives, compounds and concentrations or rates . . . ."); Mike Soraghan, *Wyo. Natural Gas Fracking Rules for* [sic] *Point the Way for Public Disclosure of Chemicals Used*, GREENWIRE (Dec. 20, 2010), http://www.eenews.net/Greenwire/2010/12/20/1/.

153. 25 PA. CODE § 78.55 (2006) ("Prior to generation of waste, the well operator shall prepare and implement a plan . . . for the control and disposal of fluids . . . including . . . stimulation fluids . . . .").

154. *See* Soraghan, *supra* note 152 (reporting that there has been "relatively little grumbling" from industry since the rules in Wyoming took effect).

155. The GWPC is a non-profit organization consisting of a collection of state regulatory officials who manage their states' groundwater regulatory programs. About Us, GROUNDWATER PROT. COUNCIL, http://www.gwpc.org/about_us/about_us.htm (last visited Mar. 21, 2011).

156. The IOGCC is a multi-state agency advocating the interests of oil and gas states. About Us, INTERSTATE OIL & GAS COMPACT COMM'N, http://www.iogcc.state.ok.us/about-us (last visited Jan. 26, 2011).

157. *See* Press Release, Ground Water Protection Council, Ground Water Protection Council to Develop and Implement a State-Based System Disclosing Chemicals Used in Hydraulic Fracturing (Sept. 28, 2010), *available*

expressed interest in considering chemical disclosure regulations for hydraulic fracturing operations done on public lands.[158] This came after separate instances in which Congress and the EPA had asked for information, including chemical data, from companies involved in fracing, with moderate success.[159] Disclosure of frac-chemicals has also gained traction from legal scholars.[160]

## III. STRIKING A BALANCE: ECONOMICS, ENERGY, AND THE ENVIRONMENT

This Note is an attempt to address a controversial issue, but the author acknowledges that no issue, especially a controversial one, exists within a vacuum. Natural gas is an integral component of our modern lives. So, while the proposals in this section address hydraulic fracturing, care was taken to consider how the changes would also fit in a broader context

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*at* http://www.gwpc.org/e-library/documents/general/Media%20release%20with%20resolution%2010-1.pdf; Press Release, American Petroleum Institute, API Endorses State-Based Proposal From GWPC and IOGCC on Hydraulic Fracturing Chemical Disclosure (Dec. 14, 2010), *available at* http://www.api.org/Newsroom/chemical-disclosure.cfm.

158. *See* Ben Geman, *Interior Mulls Policy on Disclosure of Gas 'Fracking' Fluids*, E² WIRE (Nov. 30, 2010, 1:41 PM), http://thehill.com/blogs/e2-wire/677-e2-wire/131151-interior-mulls-policy-on-disclosure-of-gas-fracking-fluids (quoting Department of Interior Secretary Ken Salazar as considering chemical disclosure regulation for public lands); *see also* Letter from Rep. Maurice Hinchey et al., to Ken Salazar, Secretary of the Interior (Jan. 12, 2011), *available at* http://degette.house.gov/images/pdf/011211salazarletter.pdf (urging the Department of Interior to develop chemical disclosure regulations, co-signed by 46 members of Congress).

159. *See* Memorandum from Rep. Henry Waxman, Chairman of the Comm. on Energy and Commerce, and Edward Markey, Subcomm. Chairman to Members of the Subcomm. on Energy and Env't, U.S. House of Representatives (July 19, 2010), *available at* http://democrats.energycommerce.house.gov/documents/20100719/Memo.Hydraulic.Fracturing.07.19.2010.pdf (describing the efforts of the committee in 2010 to get information from hydraulic fracturing and energy companies via a series of letters to the companies); Letter from Lisa Jackson, Adm'r of the EPA, to nine hydraulic fracturing companies (Sept. 9, 2010), *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/HFvoluntaryinformationrequest.pdf (requesting, among others, specific chemical names and descriptions used for hydraulic fracturing by the company in the past five years).

