SUBSURFACE TRESPASS IN THE *RESTATEMENT (FOURTH) OF PROPERTY*: AN APPRAISAL AND ALTERNATIVE ACCOUNT

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Building on the scholarly work of leading property theorists Henry Smith and Thomas Merrill, the recently approved Fourth Tentative Draft of the Restatement (Fourth) of Property *prescribes treating all entries below ground as ordinary trespasses. That includes entries in the shallow subsurface by building foundations and utility lines, as well as invasions in the deep subsurface by mining shafts, oil and gas wells, and substances injected for disposal and storage. The* Restatement *comes at an important time in the development of subsurface trespass law, as developers, courts, and policymakers grapple with the growing use of subsurface technologies for horizontal drilling, hydraulic fracturing, and injection of fluids, particularly for wastewater disposal and carbon dioxide capture and storage (CCS).*

The standard model of trespass, in which harm to the plaintiff is presumed from the mere fact of a physical entry into the plaintiff's close, works well for entries that occur near the surface and entries into solid, stationary mineral deposits in the deep subsurface. Because these parts of the subsurface may be effectively and exclusively controlled, courts apply the standard tort in those cases accordingly. Ordinary trespass has, however, proven an awkward fit for invasions involving resources that are not capable of exclusive control, like oil, gas and interconnected "pore space" where fluids are injected and stored. Accordingly, the case law generally does not support the Restatement's *application of ordinary trespass to invasions of fluid and nonexclusive resources.*

A modified account of subsurface trespass to fluid minerals and interconnected space, requiring actual harm in addition to a physical invasion, better fits the case law. The harm-based account has roots in well-established oil and gas jurisprudence, which recognizes that property rights in common reservoirs are nonexclusive and correlative in nature. The harm-based account also advances the broader goals of Merrill and Smith's scholarship and the Restatement *itself by furnishing workable guidance to owners and developers of subsurface resources and providing a superior baseline from which legislation and administrative regulation can address typical common pool problems.*

INTRODUCTION

The American Law Institute (ALI) is drafting a new restatement of the common law of property. The draft *Restatement (Fourth) of Property* aims to cover most of the general field of property law, including the previously sleepy topic of trespass below the surface of land—commonly called "subsurface trespass."[1]

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1. Eleanor Barrett, *Foreword* to RESTATEMENT (FOURTH) OF PROP., at xxi (A.L.I., Tentative Draft No. 4, 2023); RESTATEMENT (FOURTH) OF PROP. vol. 1 §§ 1.1–1.19 (A.L.I., Tentative Draft No. 4, 2023).

Once almost exclusively the concern of mineral lawyers, subsurface trespass has become salient for a broad range of scholars, practitioners, and policymakers.[2] Behind this new interest is a gradually unfolding technological revolution that has unlocked the potential of long-known but little-used subsurface resources.[3]

Thanks to this revolution, oil and gas developers routinely capture minerals from impermeable, "unconventional" rock formations using horizontal drilling and hydraulic fracturing.[4] Technology has also given us the ability to inject carbon dioxide into the microscopic interstitial spaces within geologic rock formations—"pore space"—in a process called carbon capture and storage (CCS), which many look to as a tool of climate change mitigation.[5] These and other related innovations often cross property boundaries deep underground, both raising the hackles of property owners and elevating the profile of subsurface trespass law.

As interesting as these technological developments are, they are probably not the only reason the ALI is taking on subsurface trespass in the new *Restatement*. The reporters for the current *Restatement* project, including Henry Smith as the principal reporter and Thomas Merrill as an associate reporter,[6] aim to restate nearly the entire field of property, which naturally includes property rights below ground. The stated goal of this mammoth project is to reveal the immanent "architecture" of property law,[7] which Smith and Merrill have elucidated throughout their many important scholarly contributions.[8] The tort of trespass plays a key role in this architectural theory of property, and so we again find subsurface trespass center stage.

Property, in the architectural view of the *Restatement*, is not a bundle of malleable rights and privileges created ad hoc by courts and legislatures, but a meaningful legal category with standardized essential features.[9] At the center of these features is the right of the owner to physically exclude the whole world from the owner's property.[10] The tort of trespass protects and vindicates this right.[11] Befitting the simple and standardized nature of the right to exclude, trespass traditionally is a simple tort, requiring only an intentional, unauthorized

2. *See* Tara K. Righetti et al., *The New Oil and Gas Governance*, 130 YALE L.J. F. 51, 51–54 (2020).

3. *See* Patrick H. Martin, *What the Frack? Judicial, Legislative, and Administrative Responses to a New Drilling Paradigm*, 68 ARK. L. REV. 321, 323–26 (2015).

4. *See* Righetti et al., *supra* note 2, at 67; Martin, *supra* note 3, at 323–25.

5. Keith B. Hall, *Reconciling Property Rights with Carbon Capture and Storage*, 10 BELMONT L. REV. 382, 383–92 (2023).

6. RESTATEMENT (FOURTH) OF PROP., at iv–v (A.L.I., Tentative Draft No. 4, 2023).

7. Eleanor Barrett, *Foreword* to RESTATEMENT (FOURTH) OF PROP., at xxi (A.L.I., Tentative Draft No. 4, 2023).

8. *See infra* Part I.B.

9. *Id.*

10. *Id.*

11. *See infra* Part I.C.

physical entry into an owner's land to establish liability and entitle the owner to nominal or compensatory damages and injunctive relief.[12]

Accordingly, the *Restatement* applies the standard model of exclusion and traditional trespass in restating the law governing subsurface entries.[13] The idea seems to be that molding subsurface trespass to "fit" the architecture of property makes it easier for courts to apply and more workable as guidance for private affairs.[14] Conforming subsurface trespass to the traditional tort is also said to allow private parties more freedom to modify the simple rules of exclusion and trespass by contract, and to give legislatures and administrative agencies a firm foundation for regulating problems that arise in the use of subsurface resources.[15]

The trouble is that there are multiple varieties of entries below ground and courts do not adjudicate all of them under the traditional tort of trespass.[16] Some varieties of subsurface invasions are too quirky to fit into the *Restatement*'s standardized model.[17] By using exclusive possession and trespass to explain liability for all belowground entries, the *Restatement*'s architectural approach runs into a basic descriptive problem: While courts treat some kinds of subsurface entries under the rubric of exclusion and trespass, the model does not accurately restate the case law pertaining to other kinds of subsurface entries.[18]

Merrill and Smith acknowledge in their scholarship that restating the law to fit the architecture of property might require deviating from the law as actually stated and applied.[19] The architectural approach's benefits of providing coordination, guidance, and a baseline for contractual and regulatory specialization, the argument goes, justify the *Restatement*'s departure from actual case law.[20] Even if courts do not apply traditional trespass to all entries below ground, but, instead, regularly modify the basic rules of exclusion and trespass,

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12. *See id.*

13. *See infra* Part I.D.

14. *See infra* Part I.C.

15. *See id.*

16. *See* RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2B cmt. a (A.L.I., Tentative Draft No. 4, 2023) (noting the varieties of subsurface trespass); *infra* Part II.B.

17. *See infra* Part II.B.

18. *Id.*

19. *See* Thomas W. Merrill & Henry E. Smith, Briggs v. Southwestern Energy Production: *Hydraulic Fracturing and Subsurface Trespass,* 16 J. TORT L. 1, 20–21 (2023) (distinguishing architectural fit from fit with the results or reasoning of case law) [hereinafter Merrill & Smith, *Briggs*]; Andrew S. Gold & Henry E. Smith, *Restatements and the Common Law*, *in* THE AMERICAN LAW INSTITUTE: A CENTENNIAL HISTORY 441, 457 (Andrew S. Gold & Rogert W. Gordon, eds. Oxford Univ. Press 2023) ("Restatements can fit the structure of common-law concepts and reasoning even in those cases where they do not fit the content of existing common law.").

20. *See* Merrill & Smith, *Briggs*, *supra* note 19, at 18–22; Gold & Smith, *supra* note 19, at 457–61.

the architectural approach would contend that these nonconforming but commonplace outcomes give way to a uniform approach.[21]

But what if there is a good reason that courts deviate from the traditional trespass rules for certain kinds of subsurface intrusions? And further, what if we could restate how courts modify traditional trespass in a way that is consistent with the spirit of the architectural approach and that achieves its advantages without sacrificing descriptive accuracy? In this article, I argue that such an account of subsurface trespass is not only possible, but that it already exists in the jurisprudence of oil and gas law.

The argument unfolds in four Parts. Part I provides necessary background on the architectural theory of property, the geology and uses of the subsurface, and the application of the architectural approach to the subsurface in Merrill and Smith's scholarly work and in the *Restatement* itself. Part II carefully examines how the *Restatement*'s sections on subsurface trespass fit the existing case law. This examination identifies the types of intrusions for which the *Restatement*'s account accurately restates the case law and those from which it deviates. In a nutshell, the *Restatement* accurately captures the case law on invasions into parts of the subsurface that property owners can effectively and exclusively control, but it fails to describe cases involving resources that, by their nature, are effectively not excludable.[22] In application, this means that the *Restatement*'s exclusion-and-trespass approach fits the cases dealing with intrusions near the surface, such as border crossings by building foundations and utility lines, as well as intrusions into solid minerals in the deep subsurface.[23]

The *Restatement*'s application of ordinary trespass does not, however, fit the case law involving fluid or "fugacious" minerals like oil and gas or fluids injected into pore space for storage, disposal, or enhanced recovery of oil or gas.[24] Unlike entries into the immediate reaches of the subsurface or into solid, stationary minerals, invasions involving fluid and interconnected resources are not amenable to ordinary trespass treatment because the nature of the resources does not permit effective exclusive control. The *Restatement* fails to sufficiently refine the basic rules of exclusion and trespass to deal with the peculiarities of fluid minerals and interconnected pore space.[25]

Part III of the argument turns to the existing literature of oil and gas law to find alternative accounts of subsurface trespass for these fluid and interconnected resources. It focuses on my own account, which goes by the name "fair opportunity doctrine."[26] The fair opportunity doctrine recognizes

21. *See id.*

22. *See infra* Parts II.B.–C.

23. *See infra* Part II.A.

24. *See infra* Parts II.B.–C.

25. *Id.*

26. *See generally* Joseph A. Schremmer, *Pore Space Property*, 2021 UTAH L. REV. 1 (2021) [hereinafter Schremmer, *Pore Space*] (applying the fair opportunity doctrine to pore space that extends from the subsurface

that courts modify the traditional rules of trespass for invasions involving these resources to require actual harm in addition to the mere fact of physical entry.[27] The actual harm requirement is justified by the physical nature of fluid and interconnected subsurface resources, which render rights to these resources *correlative* rather than exclusive.

The argument comes to a point in Part IV, which articulates the advantages of the fair opportunity doctrine's harm-based account using the same normative criteria advanced by proponents of the architectural approach. In addition to providing greater fidelity to the case law, the harm-based account performs the law's function of providing coordination and guidance at least as well as traditional trespass does, and it furnishes a much more workable baseline for legislation and administrative regulation. Indeed, the correlative view of property rights has an established history in oil and gas law of paving the way for beneficial regulation that protects those rights and prevents resource waste.[28] Common law schemes of exclusive possessory rights, on the other hand, demonstrably impede regulation that would limit those rights, even for the purpose of protecting them.[29]

At bottom, I want to be understood as offering a friendly amendment to the *Restatement*. Property law's architecture of exclusion and trespass has, as part of its blueprint, an exception for certain subsurface resources that courts have largely, and correctly, treated as correlative in nature. Accordingly, supplementing the *Restatement*'s application of ordinary trespass to the subsurface of land with a harm-based, modified definition of trespass for resources like oil, gas, and pore space that are correlative in nature more accurately captures the existing case law and better achieves the goals of the architectural approach.

I. THE RESTATEMENT'S APPROACH TO SUBSURFACE TRESPASS

The *Restatement* characterizes the property interest in all parts of the subsurface as exclusive and possessory, just like the surface of land, and

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of one's property to the subsurface of another's); Joseph A. Schremmer, *A Unifying Doctrine of Subsurface Property Rights*, 46 HARV. ENV'T. L. REV. 525 (2022) [hereinafter Schremmer, *Unifying Doctrine*] (expanding on the jurisprudence of the fair opportunity doctrine by articulating the key elements of trespass under this model and synthesizing a coherent conception of waste); Joseph A. Schremmer, *Subsurface Trespass: Private Remedies and Public Regulation*, 101 NEB. L. REV. 1005 (2023) [hereinafter Schremmer, *Subsurface Trespass*] (discussing the respective roles of and relationship between private rights of action and public regulation under the fair opportunity doctrine); *see also* Merrill & Smith, *Briggs*, *supra* note 19, at 10–12 (discussing the fair opportunity doctrine).

27. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1010.

28. *See infra* Part IV.A.1.

29. *See infra* Part IV.A.2.

accordingly applies the ordinary tort of trespass to land to all unauthorized entries into the subsurface of a tract.[30] The reporters do so based on the idea that exclusivity and trespass form the basic architecture of property law and that there are benefits to placing this architecture at the center of the *Restatement*'s provisions on the subsurface. The following Parts describe the intellectual underpinnings of the *Restatement*'s architectural approach to subsurface trespass and then set forth the relevant blackletter law.[31]

A. The Subsurface in Profile

The following discussion of Merrill and Smith's application of the architectural approach to the subsurface requires some background knowledge of the subsurface itself. In cross section, the subsurface underlying a typical parcel of land looks a bit like a club sandwich, with layers of sedimentary rock resting in between impermeable basement rock on the bottom and soil on the top.[32] Most entries giving rise to potential trespass liability occur within the soil layer, in the near reaches of the surface of the land. In this region of the subsurface, plants are rooted, building foundations are sunk, and drains and utility lines are buried, all of which may cross property boundaries.[33]

Within the layers of rock below the immediate reaches of the surface, most activity is related to mining, oil and gas production, and injection of materials for storage or disposal—activities that are unrelated to enjoyment of the surface of the land itself.[34] These activities target three different kinds of natural resources: solids, fluids, and void space.[35] The solid resources in the subsurface consist of various kinds of rocks, including mineral ores (e.g., lead and gold), coal, and common building materials like limestone.[36] These solid minerals are mined underground using various techniques, including the digging of tunnels and shafts that can give rise to trespass claims.[37]

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30. *See infra* Parts I.B.–D.

31. A word of caution before beginning: I do not intend to suggest that the *Restatement* as drafted by the reporter and associate reporters, let alone as approved by the full ALI, attempts to institutionalize the scholarly work of Professors Smith, Merrill, or any other thinker. That is quite clearly not the intent of the *Restatement* project. *See* Thomas W. Merrill, *The Restatement of Property: The Curse of Incompleteness*, *in* THE AMERICAN LAW INSTITUTE: A CENTENNIAL HISTORY 203, 218 (Andrews S. Gold & Robert W. Gordon eds., 2023). Even if the reporters did seek this goal, it is doubtful that the process of constructing a restatement would permit them to see it through. *See* Henry E. Smith, *Restating the Architecture of Property*, *in* 10 MODERN STUDIES IN PROPERTY LAW 13–14 (Ben McFarlane & Sinead Agnew eds., 2019).

32. *See* NORMAN J. HYNE, NONTECHNICAL GUIDE TO PETROLEUM GEOLOGY, EXPLORATION, DRILLING, AND PRODUCTION 23–26 (2d ed. 2001); *see also* Sarah J. Fox, *Soil Governance and Private Property*, 2024 UTAH L. REV. 1, 5 (2024) (discussing the soil layer).

33. *See infra* Part II.A.1.

34. John G. Sprankling, *Owning the Center of the Earth*, 55 UCLA L. REV. 979, 994 (2008).

35. Schremmer, *Unifying Doctrine*, *supra* note 26, at 530–32.

36. *See* HYNE, *supra* note 32, at 16–24, 149.

37. *See infra* Part II.A.2.

The fluids found in the deep subsurface include potable groundwater, highly saline waters, and fluid minerals like oil and natural gas (called hydrocarbons).[38] These fluids are contained within voids, or "pore spaces," of sedimentary rock layers, through which the fluids may be drained and captured by drilling a well from the surface.[39] Porous but impermeable rock formations, like shales, may contain trapped hydrocarbons that can be commercially produced only by increasing the flow of hydrocarbons through the rock by a technique of artificial stimulation called hydraulic fracturing or "fracking."[40] The venerable "rule of capture" precludes trespass claims for the mere draining of fluids into an actor's well from under another's land, but it may be trespass to drill a well in a slanted fashion to physically penetrate beneath a neighbor's tract.[41] It has been controversial whether trespass liability should lie for other penetrations, such as those arising from hydraulic fracturing.[42]

Finally, the void pore space of these sedimentary rock formations may be used for storage or disposal of various materials, like natural gas, wastewater, hazardous waste, and even captured carbon dioxide, by injecting the substances into a formation using an injection well.[43] Injection is also used to stimulate production of oil and gas from depleted reservoirs in processes called secondary and enhanced recovery.[44] Trespass claims sometimes arise when injected fluids penetrate neighboring tracts, with varying results.[45]

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38. *See* HYNE, *supra* note 32, at 2–4; Schremmer, *Unifying Doctrine*, *supra* note 26, at 530–32, 542.

39. HYNE, *supra* note 32, at 156–57.

40. Hydraulic fracturing, or "fracking," is the process of injecting water, chemicals, and propping agents into a well to fracture the surrounding formation to allow the trapped oil and gas to flow into the well. *See id.* at 149–50 (describing these unconventional plays as "source rocks"); RICHARD C. SELLEY & STEPHEN A SONNENBERG, ELEMENTS OF PETROLEUM GEOLOGY 55–56 (4th ed. 2023).

41. Analogizing to the behavior of wild animals, English courts initially developed the rule of capture to deal with the fluid and migratory nature of groundwater in interconnected aquifers. *See* RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.15 cmt. b (A.L.I., Tentative Draft No. 4, 2023); *id.* reporters' note. American courts later adopted the rule to govern rights in interconnected oil and gas reservoirs, permitting the landowner to produce an unlimited amount of fugacious minerals from an underlying reservoir through a well drilled entirely on the owner's land. *See id.* § 1.16 cmt. c; *id.* reporters' note.

42. *See* David E. Pierce, *New Subsurface Property Rights in an Old Trespass World*, 65 ROCKY MTN. MIN. L. INST. 4-1, 4-39–4-47 (2019); Bruce M. Kramer, *Horizontal Drilling and Trespass: A Challenge to the Norms of Property and Tort Law*, 25 COLO. NAT. RES. ENERGY & ENV'T L. REV. 291, 301–14 (2014); Owen L. Anderson, *Foreword: The Evolution of Oil and Gas Conservation Law and the Rise of Unconventional Hydrocarbon Production*, 68 ARK. L. REV. 231, 249 (2015); Martin, *supra* note 3, at 321–22; David E. Pierce, *Developing a Common Law of Hydraulic Fracturing*, 72 U. PITT. L. REV. 685, 689–92 (2011).

43. Schremmer, *Pore Space*, *supra* note 26, at 2, 59.

44. *Id.* at 2, 13.

45. *See infra* Parts II.C.2.b. & III.B.2.b.

B. The Architectural Approach to Property

The *Restatement (Fourth) of Property* is monumentally ambitious in multiple ways. One way is its scope. The *Restatement* aims to provide comprehensive coverage of the broad field of property law.[46] The *Restatement* is also ambitious in another way that relates to the project's intellectual underpinnings. The reporters of the *Restatement* explain that "[a] significant focus of this Restatement is the architecture of property law."[47] The idea of property law having a unifying architecture runs counter to the views that animated prior *Restatements of Property*, as well as what might be called the prevailing contemporary view of property as a disaggregated "bundle of sticks."[48] In the prevailing bundle of sticks view, "property is a collection of interests and property law is a collection of individual policy-driven rules" rather than a cohesive and stable legal concept.[49]

The "architectural" view of property, in contrast, conceives of property as having an essential feature that distinguishes the legal category of property.[50] That feature is the right of the owner to exclude all the world from a thing in which the owner has a property right.[51] Property rights are thus "in rem," or "good against the world," exclusive, and they relate to a thing, or "*res*."[52] The exclusion view comports with traditional understandings of property as a sort of "minisovereignty" over a thing, in which the role of the owner is to control the thing and all other persons are bound by duties of noninterference with the thing, notwithstanding the particular interests of such persons or specific public policies.[53] All the features of property law derive from this essential feature, or architecture, of exclusive in rem rights over a thing.[54]

The exclusion theorists offer many persuasive arguments for their definition of property as a meaningful and stable legal concept. Merrill and Smith have demonstrated that standardized, in rem property rights in things are information-cost efficient because they reduce the amount of information needed to delineate the boundaries of an owner's rights in a thing and

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46. Merrill, *supra* note 31, at 216.

47. Eleanor Barrett, *Foreword* to RESTATEMENT (FOURTH) OF PROP., at xxi (A.L.I., Tentative Draft No. 4, 2023).

48. Thomas W. Merrill & Henry E. Smith, *Why Restate the Bundle? The Disintegration of the Restatement of Property*, 79 BROOK. L. REV. 681, 704–07 (2014) [hereinafter Merrill & Smith, *Why Restate the Bundle?*].

49. *Id.* at 707.

50. *Id.* at 708; Smith, *supra* note 31, at 13–14.