160. *See, e.g.*, Wiseman, *supra* note 151, at 283 (calling for states in the Marcellus shale region to mandate disclosure of chemicals used in hydraulic fracturing).

and how they may be applied in other related scenarios as well. The first part of this section discusses previous legal and regulatory proposals to address hydraulic fracturing. Then, a set of proposals is introduced to address hydraulic fracturing law and regulation.

## A. LEGAL AND REGULATORY RESPONSES TO HYDRAULIC FRACTURING

### 1. Legal Proposals

As it has in the past, subsurface trespass is likely to remain at the forefront of future disputes arising from hydraulic fracturing. Courts have shied away from expressly ruling whether hydraulic fracturing constitutes a trespass since the Texas Supreme Court withdrew its *per curium* opinion stating that it did constitute a trespass in 1992.[161] Some commentators have called for courts to declare that fracturing across property lines is not a subsurface trespass.[162] Such a declaration could encourage developers to frac more extensively by decreasing the threat of litigation and promoting further development of a valuable resource.[163] However, the downside of such a proposal would be the hollowing-out of the rule of capture. Instead of allowing for competition in the fair capture of a resource, it would permit an operator to operate in another interest-holder's land with limited recourse for the affected

161. *See* Geo Viking, Inc. v. Tex-Lee Operating Co., No. D-1678, 1992 WL 80263 at *2 (Tex. Oct. 28, 1992) (opinion withdrawn and replaced by Geo Viking, Inc. v. Tex-Lee Operating Co., 839 S.W.2d 797 (Tex. 1992)); *see also* Coastal Oil & Gas Corp. v. Garza Energy Trust, 268 S.W.3d 1, 12 (Tex. 2008) ("We need not decide the broader issue [of whether hydraulic fracturing constitutes a trespass] here.").

162. *See* Owen L. Anderson, *Subsurface "Trespass": A Man's Subsurface is Not His Castle*, 49 WASHBURN L.J. 247, 281–82 (2010) ("The subsurface invasions listed above meet important societal needs, which must be commercial (economically efficient) if they are to succeed. A strict application of trespass law to the subsurface, particularly the ability to enjoin a continuing trespass, could in some, perhaps many, instances make the difference between an economic and uneconomic enterprise."); John W. Broomes, *Wrestling with a Downhole Dilemma: Subsurface Trespass, Correlative Rights, and the Need for Hydraulic Fracturing in Tight Reservoirs*, 53 ROCKY MTN. MIN. L. INST. 20-1, at 20-13 (2007) (suggesting that courts could declare that a fracture extending across property lines is not a subsurface trespass).

163. *See* Broomes, *supra* note 162, at 20-13.

party.[164]

Such a broad declaration may limit the ability of affected parties to obtain recourse for actual harm, such as the impairment of another production well or water source due to a hydraulic fracturing treatment. It would provide excessive cover for an already under-regulated practice and could have negative implications for emerging subsurface uses like geologic sequestration, aquifer recharge, and geothermal energy, activities with little judicial treatment thus far. Finally, although state courts and regulatory agencies have traditional purview over oil and gas matters,[165] the more crowded future subsurface will benefit from a more holistic assessment of subsurface rights, which takes into account more than just economic gain and elimination of hydrocarbon waste.

Another proposal, which would also apply more generally to other environmental statutes, is an enhanced recognition of citizens' suits by courts.[166] Such recognition would maintain the prominent role of state and federal regulatory agencies. As many agencies are understaffed and over-worked, citizen participation could help to fill in the gaps in environmental accountability.[167] A potential weakness in relying on enforcement by state regulatory agencies is the "race to the bottom" borne out in the balance regulators are forced to strike between protecting the environment and protecting the interests of industry who could take their operations to other, less regulated states.[168] Citizens' suits, however, face an uphill battle in the courts after a Supreme Court decision, *Lujan v.*

164. *Id*. at 20-13 to -14.