51. Merrill & Smith, *Why Restate the Bundle?*, *supra* note 48, at 707–08; Eleanor Barrett, *Foreword* to RESTATEMENT (FOURTH) OF PROP., at xxi (A.L.I., Tentative Draft No. 4, 2023).

52. Merrill & Smith, *Why Restate the Bundle?*, *supra* note 48, at 686 n.16, 704.

53. Thomas W. Merrill & Henry E. Smith, *Making Coasean Property More Coasean*, 54 J. L. & ECON. S77, S80–81 (2011) [hereinafter Merrill & Smith, *Coasean Property*].

54. *See* Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1710 (2012).

nonowners' duties relative to the thing.[55] They also argue that the exclusion architecture is congruent with moral and philosophical theories of property because it rests on a framework of deontological and intuitive moral principles like "don't take" and "keep out."[56] This simplicity and intuitiveness make it workable as a device for guiding and coordinating owners and nonowners of property in the use of valuable resources.[57] Finally, Merrill and Smith contend that the architecture also forms a helpful baseline for contractual and legislative modification of property rights to deal with problems that common law doctrine is ill-equipped to solve—a feature they call "institutional specialization."[58]

Merrill and Smith have explained that the goal of restating the common law of property ought to be to "fit" this architecture, even if this means deviating from the results and reasoning that exist in case law.[59] In other words, restating the architecture of property is not the same goal as restating existing property case law. As Smith explained (writing with Andrew Gold), "Restatements can fit the structure of common-law concepts and reasoning even in those cases where they do not fit the content of existing common law."[60]

C. The Architecture and Subsurface Trespass

In 2023, Merrill and Smith published their views of how the architecture of exclusion shapes the doctrine of subsurface trespass in the context of drilling and fracking.[61] The article opens, in the abstract, with an acknowledgement that "[t]he tort of trespass to land has proven to be controversial as applied to . . . oil and gas production using hydraulic fracking technology."[62] Their thesis is that the architecture of in rem exclusionary rights and their interpretation of the *ad*

55. Merrill & Smith, *Coasean Property*, *supra* note 53, at S90–91; Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 972–73 (2004).

56. Thomas W. Merrill & Henry E. Smith, *The Morality of Property*, 48 WM. & MARY L. REV. 1849, 1849–51 (2007). In this and other ways, the authors connect their work with the broader New Private Law, which attempts to marry traditional legal methods of reasoning with external methodologies and justifications to understand private law. *See* Smith, *supra* note 54, at 1725; *see generally* Paul B. Miller, *The New Formalism in Private Law*, 66 AM. J. JURIS. 175 (2021) (discussing the new legal formalism shared by New Private Law scholars).

57. *See* Gold & Smith, *supra* note 19, at 450 (discussing the importance of system to law's guidance function).

58. Merrill & Smith, *Briggs*, *supra* note 19, at 19–20.

59. *See id.* at 20–21 (distinguishing architectural fit from fit with the results or reasoning of cases).

60. Gold & Smith, *supra* note 19, at 457.

61. *See generally* Merrill & Smith, *Briggs*, *supra* note 19 (examining the Supreme Court of Pennsylvania's resolution of these issues through the lens of architectural fit).

62. *Id.* at 1.

coelum doctrine justifies application of the traditional tort of trespass in these circumstances.[63]

Traditionally understood, the doctrine *cujus est solum, ejus est usque ad coelum et ad inferos* means that a landowner's rights extend vertically *ad coelum* (up to the sky) and *ad inferos* (down to the center of the earth).[64] The view of *ad coelum* offered by Merrill and Smith, and echoed in the *Restatement*, incorporates three subsidiary concepts. Anywhere within the surface and the columns *ad coelum* and *ad inferos*, the owner is entitled to both exclusive actual possession and the exclusive right to possess.[65] "In the context of the *ad coelum* doctrine, one can think of the right to possession as an exclusive option of the owner of the surface of land to develop up or down from the surface within the column of space."[66] Merrill and Smith's model limits the owner's exclusive option to occupy the vertical column of space to "possible effective possession."[67] This concept refers to the space that a landowner could effectively (think: economically) develop given the current state of technology.[68]

In this model, a trespass may occur at any depth below the surface if it interferes with the owner's actual possession or the owner's right to possess depths that lay within the zone of possible effective possession. No showing of harm is required. Liability follows from the fact of the physical invasion, either because it interferes with the owner's continuing actual possession "or because the interference with possible effective possession is so obvious or non-temporary enough that harm can be presumed."[69] Although the plaintiff need only show the fact of a subsurface entry to establish a trespass, the authors correctly identify the difficulty in providing evidence that anything, especially fluids and fractures, has in fact crossed a boundary line. The entry requirement thus poses an obstacle to liability, especially where alleged entries are minor or temporary and only interfere with the plaintiff's right to possess.[70]

Merrill and Smith's discussion of the question focuses on a recent case, *Briggs v. Southwestern Energy Production Co.*, involving allegations of trespass caused by the fracking of the defendant's natural gas well located on the tract neighboring the plaintiff's land.[71] In a split decision, the majority of the Pennsylvania Supreme Court held that actual physical entry into the plaintiff's tract by the defendant's fracking operations is a requisite element for trespass

63. *See id.* at 12–16.

64. BLACK'S LAW DICTIONARY 42 (9th ed. 2009); United States v. Causby, 328 U.S. 256, 260–61 (1946).

65. Merrill & Smith, *Briggs*, *supra* note 19, at 12–16.

66. *Id.* at 12–13.

67. *Id.* at 13 (quoting cases relying on POLLOCK ON TORTS (13th ed.) p. 362).

68. *Id.* at 13–14.

69. *Id.* at 14–15.

70. *Id.* at 16, 23.

71. 224 A.3d 334, 339 (Pa. 2020).

liability.[72] Merrill and Smith celebrate the decision as "confirm[ing] the utility of the law of trespass to the architecture of property" law.[73]

By rendering a decision that has the merit of "architectural fit,"[74] the *Briggs* court did what courts do best: "[A]djust bilateral relations with respect to easily detected harms."[75] This leaves to contracting parties, legislatures, and regulatory bodies more fine-grained problems like "the need to unitize, complex spacing and other regulation of techniques, and considerations of owner size and wealth" that courts are not adept at incorporating into their decisions.[76] The traditional tort "of trespass, in conjunction with a fairly traditional but flexible version of *ad coelum* and an articulated law of possession," they argue, "provide[s] good baselines for further" refinement through contracting and regulation.[77]

Finally, Merrill and Smith note that "the architectural approach implicit in the *Briggs* opinion has the advantage of serving the guidance function of law" since "[a]nyone paying close attention to the way that concepts of possession, *ad coelum*, and trespass work would be able to come to a conclusion roughly like that of the court in *Briggs*."[78] The importance of law's guidance function cashes out in "a world where people kn[o]w better where they st[an]d."[79]

D. Restatement's Blackletter of Subsurface Trespass

Although the reporters have made no attempt to "adopt any particular academic discourse or mode of analysis on the various parts of the Restatement," including no attempt "to posit an essentialist definition of property, with the expectation that every discrete subject must conform to such a conception,"[80] the standardized, in rem view of property as based on an architecture of exclusion undoubtedly has influenced the *Restatement (Fourth)*. The Foreword to the draft *Restatement* explains as much: "A significant focus of this Restatement is the architecture of property law. Property rights, unlike contract rights, are often in rem—they avail against others generally. . . . Seeing

72. *Id.* at 351–52.
73. Merrill & Smith, *Briggs*, *supra* note 19, at 1.
74. *Id.* at 20 (citing Gold & Smith, *supra* note 19, at 441).
75. *Id.* at 19.
76. *Id.* at 20.
77. *Id.*
78. *Id.* at 22.
79. *Id.*
80. Merrill, *supra* note 31, at 218.

property in this manner guides the selection of the topics that this Restatement will cover."[81]

The influence of the architectural approach is particularly evident in the *Restatement*'s provisions concerning subsurface trespass. The Tentative Draft Number 4 contains these provisions, adding relevant material to earlier drafts.[82] In Volume 1 (The Basics of Property), Tentative Draft Number 4 adds several sections describing the extent of a landowner's rights to possess the subsurface.[83] In Volume 2 (Interferences with, and Limits on, Ownership and Possession), Tentative Draft Number 4 adds five sections to the division and chapter pertaining to trespass to land, which define the elements of subsurface trespass liability for a variety of invasions.[84]

This Part of the article lays out the relevant blackletter law in an organized fashion, starting with the general provisions defining trespass to land.

1. Ordinary Trespass to Land

Section 1.1 of Volume 2 (Interferences with, and Limits on, Ownership and Possession) lays out the elements of a prima facie case for a trespass to land:

> An actor is subject to liability to another for trespass to land if the actor intentionally:
> (a) enters or causes entry of a tangible thing or a person onto land in the other's possession, or
> (b) remains on land in the other's possession, or
> (c) fails to remove a tangible thing that the actor is duty-bound to remove from land in the other's possession.[85]

Meanwhile, Section 1.4 of Volume 2 clarifies that trespass to land is not a harm-based tort:

> A trespass to land in the possession of another is complete when the actor, acting with the requisite intent, enters, causes entry onto, remains on, or fails to remove a thing that the actor is duty-bound to remove from the land. The absence of bodily injury, property damage, economic loss, or other harm does not defeat liability. However, if a trespass causes such harm, the trespasser ordinarily also will be liable for the harm.[86]

In Comment *b*, the reporters explain that harm is not required because "[a] trespass is an interference with the right of a possessor to exclude persons and

81. Eleanor Barrett, *Foreword* to RESTATEMENT (FOURTH) OF PROP., at xxi (A.L.I., Tentative Draft No. 4, 2023).

82. RESTATEMENT (FOURTH) OF PROP. (A.L.I., Tentative Draft No. 4, 2023).

83. *Id.* vol. 1 §§ 1.1–2, 1.12–19.

84. *Id.* vol. 2 §§ 1.2B–F.

85. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.1 (A.L.I., Tentative Draft No. 2, 2021).

86. *Id.* § 1.4.

things from the land she possesses, or which she has a right to possess."[87] A trespass is therefore complete when the owner's possession or right to possession is infringed, regardless of any consequences to the physical integrity of the land or structures on the land.[88]

Integral to the *Restatement*'s treatment of trespass to land and subsurface trespass is its articulated definition of "possession." Tracking the idea of possession advanced by Merrill and Smith in their scholarship on subsurface trespass, the *Restatement* distinguishes between possession and *the right to possession*. In Volume 1 (The Basics of Property), Section 1.1 defines "possession" as follows: "A person has possession of a physical thing if the person has established effective control over that thing and manifests an intent to maintain such control to the exclusion of others."[89] So, "possession" means actual, effective control of a thing.

The "right to possession" is broader, encompassing an entitlement to actual possession by one not currently in actual possession. Volume 1, Section 1.8 explains the right to possession:

> The right to possession is the legal right to gain possession of a physical thing or prevent its loss. A person in possession of a physical thing typically has a right to possession against all except those with superior title. A person not in possession of a physical thing who has a superior title relative to the actor in possession also typically has a right to possession. A person not in possession who asserts a right to possession based on superior title can typically gain possession only if the right is to immediate possession.[90]

2. Trespass Below the Surface of the Land

Having defined a trespass to land in their second tentative draft, the reporters of the *Restatement* turn to defining the vertical extent of land in Tentative Draft Number 4. In Volume 1 (The Basics of Property), Section 1.1 defines land to include the entire subsurface underlying it: "For purposes of property law, land refers to a three-dimensional space in which the horizontal dimensions are determined by the physical boundaries of the surface of the land, and the vertical dimensions extend upward and downward from the surface boundaries."[91] Section 1.2 connects this definition of land with the *Restatement*'s idea of possession:

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87. *Id.* cmt. b.
88. *Id.* § 1.1 cmt. g.
89. *Id.* vol. 1 § 1.1.
90. *Id.* § 1.8.
91. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.1 (A.L.I., Tentative Draft No. 4, 2023).

> The vertical scope of land is generally determined by three principles:
> (a) land includes space above and below the surface actually possessed by the actor with superior title to the surface;
> (b) possession of land includes the right to possess the space above and below the surface to which the actor has superior title insofar as that space is subject to possible effective possession; and
> (c) possession of land includes the right to exclude intrusions on, above, or below the surface that substantially harm the use and enjoyment of the surface or the space actually possessed above or below the surface.[92]

The Introductory Note to Topic 1 (The Vertical Scope of Rights in Land) echoes Merrill and Smith's explanation of the significance of the right to possess the subsurface: "[t]he owner of the surface has what is effectively an exclusive option to build above or dig below the surface, and no one else may interfere with this option without permission."[93] This exclusive right to possession is limited, as in Merrill and Smith's work, by the owner's "possible effective possession . . . ."[94] The reporters' note to Section 1.2 provides that, in determining possible effective possession, the question is whether "it is foreseeable, given the present state of technology, the economic costs and rewards of development, and what is considered acceptable as a matter of social norms and customs, for an owner of the surface to seek to reduce the column of space up or down to actual possession."[95] The reporters' note cites substantial case authority adopting the idea of possible effective possession.[96]

Reiterating the substance of Section 1.2, Section 1.11 extends the landowner's right to possess to the entire subsurface, subject to possible effective possession:

> Subject to valid law and regulation to the contrary, one who has title to land also has the right to possess the column of space extending below the surface of the land for an indefinite distance, and any intrusion of the type described in Volume 2, Division I, Chapter 1 (trespass) into this space constitutes a trespass to land.[97]

Sections 1.12 and 1.13 then provide that the owner's possession and right to possession, respectively, are protected from unauthorized intrusion by the tort of trespass. Concerning protection of actual possession, Section 1.12 states:

92. *Id.* § 1.2.

93. *Id.* intro. note.

94. *Id.* § 1.2; Merrill & Smith, *Briggs*, *supra* note 19, at 13.

95. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.2 reporters' note (A.L.I., Tentative Draft No. 4, 2023).

96. *Id.*

97. *Id.* § 1.11.

> Physical intrusions into subsurface space that interfere with the possession of the person with superior title to the surface of land are subject to the same principles of liability that govern trespass to the surface of land. Any intrusion of the type described in Volume 2, Division I, Chapter 1 (trespass) into this space constitutes a trespass to land.[98]

Section 1.13 provides the following, concerning protection of the right to possess:

> Physical intrusions into subsurface space that interfere with possible effective possession by the person with superior title to the surface of land are subject to the same principles of liability that govern trespass to the surface of land. Any intrusion of the type described in Volume 2, Division I, Chapter 1 (trespass) into this space constitutes a trespass to land.[99]

Both sections cross-reference the definition of trespass below the surface of the land and the special provisions regarding certain subsurface elements contained in Volume 2 (Interferences with, and Limits on, Ownership and Possession). The elements definition for subsurface trespass is contained in Section 1.2B of this Volume, and it provides as follows:

> (a) An actor who intentionally directs or causes a tangible object to enter underground space possessed by another is subject to liability for trespass to land in the manner of surface trespasses as set forth in § 1.1.
>
> (b) An actor who intentionally directs or causes a tangible object to enter unpossessed underground space that another has a right to possess is subject to liability for trespass when the intrusion substantially interferes with possible effective possession.
>
> (1) A permanent intrusion substantially interferes with possible effective possession whether or not it causes measurable harm.
>
> (2) A temporary intrusion substantially interferes with possible effective possession if and only if it causes substantial harm to the other's interest in possessed space.[100]

Importantly, the definition of a subsurface trespass in subsection (a) cross-references the general definition of a trespass to land contained in Section 1.1 of Volume 2, which requires an intentional entry but not actual harm.[101]

98. *Id.* § 1.12.
99. *Id.* § 1.13.
100. *Id.* § 1.2B.
101. *Id.*; RESTATEMENT (FOURTH) OF PROP. vol. 2 §§ 1.1, 1.4 (A.L.I., Tentative Draft No. 2, 2021).

3. Application to Specific Subsurface Elements

From this foundation, the *Restatement* branches off into some specific doctrinal areas involving particular types of subsurface elements. Namely, the *Restatement* contains specific provisions dealing with the owner's possessory rights in, and trespasses to, solid minerals, groundwater, fugacious minerals (like oil and gas), and caves and cavities (including pore space).[102] The topic of groundwater is a notable omission, as the reporters (appropriately) do not attempt to restate the highly varied and specific state laws governing groundwater rights.[103]

a. Solid Minerals

Section 1.14 details an owner's rights in solid minerals and other solid objects. It states:

> One who has the right to possess the column of space extending for an indefinite distance below the boundaries of land is entitled to extract solid minerals and other solid objects found in that subjacent space by any method that does not involve an unauthorized entry onto either the surface, superjacent airspace, or the subjacent space of land that is subject to the superior possessory rights of another.[104]

The upshot of Section 1.14 is that no special rules apply to trespass cases involving hard-rock mining. An owner of minerals must confine all extractive activities to the subsurface of the owner's own land, and "[d]igging a mining shaft that enters the column of space of another surface owner below the surface is prohibited as a form of trespass."[105] Comment *b* recognizes the doctrine of extralateral rights codified in the federal mining law of 1872, which entitles a claimant to pursue a valid claim to a seam or vein of ore beyond the lateral extent of the claim.[106] Otherwise, the rule in Section 1.14 has no exceptions.

b. Oil and Gas (Fugacious Minerals)

The *Restatement* delineates the rules for fugacious minerals, like oil and gas, in three sections. Section 1.16 (Vol. 1) defines the rule of capture, limiting it by the obligation not to trespass into the subsurface of another.[107] Section 1.2C (Vol. 2) then addresses the application of trespass in the context of oil and gas

102. RESTATEMENT (FOURTH) OF PROP. vol. 2 §§ 1.2C–F (A.L.I., Tentative Draft No. 4, 2023).

103. *Id.* vol. 1 § 1.15 cmt. c.

104. *Id.* § 1.14.

105. *Id.* cmt. a.

106. *Id.* cmt. b.

107. A summary of the common law rule of capture can be found at RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.16 cmt. c (A.L.I., Tentative Draft No. 4, 2023).

extraction. Section 1.2F (Vol. 2) likewise defines an actionable trespass from the use of hydraulic fracturing and horizontal drilling. Section 1.16 provides as follows:

> An actor who has the right to possess underground space subjacent to land is entitled to capture oil, gas, and other fugacious minerals that enter the subjacent space, and may extract these minerals by any method that does not entail an unauthorized entry onto either the surface, superjacent airspace, or the subjacent space that is subject to the superior possessory rights of another. This power is subject to positive legislation and regulation that satisfies constitutional- and administrative-law requirements.[108]

"Fugacious minerals" are those that "migrate from place to place in response to pressure differentials and rock permeability. The primary examples are oil and natural gas."[109]

i. Slant Wells

Section 1.2C demonstrates the application of the *Restatement*'s version of trespass to activities involving the exploration and exploitation of fugacious minerals like oil and gas:

> (a) An actor who has the right to possess subjacent underground space is entitled to capture oil, gas, and other fugacious minerals that enter the underground space, and may extract these minerals by any method that does not entail an unauthorized entry onto either the surface, superjacent airspace, or subjacent underground space that is subject to the superior possessory rights of another.
>
> (b) If the only injury from a subsurface trespass is alleged drainage from a common reservoir or pool of fugacious minerals that lies under multiple parcels subject to surface rights and accompanying subsurface rights, the actor who commits the trespass is subject to injunctive relief or an award of more than nominal damages only if the subsurface trespass substantially impairs another's equal right to capture fugacious minerals, or otherwise interferes with the actor's possession of the surface or subsurface or the actor's right to possession of subsurface space.[110]

Subpart (a) reiterates Section 1.16 by restating the rule of capture and the role of trespass as limiting an owner's capture rights. The main focus of subpart (a) is slant wells, which are drilled from a surface location on the driller's own land but are bottomed in a portion of a producing formation underlying the

108. *Id.* § 1.16.
109. *Id.* § 1.16 cmt. a.
110. *Id.* vol. 2 § 1.2C.

plaintiff's land. The reporters cite that drillers of slant-hole wells are subject to trespass liability when they drain oil or gas directly from the plaintiff's land.[111]

Subpart (b) is interesting. It limits the available remedies where the plaintiff's only injury is drainage of minerals, unless the trespass interferes with the plaintiff's right to capture minerals. Thus, a showing of actual interference or harm is not required to establish liability for a trespass under (a), but it is necessary to recover compensatory damages or obtain an injunction under (b).

ii. Hydraulic Fracturing and Horizontal Drilling

Section 1.2C dovetails into Section 1.2F concerning trespass by fracturing and horizontal drilling. It provides as follows:

> (a) An actor who uses fracturing and horizontal drilling technology to enhance the production of fugacious minerals from the subsurface commits a trespass if the actor intentionally causes any portion of the horizontal drill or pipe, or fracturing fluid pumped under pressure through such pipes, to enter the underground space subject to the possessory rights of another.
>
> (b) If the only injury from a subsurface trespass is alleged drainage from a common reservoir or pool of fugacious minerals that lies under parcels subject to surface rights and accompanying subsurface rights, the actor who commits the trespass is subject to injunctive relief or an award of more than nominal damages only if the subsurface trespass substantially impairs another's equal right to capture fugacious minerals or otherwise interferes with another's use and enjoyment of the surface.[112]

Note that the special limitation on the plaintiff's remedy carries over from Section 1.2C(b).

c. Subsurface Cavities

Finally, the *Restatement* contains specific provisions relating to caves and other subsurface cavities, including pore space. Section 1.17 sets forth the landowner's right to possession over subsurface openings:

> An actor who holds the right to the surface has the right to possess caves, fissures, and other open spaces subjacent to the surface, provided effective possession of such spaces is possible. Prominent examples of such open spaces include not only caves, but also abandoned mines and wells, fissures in underground rock formations, and pores in permeable rock. The right to possess such spaces is subject to positive legislation and regulation that satisfies the requirements of constitutional and administrative law.[113]

111. *Id.* cmt. c.
112. *Id.* § 1.2F.
113. *Id.* vol. 1 § 1.17.