165. *Cf.* 42 U.S.C. § 300h (2006) (showing deference in UIC requirements for state oil and gas operations); JOHN S. LOWE, OIL AND GAS LAW IN A NUTSHELL 18 (1995) (noting the development of state oil and gas conservation laws).

166. *See* Will Reisinger, Trent A. Dougherty & Nolan Moser, *Environmental Enforcement and the Limits of Cooperative Federalism: Will Courts Allow Citizen Suits to Pick Up the Slack?*, 20 DUKE ENVTL. L. & POL'Y F. 1, 2 (2010) ("[W]hile Congress intended federal and state agencies to hold primary enforcement responsibilities, legislators also included provisions allowing private citizens to enforce the laws when the government was unwilling or unable to do so.")

167. *See id.* at 2; Abrahm Lustgarten, *State Oil and Gas Regulators Are Spread Too Thin to Do Their Jobs*, PROPUBLICA (Dec. 30, 2009, 12:38 PM), http://www.propublica.org/article/state-oil-and-gas-regulators-are-spread-too-thin-to-do-their-jobs-1230.

168. *See* Reisinger, *supra* note 166, at 19.

*Defenders of Wildlife*, held that a citizen suit brought under the Endangered Species Act lacked standing.[169] Finally, despite the inclusion of a citizen suit provision in the SDWA, it would be impossible to force an agency to regulate something that it is exempted by law from doing, as is the case with hydraulic fracturing, the EPA, and the SDWA.[170] The next section will address this and other regulatory issues.

2. Regulatory Proposals

Although actors in the gas and oil industry have been resistant to regulation, a permitted activity can provide a level of protection from liability against causes of action like subsurface trespass.[171] To that end, many have proposed a new regulatory structure for hydraulic fracturing. A "Marcellus Shale Compact Commission" would focus on planning on a multi-state scale, with a priority interest in protecting water resource needs.[172] It would have the ability to make environmental decisions on a broader level than states are able to and would relieve some regulatory pressure from state agencies.[173] However, it is unclear exactly how such a Commission would fit into existing oil and gas regulatory schemes or how state agencies and region-wide industries would react. It is one proposal, however, that could help broaden the focus of regulators and state actors from a strictly "waste not" mentality regarding resource production towards protection of the environment.

On the federal level, there have been calls to regulate fracing under a portion of the SDWA that addresses wells that inject other oil and gas-related fluids. However, this section requires a finding by the EPA that the injection of the oil and

169. Lujan v. Defenders of Wildlife, 504 U.S. 555, 577 (1992) ("To permit Congress to convert the undifferentiated public interest in executive officers' compliance with the law into an 'individual right' vindicable in the courts is to permit Congress to transfer from the President to the courts the Chief Executive's most important constitutional duty, to 'take Care that the Laws be faithfully executed' . . . .") (citations omitted).

170. 42 U.S.C. § 300j-8 (2006) (citizen suit provision of SDWA); 42 U.S.C. § 300h(d)(1)(B)(ii) (2006) ("Halliburton Loophole" exempting hydraulic fracturing from EPA regulation in SDWA).

171. *See generally* Anderson, *supra* note 162, at 268–81 (describing subsurface trespass in several situations and how permits can sometimes insulate an operator from liability, but only to a certain extent).

172. *See* Reeder, *supra* note 138, at 1023–24.

173. *Id.*

gas fluids will endanger sources of drinking water wells before it can regulate those wells.[174] Further, it is not clear whether the EPA could actually regulate fracing-related injection due to the exemption in the SDWA.[175] The agency does regulate the disposal of oil and gas waste through the Underground Injection Program specified in SDWA regulations—indirectly regulating fracing without explicitly doing so.[176] Due to this statutory obstacle, others have called for the repeal of the exemption by Congress, which could lead to a regulatory framework that addresses broader issues than state regulation could, including migration of pollution across state lines, protection of sparsely populated regions' water supply, and better application of findings from national studies like the one currently underway at the EPA.[177] Efforts in both houses of Congress were made to repeal the exemption and mandate disclosure of chemicals, although neither bill passed the 111th Congress.[178]