Thus, the right to possess subsurface openings entails the right to be free from unauthorized intrusions into such space, but only to the extent that effective possession of the space is possible. As the comments explain,

> this means there must either be an opening to the space on the surface or it must be reasonable for the surface owner to incur the cost to gain access to the space by digging an opening or shaft to the space, or drilling a well to access the space.[114]

Section 1.18 elaborates on the owner's right to effective possession of subsurface openings by enumerating the owner's right to inject fluids into those openings for storage or disposal:

> An actor who has the right to possess the underground space subjacent to land is entitled to inject fugacious material into a cave, abandoned well, or other fissure below the surface—either for storage of valuable fugacious minerals or for disposal of waste material generated by production of other fugacious material. As long as the method of injection does not constitute an intentional and unauthorized entry onto the land or the subjacent space of another actor, the injector is not liable for trespass for subsequent migration of the fugacious material into subjacent space subject to another's superior possessory rights.[115]

Although tort of trespass limits the right to inject, the section is explicit that trespass liability requires intentional entry, not unintentional migration.[116]

The final relevant sections apply ordinary trespass to intrusions by injected fluids. Section 1.2D covers intrusions by injected gas: "Injection of gas into a subsurface cavity, whether to stimulate production of fugacious minerals, for storage, or for disposal, does not give rise to trespass liability, because gases are not tangible objects."[117] Likewise, Section 1.2E covers intrusions by injected liquids or solids:

> An actor who has the right to possess subjacent underground space is entitled to inject liquids or solids into a cavity, abandoned well, or other fissure below the surface, without fear of trespass liability, whether to stimulate production, for storage, or for disposal, provided the actor does not intend or know to a near certainty that the material will migrate into subsurface space subject to another's superior possessory rights.[118]

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114. *Id.* cmt. b.
115. *Id.* § 1.18.
116. *Id.*; *see* RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.1 (A.L.I., Tentative Draft No. 2, 2021).
117. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D (A.L.I., Tentative Draft No. 4, 2023).
118. *Id.* vol. 2 § 1.2E.

Thus, Sections 1.2D and 1.2E largely immunize unauthorized invasions of subsurface space on the grounds that they typically fail to satisfy at least one element of prima facie trespass. In the case of intrusions by gases, the physical entry element is not met.[119] In the case of intrusions by liquids and solids, intent is frequently missing.[120] Thus, while intrusions into subsurface space by tangible substances would generally interfere with an owner's right to possess the subsurface space, these intrusions are not generally subject to liability because injectors typically lack the requisite intent to commit a trespass.[121]

II. FIT AND TENSION WITH THE CASE LAW

As this Part demonstrates, the *Restatement*'s application of traditional trespass principles to subsurface intrusions accurately restates the law relative to some kinds of intrusions, but not others. For example, the *Restatement* accurately captures those cases involving trespasses into the immediate reaches of the subsurface—in the soil or the shallow bedrock or water table—that directly implicate the landowner's possession of the surface of the land. These include pollution cases in which deleterious substances escape from a defendant's tract and migrate underground through soil and groundwater to contaminate the plaintiff's land. Likewise, when it comes to intrusions in the deep subsurface, hundreds or thousands of feet below ground, the *Restatement*'s traditional trespass model accurately restates trespasses to solid or hard-rock mineral deposits—resources that, like the surface of land itself, are tangible and stationary.

Cases involving other kinds of deep subsurface intrusions, however, pose complications for the *Restatement*'s traditional trespass model. Traditional trespass does not seem to fit the case law concerning operations in common pools of oil and gas, in which the fluid and fugacious nature of the resources and the attendant rule of capture problematize the definition of trespass. Traditional trespass proves an awkward fit for intrusions into subsurface space by activities such as hydraulic fracturing, horizontal drilling, and injection of substances for waste disposal, waste storage, or enhanced oil recovery.

A. Intrusions to the Immediate Reaches and Solid Minerals

The *Restatement*'s approach to subsurface trespass neatly fits existing case law pertaining to physical invasions of the immediate reaches of the subsurface and invasions of an owner's interest in solid minerals and other objects in the subsurface. In those cases, the courts, and consequently the *Restatement* and

119. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.1 cmt. h (A.L.I., Tentative Draft No. 2, 2021).
120. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E cmt. c (A.L.I., Tentative Draft No. 4, 2023).
121. *Id.*

Merrill and Smith's general theory of in rem exclusionary rights, treat the thing that is invaded—either the immediate reaches of the soil or some solid layer of rock deep below—as having the same basic characteristics of land itself. It is therefore no stretch to apply the tort of trespass to land to invasions of the immediate reaches of the subsurface and to solid subsurface objects.

1. Immediate Reaches

In line with Sections 1.1 (Vol. 1) and 1.2B (Vol. 2) of the *Restatement*, courts, seemingly without controversy, treat claims of trespasses into the immediate reaches of the subsurface as they do claims of trespasses on the surface itself.[122] Thus, courts have held drains,[123] sewer lines,[124] pipelines,[125] and building foundations[126] to be trespasses when encroaching underground into a plaintiff's tract, regardless of whether they in fact damage or harm the plaintiff's land.

It is easy to justify treating trespass claims in the immediate reaches under the ordinary rubric for trespass. The immediate reaches are merely an extension of the surface of the land itself. Like the surface, the immediate subsurface is reasonably easy to monitor for encroachments, and unwanted encroachments can often be removed through self-help.[127] Moreover, because the immediate subsurface is so closely connected with the surface, one's ability to exercise exclusive possession of the surface of land depends on the power to control entries into the immediate subsurface.[128] The owner of Blackacre, for example, would not be secure in her possession of Blackacre if the owner of neighboring Greenacre were free to construct a cistern that encroached under Blackacre, as the cistern would prevent the owner of Blackacre from possessing or using that portion of her land. This subsurface encroachment would be tantamount to a building encroachment at the surface and should be treated as such.

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122. *See supra* Part I.D.2.

123. Indep. Sch. Dist. v. DeWilde, 53 N.W.2d 256, 261 (Iowa 1952); Geragosian v. Union Realty Co., 193 N.E. 726, 728 (Mass. 1935).

124. Blakeslee v. Punnett, 368 N.Y.S.2d 216, 217 (N.Y. App. Div. 1975); Nichols v. City of Evansdale, 687 N.W.2d 562, 572 (Iowa 2004).

125. Miller v. Cudahy Co., 592 F. Supp. 976, 1006–07 (D. Kan. 1984).

126. Harrington v. McCarthy, 48 N.E. 278, 278 (Mass. 1897).

127. *See* Higdon v. Henderson, 304 P.2d 1001, 1002 (Okla. 1956); Atkins v. Adams, 301 A.3d 802, 807 (Me. 2023) (recognizing self-help remedy for encroaching tree roots); Booska v. Patel, 30 Cal. Rptr. 2d 241, 243–44 (Cal. Ct. App. 1994) (citing cases recognizing the same principle); Harding v. Bethesda Reg'l Cancer Treatment Ctr., 551 So. 2d 299, 302 (Ala. 1989).

128. *Cf.* United States v. Causby, 328 U.S. 256, 264 (1946) ("Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere."); *see also Atkins*, 301 A.3d at 807–09 (quoting *Causby* for this proposition in a case involving subsurface encroachment of tree roots).

2. Solid Minerals and Objects

It is also uncontroversial that courts generally subject miners to trespass liability for digging, mining, or tunneling under the land of another to extract valuable hard-rock mineral, and *Restatement* Sections 1.14 (Vol. 1) and 1.2B (Vol. 2) reflect this consensus.[129] Courts have no difficulty treating solid subsurface mineral rights as possessory and generally hold that an unauthorized entry to remove mineral constitutes a trespass.[130] Recognizing, however, that veins of ore often traverse multiple segments of land, the federal law doctrine of extralateral rights authorizes mining of veins beyond the boundaries of a miner's claim if on federal lands.[131]

The difficulties in these cases center on whether the plaintiff could have reasonably discovered the entry and on the appropriate measure of damages for the trespass, conversion of minerals, and damage to the land.[132] Because it is more difficult to detect an unauthorized entry in the subsurface than at the surface, courts generally toll the statute of limitations for trespass (and thus, the period for adverse possession) until the landowner could have reasonably discovered the entry.[133]

Ordinary trespass for invasions of solid objects including minerals in the subsurface makes sense because these things, like land, have fixed and immoveable boundaries. Although their boundaries may (and often do) extend beyond separate tracts of land, they do not move from place to place. Thus, they may be developed separately under each separate tract of land without cross-interference. Because the location and boundaries of solid objects are fixed, they may be monitored and their encroachments observed and even guarded against, albeit with greater difficulty than at the surface of the earth. In short, landowners are able to effectively control solid minerals and objects underground in a similar way as the surface of land itself. Hence, the traditional tort of trespass protects these things with relative ease.

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129. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.14, vol. 2 § 1.2B (A.L.I., Tentative Draft No. 4, 2023).

130. *E.g.*, Lincoln-Lucky & Lee Mining Co. v. Hendry, 50 P. 330, 332 (N.M. 1897).

131. *See* Del Monte Mining & Milling Co. v. Last Chance Mining & Milling Co., 171 U.S. 55, 65–67 (1898) (construing the General Mining Law of 1872, 30 U.S.C. § 26); RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.14 cmt. b (A.L.I., Tentative Draft No. 4, 2023).

132. *See, e.g.*, Smith v. City of Atlanta, 17 S.E. 981, 981 (Ga. 1893) (involving the amount of compensation for subsurface land lost due to the city's construction of a sewer); Pan Coal Co. v. Garland Pocahontas Coal Co., 125 S.E. 226, 233–34 (W.Va. 1924) (involving issues about the measure of damages); Armstrong v. Bromley Quarry & Asphalt, Inc., 378 P.3d 1090, 1096–1101, 1103–07 (Kan. 2016) (involving issues about the running of the statute of limitations, evidence of the plaintiff's knowledge of the entry, and the measure of damages); Harrod Concrete & Stone Co. v. Crutcher, 458 S.W.3d 290, 293–300 (Ky. 2015) (involving the measure of damages).