### B. SUBSURFACE 2.0: RE-IMAGINING THE LAW GOVERNING HYDRAULIC FRACTURING

The following is a collection of proposals to balance public and private interests through changes to laws, regulations, and policies governing hydraulic fracturing. Protection of environmental and human health is paramount, but realistic

174. 42 U.S.C. § 300h-1(c) (addressing the duties of the EPA in the case of a state choosing not to pursue primary enforcement of the UIC program under the SDWA, "Such program may not include requirements which interfere with or impede . . . any underground injection for the secondary or tertiary recovery of oil or natural gas, unless such requirements are essential to assure that underground sources of drinking water will not be endangered by such injection."); Angela C. Cupas, Note, *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, 629 (2009) ("[I]t appears entirely reasonable to require that hydraulic fracturing activities meet the more lenient standards required under section 1425 of the SDWA.").

175. 42 U.S.C. § 300h(d)(1)(B)(ii) (2006).

176. *See* 40 C.F.R. § 146.5 (2010).

177. *See* Wiseman, *supra* note 45, at 183–87; *Halliburton Loophole*, *supra* note 20, at A28 (calling for a close of the "Halliburton Loophole").

178. *See* Fracturing Responsibility and Awareness of Chemicals (FRAC) Act of 2009, H.R. 2766, 111th Cong. (2009) (sponsored by Rep. Diana DeGette (D-CO) and co-sponsored by seventy-two other members); Fracturing Responsibility and Awareness of Chemicals (FRAC) Act, S. 1215, 111th Cong. (2009) (sponsored by Sen. Robert Casey Jr. and co-sponsored by nine other Senators).

proposals also incorporate the significant economic and security interests of the states and the energy sector. Thus, the four proposals call for changes to the legal and regulatory landscape of hydraulic fracturing through executive, administrative, industry, state, and judicial action.

*1. Place a moratorium on new hydraulic fracturing operations on federally-owned land until findings from the EPA study are released and show that it has no adverse effect on drinking water resources.*

A moratorium on hydraulic fracturing, even though it would be temporary and only applicable to *new* leases for natural gas operations employing hydraulic fracturing on federally owned land, would give scientists and regulators a chance to "catch up" with the advancements made in the past five years in the technology. It could be ordered by the President via an executive order and implemented by the Department of the Interior, the executive agency that manages the nation's publically owned lands and leases.[179]

Moratoria of certain natural gas activities are not without precedent. Some states and municipalities have, for instance, already banned hydraulic fracturing on state lands or until studies on the environmental effects of the practice on drinking water sources can be completed.[180] Analogously, moratoria on offshore drilling have been a contentious political issue for thirty years, from a Congressional moratorium in 1982, to an executive order issued by President George H.W. Bush in 1990 extending the moratorium, to President Obama's issuance, court-rejection, and finally, lifting of a deepwater moratorium in the wake of the Deepwater Horizon oil spill in 2010.[181]

179. U.S. DEPT. OF INTERIOR, WHAT WE DO, http://www.doi.gov/whatwedo/index.cfm (last visited Mar. 28, 2011).

180. *See, e.g.*, Gov. Edward G. Rendell, *supra* note 142 (announcing the moratorium on gas leases in Pennsylvania State Forests); Mireya Navarro, *N.Y. Senate Approves Fracking Moratorium*, N.Y. TIMES (Aug. 4, 1010, 1:23 PM), http://green.blogs.nytimes.com/2010/08/04/n-y-senate-approves-fracking-moratorium/ (reporting on passage by the N.Y. Senate of a bill that would establish a moratorium on hydraulic fracturing until May 2011).

181. *See, e.g.*, Steven Lee Myers & Carl Hulse, *Bush Acts on Drilling, Challenging Democrats*, N.Y. TIMES, July 15, 2008, at A13 (describing the lifting of the presidential moratorium on offshore drilling by President Bush in

Despite the existence of long-running moratoria on certain areas of fossil fuel extraction, the industry seems to come out unscathed and there is no reason to believe that a brief moratorium on new gas leases on federal land would cripple one of the nation's more profitable industries.