133. Lewey v. H.C. Frick Coke Co., 31 A. 261, 263–64 (Pa. 1895) (applying the discovery rule to toll statute of limitations for adverse possession for underground mining); Lightner Mining Co. v. Lane, 120 P. 771, 774–77 (Cal. 1911) (applying fraudulent concealment doctrine to toll statute).

While the *Restatement* does not directly address these cases, courts are notably divided on the proper result when one party tunnels under the land of another but does not remove or damage valuable mineral or otherwise harm the plaintiff in her use of the land, such as when cities dig tunnels for subways or sewers.[134] These intrusions usually occur hundreds of feet below the surface, and thus below what one could call the "immediate reaches." One court denied trespass liability for a sewer tunnel 150 feet below the plaintiff's surface on the basis that the plaintiff had no ability to use the subsurface at that depth.[135] Other courts have awarded plaintiffs nominal damages for deep intrusions by tunnels.[136] Still others award compensatory damages when the trespassing tunnel interferes with a plaintiff's use and enjoyment of the surface.[137] Although commentary on tunnelling cases is limited, one leading treatise has suggested that "[a] tunnel hundreds of feet below the surface that does not affect the value of the land or remove minerals probably should not be regarded as a trespass."[138]

B. Oil, Gas, and Fugacious Minerals[139]

As demonstrated below, the provisions of the *Restatement* addressing ownership and trespass liability for fugacious minerals achieve only a partial fit with existing case law. Sections 1.16 (Vol. 1) and 1.2C(a) (Vol. 2) faithfully restate ownership of oil and gas resources under the rule of capture. Section 1.2C(a) also accurately describes case law holding that drilling a slant well to capture oil and gas directly from neighboring land constitutes a trespass. Section 1.2F(a) (Vol. 2), however, attempts to apply the same rule to hydraulic fracturing operations and nonproducing horizontal wellbores that cross boundary lines, even though the cases largely do not support that application.

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134. *Compare* Boehringer v. Montalto, 254 N.Y.S. 276, 277–78 (N.Y. Sup. Ct. 1931), *and In re* Tunnel St. in New York, 144 N.Y.S. 1002, 1002 (N.Y. App. Div. 1913), *aff'd*, 106 N.E. 1043 (N.Y. 1914) (holding that a tunnel 150 feet below ground does not trespass on the landowner's interest), *with* City of Chicago v. Troy Laundry Mach. Co., 162 F. 678, 679 (7th Cir. 1908) (noting in dicta that the unauthorized construction of a tunnel constituted a trespass).

135. *Boehringer*, 254 N.Y.S. at 277–78; *accord In re* Tunnel St., 144 N.Y.S. at 1002. This reflects the *Restatement*'s notion of possible effective possession.

136. *E.g.*, *In re* Gillespie, 17 N.Y.S.2d 560, 563–64 (N.Y. Sup. Ct. 1940).

137. *E.g.*, Troy Laundry Mach. Co., 162 F. at 678–79.

138. 1 DAN B. DOBBS, THE LAW OF TORTS § 55, at 112 (2001) (citing cases).

139. When we think about intrusions into minerals, it is important to remember that the intrusion might occasion injury to two distinct property interests: the surface estate and the severed estate in the minerals. For instance, when a horizontal well traverses the subsurface of a tract of land, it may cause injury to the tract owner's interest in the surface estate, which would include the solid rock damaged by the wellbore, and to the oil and gas owner's interest in the tract. The following sections focus on the injury to the mineral estate.

In addition, both 1.2C(b) and 1.2F(b) graft onto the law a novel rule that limits a plaintiff's remedies to nominal damages in the event of a trespass by slant well, fracking, or horizontal drilling unless the plaintiff can show that the intrusion impaired her equal right to capture oil and gas from the common pool. As will be seen, this novelty confuses the way that trespass liability interacts with the rule of capture. In their net effect, Sections 1.16, 1.2C, and 1.2F provide a poor explanation of the cases.

1. Slant Wells

Sections 1.16 (Vol. 1) and 1.2C(a) (Vol. 2) of the *Restatement* set forth the conventional understanding of the rule of capture, which holds that the owner of land (or a severed estate in minerals) "is entitled to capture oil, gas, and other fugacious minerals that enter the subjacent space, and may extract these minerals by any method that does not entail an unauthorized entry" into the land of another.[140] This view finds support in case law and the leading treatises and casebooks in the field.[141] Furthermore, these sections of the *Restatement* correctly identify that the rule of capture does not permit an owner to slant drill a well beneath a neighbor's land to capture mineral.[142]

In the conventional understanding, a slant well drilled into a plaintiff's subsurface without permission and that produces oil or gas constitutes a trespass *and an exception to the rule of capture*.[143] The rule of capture applies to make the producer the owner only of that which the producer "may *legally* recover."[144] Thus, the owner of the slant well is liable for converting the captured mineral and must pay the value of the mineral to the plaintiff whose land they trespassed.[145] Many cases exist affirming injunctions and money judgments against a slant well trespasser for the value of mineral captured from the well.[146]

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140. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.16, vol. 2 § 1.2C(a) (A.L.I., Tentative Draft No. 4, 2023).

141. 1 EUGENE KUNTZ ET AL., KUNTZ, LAW OF OIL AND GAS § 4.2 (Matthew Bender, ed. LexisNexis 2025) (collecting cases); *accord* 1 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS, OIL AND GAS LAW § 204.4 (Matthew Bender, ed. Lexis Nexis 2024); 1 NANCY SAINT-PAUL, SUMMERS OIL AND GAS § 3:2 (3d ed. rev. 2015).

142. 1 KUNTZ ET AL., *supra* note 141, § 4.2 (collecting cases); *accord* 1 MARTIN & KRAMER, *supra* note 141, § 227; 1 SUMMERS, *supra* note 141, § 2:4.

143. JOHN S. LOWE ET AL., CASES AND MATERIALS ON OIL AND GAS LAW 53–54 (8th ed. 2022); RICHARD W. HEMINGWAY, THE LAW OF OIL AND GAS § 4.2, at 161 (2d ed. 1983); Keith B. Hall, *Hydraulic Fracturing: If Fractures Cross Property Lines, Is there an Actionable Subsurface Trespass?*, 54 NAT. RES. J. 361, 369–70 (2014); Coastal Oil & Gas Corp. v. Garza Energy Tr., 268 S.W.3d 1, 42–43 (Tex. 2008) (Johnson, J., concurring in part).

144. Halbouty v. R.R. Comm'n, 357 S.W.2d 364, 375 (Tex. 1962) (emphasis added); SWEPI, L.P. v. Camden Res., Inc., 139 S.W.3d 332, 341 (Tex. App. 2004); 1 SUMMERS, *supra* note 141, § 2:4.

145. 1 KUNTZ ET AL., *supra* note 141, §§ 4.2, 11.9; Hall, *supra* note 143, at 370.

146. 1 KUNTZ ET AL., *supra* note 141, § 4.2 (noting that slant well trespasses may be enjoined or entitle the plaintiff to damages); *see, e.g.*, Union Oil Co. of California v. Domengeaux, 86 P.2d 127, 129–30 (Cal. App.

On this point, the *Restatement* parts company with the conventional understanding reflected in the case law. In Section 1.2C(b), the *Restatement* limits a plaintiff's remedies for slant well trespass to nominal damages if (paraphrasing): (i) the only injury alleged is drainage from a common pool of oil and gas and (ii) the trespass did not substantially impair the plaintiff's equal right to capture oil and gas.[147]

Section 1.2C(b) thus seems to contemplate that an actor might be found liable for a subsurface trespass and yet retain the proceeds, paying the neighbor only nominal damages. Provided it doesn't impair the plaintiff's ability to drill and produce her own well, the actor might continue operating its trespassing well and draining mineral from the plaintiff's tract, because no injunction may be issued. In essence, the rule of capture might continue to apply despite a subsurface trespass, so long as the trespass did not infringe on the plaintiff's equal right to produce from the same reservoir.

Comment *d* to Section 1.2C attempts to explain the reasoning behind subsection (b)'s apparently novel rule: "The complication created by the rule of capture is that, although courts have been clear that activities like slant drilling are a form of trespass, *it is not clear whether such forms of trespass cause any injury to a surface owner*."[148] This is because "if the person who drills on a slant had instead drilled straight down, it is very likely they would have been able to extract the same amount of fugacious material from the common pool."[149] This statement seems odd, given that injury is presumed under ordinary trespass.[150] This special rule renders Section 1.2C incoherent. If slant wells are a trespass, the resulting production should be a wrongful conversion. If the resulting drainage is not wrongful, that must be because the rule of capture applies, and the entry of the slant well is not wrongful. It makes no sense to hold the entry as wrongful but permit the wrongdoer to retain the ill-gotten production.

2. Horizontal Drilling

The *Restatement* incorporates the same rules for trespass by hydraulic fracturing and horizontal drilling as for slant wells in Section 1.2F.[151] Section 1.2F(a) provides that an intentional entry into another's subsurface tract by

1939); Hastings Oil Co. v. Tex. Co., 234 S.W.2d 389, 398 (Tex. 1950); Edwards v. Lachman, 534 P.2d 670, 678 (Okla. 1974).

147. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2C cmt. d (A.L.I., Tentative Draft No. 4, 2023).

148. *Id.* (emphasis added).

149. *Id.*

150. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.1 cmt. b, vol. 2 § 1.4 (A.L.I., Tentative Draft No. 2, 2021).

151. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2F (A.L.I, Tentative Draft No. 4, 2023).

fracturing or horizontal drilling technology to produce fugacious minerals constitutes a trespass, just as though it were a slant well.[152] However, while courts uniformly find defendants subject to trespass liability for drilling and producing slant wells, they do not always hold the drilling of a non-producing horizontal wellbore to be a trespass.

In a leading case, the Texas Supreme Court specifically rejected trespass liability for an invading horizontal wellbore. In *Lightning Oil & Gas Co. v. Anadarko E&P Onshore, LLC*, the court denied a plaintiff's request for injunction against a defendant's plan to drill horizontally through the plaintiff's oil and gas lease to access the defendant's own oil and gas lease on a neighboring tract.[153] The court "generally agree[d]" with the lower court's reasoning that the defendant's horizontal drilling would not impair the plaintiff's "fair chance to recover the oil and gas in place or under" the plaintiff's lease.[154]

While some courts have held a defendant liable for trespass for drilling horizontally through a plaintiff's tract, the *reasoning* of these opinions does not support the *Restatement*'s position. Consider two examples, which apply Ohio law. In *Tera II, LLC v. Rice Drilling D, LLC*, the court held that a subsurface trespass caused by the defendant's drilling of a well into a formation owned by the plaintiff occurred at the moment the drill bit reached the plaintiff's formation rather than when the well began producing oil from the formation.[155] While that result aligns with *Restatement* Section 1.2F(a), the test the court applied to determine when the cause of action for trespass accrued does not.