Finally, this proposal hews to the precautionary principle of regulating under scientific uncertainty. The precautionary principle states that "rather than await [scientific] certainty, regulators should act in anticipation of environmental harm to ensure that this harm does not occur."[182] However useful this concept may be in the abstract, its application can be complicated: instead of weighing caution versus risk, the regulator finds itself instead weighing the risk against the risk created by the principle itself.[183] In the context of hydraulic fracturing, the precautionary principle could be a beacon guiding state and federal regulators through the circus act of balancing the promotion of production while also protecting the public and environment. Further, the degree of scientific certainty will never be complete and will always be a bone of contention between the public and industry, but by hewing to the precautionary principle, regulators will be further assured of the soundness of their management.

*2. The Pennsylvania state court should declare that extending hydraulic fracturing onto another interest holder's property is a trespass, but shield properly permitted operators from liability when acting within the scope of their permit. The legislature should also revise well spacing regulations to reflect the emergence of hydraulic fracturing.*

The rule of capture looms large over all oil and gas-based subsurface trespass cases,[184] and for good reason: its use as a

2008 and noting the history of offshore drilling moratoria); Peter Baker & John M. Broder, *U.S. Lifts the Ban on Deep Drilling, with New Rules*, N.Y. TIMES, Oct. 12, 2010, at A1, *available at,* http://www.nytimes.com/2010/10/13/us/13drill.htmlhttp://www.nytimes.com/2010/10/13/us/13drill.html (summarizing President Obama's deepwater offshore drilling moratorium's progress and lifting).

182. Daniel Bodansky, *Scientific Uncertainty and the Precautionary Principle*, 33 ENV'T 4, 4 (1991).

183. *See id.* at 43 (noting that the precautionary principle may be more useful as a general goal than as a specific solution to decrease the risk of environmental harm through regulation).

184. *See, e.g.*, Coastal Oil & Gas Corp. v. Garza Energy Trust, 268 S.W.3d

doctrine has served the industry well in encouraging production and limiting economic waste. Pooling, unitization, and the fair use doctrine provide adequate remedies for adjacent interest-holders who may be at risk for drainage or encroachment from a hydrocarbon production operation. However, the remedies available to an interest holder who has concerns about hydraulic fracturing for environmental, not production reasons, are less certain without an express declaration that hydraulic fracturing—either the estimated extent of the fracture or flood—constitutes a subsurface trespass.

Pennsylvania is not Texas. The two states have different histories and interests, and Pennsylvania should not be beholden to a state whose highest court cited, as reason not to alter the rule of capture, the fact that industry did not want it to change.[185] This is somewhat akin to the Michigan Supreme Court deciding that catalytic converters were not necessary pollution-abatement technologies because the automotive industry did not want the change. Importantly, declaring hydraulic fracturing to be a subsurface trespass would not preclude the rule of capture in the case where an interest holder alleges drainage from under their property. It would help those seeking injunctions to stop the physical invasion of a fracture into their interest.

There is a question of whether the trespass would also include the flood of frac fluid or displaced brine due to the changes in subsurface pressure that fracing induces. Although estimates of the extent of migrated fluids may be more difficult to determine than estimates of the extent of the fractures, this is not to say that it is less important. In fact, if the purpose of regulation is to protect water resources, it may be more significant if some fluid has breached a boundary than if a fracture has. Although, if a fracture has crossed a subsurface boundary, it is almost certain then that some fluid has also crossed a property interest;[186] thus, a requirement that fluids

1, 13 (Tex. 2008) ("The rule of capture is a cornerstone of the oil and gas industry and is fundamental both to property rights and to state regulation.").

185. *See id.* at 16 ("[T]he law of capture should not be changed to apply differently to hydraulic fracturing because no one in the industry appears to want or need the change.").