Under Ohio law, "trespass requires that a property owner prove: (1) an unauthorized intentional act, and (2) an intrusion that interferes with the owner's right of exclusive possession of her property."[156] However, "[a]s applied to subsurface rights, it has long been established in Ohio that a property owner can exclude invasion of her subsurface property where the invasion interferes with her 'reasonable and foreseeable use of the subsurface.'"[157] Applying this rule, the court found that:

152. *Id.* § 1.2F(a).

153. 520 S.W.3d 39, 53 (Tex. 2017).

154. *Id.* at 47 (quoting Lightning Oil Co. v. Anadarko E & P Onshore, LLC, 480 S.W.3d 628, 635 (Tex. Ct. App. 2015)).

155. 679 F. Supp. 3d 620, 643 (S.D. Ohio 2023), *on reconsideration in part*, No. 19-CV-2221, 2024 WL 231456 (S.D. Ohio Jan. 22, 2024), *opinion clarified*, No. 19-CV-02221, 2024 WL 248889 (S.D. Ohio Jan. 22, 2024).

156. *Id.* at 642 (citing Estes v. Robbins Lumber LLC, 12th Dist. Clermont No. CA2016–02–011, 2016-Ohio-8231, ¶ 16).

157. *Id.* (citing Chance v. BP Chems., Inc., 77 Ohio St. 3d 17, 26, 670 N.E.2d 985 (1996)).

> [t]he wide array of discovery submitted to this Court indicates that drilling these wells and causing hydraulic fractures has a substantial impact on the stability and use of subsurface minerals, leading to the logical conclusion that Plaintiffs' reasonable and foreseeable use of the hydrocarbons in the Point Pleasant would be impacted.[158]

The court concluded that if a trespass occurred, then it commenced when the wellbore penetrated the plaintiff's property because that is the event that interferes with plaintiff's reasonable or foreseeable use of drilling and extracting oil and gas from the formation.[159]

Honey Crest Acres, LLC v. Rice Drilling D, LLC[160] involved very similar facts and the same defendant as *Tera II, LLC*. In considering whether the plaintiff sufficiently alleged a claim for trespass by the defendant's drilling of a formation owned by the plaintiff, the court explained that "[o]n the matter of subsurface rights, Ohio courts conclude that for a plaintiff to recover for trespass, the plaintiff must demonstrate 'some type of physical damages or interference with use.'"[161] By this standard, the court found to be sufficient plaintiff's allegations that defendant's drilling and fracturing technology used under the plaintiff's land were "designed to exert pressures underground such that Defendants cause hydrocarbons within the properties throughout the unit to leave their formations and migrate to Defendants' wellbores."[162]

Cases from other jurisdictions support the idea that traversing bore holes may constitute a trespass, but these also suggest the importance of the damage—beyond mere entry—that subsurface drilling wreaks on geologic formations. In *True Oil LLC v. Bureau of Land Management*, the court held that a traversing, non-producing wellbore going through a federally owned mineral estate could constitute a trespass of the federal minerals because the well "could not only potentially go through federal minerals, but also injure the United States' ability to protect its minerals."[163] The court also noted that a special regulatory definition of "trespass" applied, which encompasses "the unlawful use of, or injury to, property of the United States."[164] Similarly, in affirming a lower court's temporary injunction restraining the defendant's proposed

158. *Id.* at 643 (citing Briggs v. Sw. Energy Prod. Co., 224 A.3d 334, 347–48 (Pa. 2020) ("[A]ll drilling for subsurface fugacious minerals involves the artificial stimulation of the flow of that substance. The mere act of drilling interferes with nature and stimulates the flow of the minerals toward artificially-created low pressure areas, most notably, the wellbore.").

159. *Id.*

160. 723 F. Supp. 3d 617 (S.D. Ohio 2024).

161. *Id.* at 624 (quoting Baker v. Chevron USA, Inc., 533 F. App'x 509, 521–22 (6th Cir. 2013)).

162. *Id.* (quoting the plaintiff's complaint).

163. 700 F. Supp. 3d 1004, 1014 (D. Wyo. 2023).

164. *Id.* (quoting 43 C.F.R. § 9239.0-9(a)).

horizontal drilling, the Texas Court of Appeals in *Chevron Oil Co. v. Howell* specifically referenced the admission of the defendant's superintendent that the wellbore would damage the formation.[165]

3. Hydraulic Fracturing

The *Restatement*'s application of ordinary trespass also does not accurately capture courts' treatment of trespass liability for cross-boundary hydraulic fracturing. In the seminal case, *Coastal Oil & Gas Corp. v. Garza Energy Trust*, the Supreme Court of Texas held that the defendant was not liable for the value of natural gas drained from the plaintiff's tract through hydraulic fractures generated within the defendant's tract to stimulate the defendant's well.[166] Part of the court's rationale was that the plaintiff could not show any injury resulting from the invasion to its ability under the rule of capture to drill and fracture a well within its tract.[167]

The reporters' notes to Subsection 1.2F do identify a case to support the rule proposed in subsection (a) that cross-boundary hydraulic fracturing operations constitute trespasses, and it is the same case hailed by Merrill and Smith in their scholarly article on the subject: *Briggs v. Southwestern Energy Production Co*.[168] Per the Reporters' Note: "The Supreme Court of Pennsylvania, in the most thoroughly considered review of the issue, has concluded that the traditional rules of subsurface trespass continue to apply in the context of extraction of oil and gas using hydraulic fracturing."[169]

The reporters suggest that the *Briggs* court "reaffirmed two propositions: first, that the rule of capture continues to apply even when production is facilitated by the use of hydraulic fracturing; and second, that liability for trespass continues to exist when a production company commits a physical invasion of the subsurface column of space of another."[170] Merrill and Smith make the same claim in their article,[171] as does the concurrence in *Briggs* itself.[172]

165. 407 S.W.2d 525, 528 (Tex. App. 1966). An important fact in the case was that the surface tenant had denied permission to the defendant to drill the well from the surface of the tenant's lease, and presumably to install ancillary surface equipment there as well. *See id.* at 526–28.

166. 268 S.W.3d 1, 14 (Tex. 2008).

167. *Id.* at 12–14.

168. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2F reporters' note (A.L.I., Tentative Draft No. 4, 2023) (citing 224 A.3d 334 (Pa. 2020)).

169. *Id.*

170. *Id.*

171. Merrill & Smith, *Briggs*, *supra* note 19, at 3.

172. *Briggs*, 224 A.3d at 353 (Dougherty, J., concurring in part); *see also* MARTIN & KRAMER, *supra* note 141, § 228 (interpreting *Briggs* to clearly suggest "that in cases in which a mineral owner can show that either liquids or proppants have migrated across a property line, a trespass will have occurred.").

A couple of district courts have also referenced *Briggs* as holding that the rule of capture does not apply when a physical intrusion has been alleged.[173]

The problem with this interpretation of *Briggs* is that the majority opinion only affirms the first proposition. It does not consider the second issue of whether the ordinary rule of trespass applies in the deep subsurface. That question was not preserved for review and the court did not engage with it. The opinion explains:

> We have not overlooked Southwestern's argument that trespass should not be viewed as occurring miles beneath the surface of the earth. As Southwestern observes, in some jurisdictions traditional concepts of physical trespass have been relaxed where activities take place miles below the surface and the plaintiff is not deprived of the use and enjoyment of the land. Southwestern posits that this is analogous to the principle that trespass does not arise high above the surface. It emphasizes that other socially useful endeavors—such as carbon sequestration projects, energy storage wells, and waste disposal sites—could be jeopardized if the rule against trespass were to be enforced in an unduly stringent manner where deep subsurface activities are concerned.
>
> *Without speaking to the merit of such a claim*, we note that this Court is limited to the issue as it was framed in the petition for allowance of appeal . . . .[174]

Southwestern framed that sole issue on appeal this way:

> Does the rule of capture apply to oil and gas produced from wells that were completed using hydraulic fracturing and preclude trespass liability for allegedly draining oil or gas from under nearby property, where the well is drilled solely on and beneath the driller's own property *and the hydraulic fracturing fluids are injected solely on or beneath the driller's own property*?[175]

The court answered the question presented in the negative, holding "that the rule of capture remains extant in Pennsylvania, and developers who use hydraulic fracturing may rely on pressure differentials to drain oil and gas from under another's property, at least in the absence of a physical invasion."[176] It was not necessary for the court to further decide whether a physical invasion was the only necessary element of liability for a trespass by fracking.[177]

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173. Briggs v. Sw. Energy Prod. Co., No. 3:21-CV-520, 2024 WL 38298, at *9–10 (M.D. Pa. Jan. 3, 2024) (citing Golden Eagle Res. II, LLC v. Rice Drilling D, LLC, No. 22-CV-02374, 2023 WL 1927799, at *9 (S.D. Ohio Feb. 10, 2023)).

174. *Briggs*, 224 A.3d at 350 (emphasis added) (citations omitted).

175. *Id.* at 343.

176. *Id.* at 352.

177. *See id.* at 343, 347, 349–51.

Further, the proposition that a physical invasion is itself sufficient to establish liability for trespass was not necessary to the disposition of the case in *Briggs* and thus cannot be the holding.[178] The court remanded the case to the Superior Court to determine whether the plaintiffs had adequately alleged a physical invasion to support a claim for trespass liability.[179] Had the court conceived its opinion as holding that physical invasion was itself sufficient to establish liability, the decision to remand would have been the same, since it would need to be resolved whether the plaintiffs alleged a physical invasion regardless of whether the test for trespass requires only an invasion or an invasion plus some harm (as the defendant argued).[180]

Others also read *Briggs* narrowly. The cumulative supplement to the prominent treatise, *Kuntz Law of Oil and Gas*, describes the *Briggs* decision thusly in its section pertaining to the rule of capture:

> In *Briggs v. Southwestern Energy Prod. Co.*, the Pennsylvania Supreme Court reversed the Superior Court's holding that the rule of capture does not protect an operator when it uses hydraulic fracturing to facilitate drainage. However, the court declined to rule on whether the physical intrusion of frac fluids and proppants into neighboring land was a trespass because plaintiff land and mineral owners (unleased) had not alleged such an intrusion until the appeal. The court remanded the matter to the Superior Court for a determination on whether the plaintiffs could proceed on their physical intrusion claim. In its conclusion the Supreme Court stated "that the rule of capture is extant in Pennsylvania, and developers who use hydraulic fracturing may rely on pressure differentials to drain oil and gas from under another's property, at least in the absence of a physical invasion." *Thus, the unanswered question is whether a physical invasion of fluids, proppants, or even induced fractures by themselves might constitute a trespass.*[181]

Apart from *Briggs*, only one other case exists that arguably supports the *Restatement*'s rule favoring ordinary trespass liability for fracking. In *Stone v.*

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178. EUGENE WAMBAUGH, THE STUDY OF CASES § 1, at 17 (2d ed. 1894). Waumbaugh's inversion test for determining the holding of a case states as follows:

> In order to make the test, let him first frame carefully the supposed proposition of law. Let him then insert in the proposition a word reversing its meaning. Let him then inquire whether, if the court had conceived this new proposition to be good, and had had it in mind, the decision could have been the same. If the answer be affirmative, then, however excellent the original proposition may be, the case is not a precedent for that proposition, but if the answer be negative the case is a precedent for the original proposition and possibly for other propositions also.