186. This is so because the opened fracture is the pathway though which the fluid flows and, because the fluid is under pressure, it is reasonable to believe that the extent of the fluid would be to at least the extent of the fracture.

not cross boundaries would thus be more protective to an adjacent interest-holder than a fracture-only requirement. As an added benefit (or, to some, a burden), such a stipulation would also encourage well operators to develop accurate models of their fluid plumes.

Importantly, such a declaration would have a negligible impact on most hydraulic fracturing operations—it is difficult to imagine a gas company acquiring such a small interest that its operations would be at constant risk of interacting with other properties. Further, there are certain steps regulators and companies can take to make adoption of the rule even easier. Pennsylvania should revise its well spacing regulation to include boundary restrictions (the closest distance to another property line that a well can be drilled) for horizontal well laterals and estimates of the extent of the fracture and flood.[187] This would help protect adjacent interest holders from subsurface trespass and extend a liability shield for operators who would then have regulatory approval for their hydraulic fracturing operations, all achieved through only minimal regulatory rulemaking.

*3. Mandate disclosure of chemicals used in hydraulic fracturing and integrate data into a database coordinated with the Interstate Oil and Gas Compact Commission and federal, state, and local agencies.*

A variety of stakeholders—including industry, state agencies, federal agencies, and members of Congress—increasingly view disclosure of chemicals used in hydraulic fracturing as a viable component of regulatory reform.[188] Several states have currently established more comprehensive disclosure requirements than the federal government, specifically Wyoming, Pennsylvania, and New York.[189] But these states amount to only a small fraction of the states with

187. As it currently exists, Pennsylvania's well spacing code states, "The requested location of the well may not conflict with a spacing or pooling order previously entered or pending before the Department, and the requested location shall be at least 330 feet from the nearest outside boundary line of the lease on which it is located." 25 PA. CODE § 79.11(b) (1998). This language could be modified to read, in part, "The requested location of the well, including the extent of the lateral and fractures, may not . . . ."

188. For a summary of recent chemical disclosure initiatives related to hydraulic fracturing, see *supra* Part II.E.2.

189. *See* discussion supra Part II.E.2.

hydraulic fracturing operations. Furthermore, companies have the power to protect the identity of some chemicals by labeling them as trade secrets.[190] A more comprehensive disclosure policy is required to ensure that regulators and the public have knowledge of the full nature of frac chemicals.

This proposal will build on the various state disclosure requirements while combining the work done on an online database by the GWPC and IOGCC with the enforcement and resource capabilities of the federal government. The EPA should promulgate rules under the EPCRA to add hydraulic fracturing companies to the list of industries required to submit a Toxic Release Inventory report annually. Alternately, the agency could develop rules within EPCRA in conjunction with industry, industry groups, and state regulatory agencies to establish a new reporting program tailor-made for hydraulic fracturing. This program would specify what information about the chemicals must be disclosed (e.g., composition, quantity used, amount recovered/disposed of) and would limit companies' ability to seek trade secret status for the chemicals. States would administer the data collection if they choose in conjunction with organizations like the GWPC and IOGCC, who are already working on data-gathering tools, with federal resources available as needed. The data would be available to the public and could further be used to set up a certification or permitting program, as introduced in the next section.

There will be challenges in implementing such a program. Industry will be reluctant to submit to mandatory disclosure requirements and lose the ability to claim that frac chemicals are protectable trade secrets. Further, state and state-based organizations like GWPC and IOGCC might be wary of a program with significant federal involvement despite being able to take a prominent part in the formulation and administration of the program. But despite these challenges, establishing a federal program of mandatory disclosure would achieve several important goals. First, it would ensure that the patchwork of state disclosure laws is unified, with a federal floor specifying a minimum level of information that must be disclosed and is the same across the country. The program would also give the public valuable information regarding the

190. *See* Soraghan, *supra* note 152 (noting that, since the implementation of Wyoming's disclosure rules, the state has agreed to too many industry requests to shield their chemical compounds as trade secrets).

chemicals used under their property and in their watersheds. This information can help identify bad actors and pressure them, and the industry as a whole, to use chemicals that are less harmful to the environment and people if spilled or leaked. Finally, the program would help both industry and government identify and develop best practices by using the chemical data to further refine the technical aspects of fracing.

*4. Use disclosure information to issue permits for hydraulic fracturing based on the use of environmentally safe chemicals. Require higher fees and higher limits to liability for companies that use chemicals shown to be harmful to the environment after review by the EPA.*

The final proposal takes regulation one step further than disclosure and calls for the issuance of permits based upon best practices garnered from data gathered from the chemical disclosure database and incorporating existing state and commission permit requirements relating to hydraulic fracturing. Aside from the public and environmental benefits of disclosure, collecting data from across the industry will also generate a large dataset that can be used in consultation with industry to identify a class of chemicals that are both environmentally friendly and effective. Once this class is identified, the use of these environmentally safer chemicals should be encouraged, through incentives, such as special designations (similar to Energy Star or LEED), reduced liability for potential leakage or contamination, outright bans on the most harmful chemicals, or by making it more difficult to use certain chemicals by requiring written justification by the operator prior to use, subject to regulatory or administrative approval.

This proposal would likely require a repeal of the Safe Drinking Water exemption currently applied to hydraulic fracturing through a bill similar to the legislation introduced in the previous Congress.[191] Such an act would require

191. *See* Fracturing Responsibility and Awareness of Chemicals (FRAC) Act of 2009, H.R. 2766, 111th Cong. (2009); Fracturing Responsibility and Awareness of Chemicals (FRAC) Act, S. 1215, 111th Cong. (2009).

considerable political will and it appears unlikely to occur given the current makeup of Congress. However, the federal route is not the sole regulatory option. An entity like a river basin commission could issue such permits, although it is unclear whether it would have the resources and expertise to manage such a program. Further, regulation by commission could have a negative impact on the economy of the basin, especially if the shale formation covers a larger area than the basin's jurisdiction and thus incentivizes industry to move away from the regulated areas.

Despite the significant challenges this proposal presents, the controversy over hydraulic fracturing in the Marcellus Shale could provide the requisite motivation for federal legislative action to address issues previously confined to certain state actors. The need for federal legislation, with the acknowledgement of the importance of continued state and industry input, is inextricably tied to the duty of the federal government to protect the nation's environmental and public health. In studying the effects of hydraulic fracturing, the EPA is taking important first steps in collecting the information necessary for smart, not overly burdensome regulation. But this is simply the first step in what may be a long, difficult process of readjusting the balance between public and private interests.

## IV. CONCLUSION

The sudden emergence of hydraulic fracturing in geologic formations like Pennsylvania's Marcellus Shale has the potential to be a tremendous resource for the region and the country. Apart from the obvious economic opportunities, fracing could produce real impacts on our energy portfolio, national security, and capacity for technological innovation. However, uncertainty surrounding the environmental effects as well as the regulatory and legal treatment of fracing could lead to unintended, perhaps lasting consequences. The proposals in this Note will attempt to shift the traditional resource-centric view of the subsurface to a more holistic view that takes into account other important viewpoints often overshadowed by the tremendous short term opportunity hydraulic fracturing presents. The proposals advocate steps to be taken in the courtroom, on the floor of Congress, and by our regulatory agencies. Industry is not treated as an opponent, but rather an ally who, if held to high, yet reasonable standards of

responsibility, has an opportunity to lend its considerable expertise towards effective regulation. Finally, the proposals recognize the traditional role of the states in oil and gas law and attempt to combine this unique expertise with the considerable resources and overarching goals of the federal government.

Natural gas, like coal and oil, is destined to be a significant part of our nation's energy mix for years to come and so it is critical that we take the necessary steps now to ensure that it is a sustainable future for everyone. The next chapter of our energy story is being written now—hydraulic fracturing is destined to be a main character, but there is hope that efficient, effective regulation and sound science will also take center stage and not find themselves relegated to bit player status. That would be a tragedy, indeed.