Id. (footnote omitted).

179. *Briggs*, 224 A.3d at 351.

180. *Id.* at 343.

181. 1 KUNTZ ET AL., *supra* note 141, § 4.2 (Cum. Supp. 2023) (internal citation omitted) (emphasis added); *see also* 1 SUMMERS, *supra* note 141, § 3:2 n.1 (Cum. Pocket Part 2020) (stating that *Briggs* holds "that there is no liability for the drainage of oil and gas from under the lands of another so long as there has been no trespass."). Although I am currently the update and revision author of *Kuntz Law of Oil and Gas*, I was not in 2020 or 2021 when the *Briggs* case was included in the supplement. The authors at that time were three leading oil and gas law scholars: Owen L. Anderson, John S. Lowe, and Christopher S. Kulander.

Chesapeake Appalachia, LLC, the federal district court for the Northern District of West Virginia held that a defendant may be liable for trespass and damages for oil and gas drained from a well on account of the defendant's hydraulic fracturing treatment.[182] But that opinion is minimally persuasive for several reasons, including that it was vacated when the parties settled the matter.[183] Additionally, the opinion is not clear on whether the defendant's fracturing treatment actually crossed the boundary into the plaintiff's tract. While certain language in the opinion appears to suggest that it did,[184] Merrill and Smith and the reporters of the *Restatement* read the case to say that use of hydraulic fracturing is always a trespass when it induces drainage from a neighboring property, regardless of whether the fracturing treatment crosses a boundary.[185] In other words, they understand *Stone* to mean that the rule of capture does not apply when fracturing treatments are used.[186]

Stone's reasoning is also unpersuasive. Starting with the premise that the rule of capture applies to fugacious minerals because they are capable of movement through permeable rock formations, the court concluded that the rule should not apply to natural gas trapped in impermeable shale formations that must be fractured to allow the gas to migrate.[187] This is problematic, however, because the rule of capture has been held to apply to a long list of techniques to artificially stimulate the drainage of oil and gas from a reservoir.[188] Accordingly, this reasoning was rejected in *Briggs*,[189] as well as by Merrill and Smith[190] and the *Restatement*.[191]

In short, neither Merrill and Smith nor the reporters of Section 1.2F find *Stone* to be worthy support for the restated rule that hydraulic fracturing

182. No. 5:12-CV-102, 2013 WL 2097397, at *8 (N.D. W. Va. Apr. 10, 2013), *vacated*, No. 5:12-CV-102, 2013 WL 7863861 (N.D. W. Va. July 30, 2013).

183. Stone v. Chesapeake Appalachia, LLC, No. 5:12-CV-102, 2013 WL 7863861, at *1 (N.D. W. Va. July 30, 2013).

184. *Stone*, 2013 WL 2097397, at *1 (noting that the plaintiff's complaint alleged "trespass by engaging in hydraulic fracturing *on [the] plaintiffs' property*." (emphasis added)), at *8 ("[H]ydraulic fracturing *under the land of a neighboring property* without that party's consent is not protected by the 'rule of capture,' but rather constitutes an actionable trespass." (emphasis added)).

185. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2F reporters' note (A.L.I., Tentative Draft No. 4, 2023); Merrill & Smith, *supra* note 19, at 9.

186. Merrill & Smith, *supra* note 19, at 9.

187. *Stone*, 2013 WL 2097397 at *6–8.

188. *See* 1 KUNTZ, *supra* note 141, § 4.2 (collecting cases) (noting the rule permits a well owner "to use artificial means of stimulating production even though the effect is to increase the drainage from the land of another" including shooting the well, putting the well on the pump, and using a compressor to produce natural gas).

189. Briggs v. Sw. Energy Prod. Co., 224 A.3d 334, 348 (Pa. 2020).

190. Merrill & Smith, *supra* note 19, at 9–10.

191. RESTATEMENT (FOURTH) OF PROP. § 1.2F reporters' note (A.L.I., Tentative Draft No. 4, 2023).

operations that cause drainage across the boundary of a neighboring property constitute trespasses per se. That leaves only a questionably broad reading of *Briggs* as support for the *Restatement*'s position on this important point.

Summing up, *Restatement* Sections 1.2C and 1.2F pertaining to trespasses involving fugacious minerals do not accurately restate the case law, either at the level of results or (especially) at the level of reasoning. Subsection (b) of both sections would create a rule limiting the available remedies for a subsurface trespass that no court seems to have adopted. The proposed rule attempts to reconcile the law of trespass with the rule of capture in a way that confuses how the two principles really interact. Moreover, while Section 1.2C(a)'s imposition of traditional trespass liability on slant hole wells seems to fit the case law, Section 1.2F(a)'s attempt to do likewise for fracking and traversing horizontal wellbores does not. Ultimately, the *Restatement*'s approach cannot explain why producing slant wells seem to be trespasses per se while other forms of intrusion like fracking and traversing (but non-producing) wellbores appear to be trespasses, if at all, *per accidens*.[192]

C. Caves and Cavities

The *Restatement* gives uniform treatment to all subsurface voids, including caves as well as microscopic pore space within rock formations. Section 1.17 (Vol. 1) ("Caves and Other Subjacent Cavities"), provides that the owner of the surface of land has the right to possess "caves, fissures, and other open spaces subjacent to the surface, provided effective possession of such spaces is possible."[193] The section applies to caves as well as "abandoned mines and wells, fissures in underground rock formations, and pores in permeable rock."[194] As the comments explain, "[g]iven the difficulty of identifying a principled distinction among different types of subjacent cavities, it is desirable to have a unified principle that applies to all such formations."[195]

The following Parts of this Article distinguish openings like caves, which can be accessed and occupied by humans from the surface, from openings like pore space, fissures, and fractures, which are accessible only by injection-well

192. As with the *Restatement*'s rule for slant-well trespass, Section 1.2F(b) limits the plaintiff's remedies for fracking and horizontal-well trespass to nominal damages where her only injury is drainage and her equal right to capture minerals is not impaired. There is thin case law support for either rule. While both *Garza* and *Lightning Oil* appear at first blush to support the *Restatement*'s position on the remedies available for trespass by fracking and horizontal drilling, they in fact do not. That is because neither case found that the plaintiff had a prima facie case for trespass by the defendant's conduct. Accordingly, neither court affirmed an award to the plaintiff even of nominal damages. The problem with using *Garza* and *Lightning Oil* as support for Section 1.2F(b) is that they support neither the rule in the subsection nor the general rule in subsection (a) that fracking and horizontal drilling constitute per se trespasses.

193. RESTATEMENT (FOURTH) OF PROP. vol.1 § 1.17 (A.L.I., Tentative Draft No. 4, 2023).

194. *Id.*

195. *Id.* vol. 1 § 1.17 cmt. a.

technology. As these Parts illustrate, entries into openings like caves and openings like pore space have been dealt with quite differently in the case law. The following Parts separately examine the two kinds of cavities for this reason, with the overall conclusion that the *Restatement*'s adoption of ordinary trespass may be defensible as applied to caves but not as to pore space.

1. Caves

There is very little decisional law concerning ownership and trespass of caves accessible from the surface of the earth. The opinions accept that the owner of the surface owns whatever portion of the cave rests below it.[196] The difficulty in these cases involves knowing the location of the cave at issue. In the famous series of cases over the Great Onyx Cave, the court upheld the trial court's order authorizing a survey of the disputed cave on the premise that if the cave were found to extend under the plaintiff's land, then under the *ad coelum* maxim, the plaintiff would own that portion and the defendant would be liable for trespassing into it.[197] The equally famous *Marengo Cave Co. v. Ross* accepted that allowing entrance by the public into a cave partially underlying the plaintiff's land without the plaintiff's permission could form the basis of a claim for adverse possession, but held that the statute of limitations on plaintiff's trespass claim did not run until the plaintiff could discover the entry under his land.[198] Courts have dealt with trespasses by mining shafts in similar fashion.[199]

The *Restatement* describes these cases accurately but advocates for a different rule on principle. Under Section 1.17 (Vol. 1), the surface owner owns underlying caves only to the extent that each cave is capable of effective possession from the surface of the tract.[200] This means that the reporters would have denied relief to the plaintiff in the Great Onyx Cave case on the ground that he lacked an economical means of accessing the cave from his tract.[201] Echoing the concerns of Justice Logan, who dissented from the majority's ruling in *Edwards v. Sims* (Great Onyx Cave case), the reporters explain that this deviation from *ad coelum* is justified because it avoids giving a kind of veto power to neighbors who lack any way to use a cave, by which they might block the

196. *See* Edwards v. Sims, 24 S.W.2d 619 (Ky. 1929); Edwards v. Lee's Adm'r, 96 S.W.2d 1028 (Ky. 1936); Marengo Cave Co. v. Ross, 10 N.E.2d 917 (Ind. 1937).

197. *Sims*, 24 S.W.2d at 620–21.

198. *Marengo Cave*, 10 N.E.2d at 922–23.

199. *See, e.g.*, Lewey v. H. C. Frick Coke Co., 31 A. 261 (Pa. 1895) (applying discovery rule to toll statute of limitations for adverse possession for underground mining); Lightner Mining Co. v. Lane, 120 P. 771 (Cal. 1911) (applying fraudulent concealment doctrine to toll statute).

200. RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.17, cmts. b, c (A.L.I., Tentative Draft No. 4, 2023).

201. *See id.* vol. 1 § 1.17 cmt. b & reporters' note.

other cave owner from putting it to use as a tourist attraction or for education purposes.[202]

At bottom, the cave cases are so few and so unusual that it would be unfair to say the *Restatement*'s approach in Section 1.17 is out of line with any sort of case-law consensus. On the contrary, the reporters articulated a principled reason for deviating from strict adherence to *ad coelum* and trespass for caves when there is no feasible entrance available on the overlying land.

2. Pore Space

a. Intrusions by Gas

Section 1.2D applies the *Restatement*'s definition of trespass to intrusions into subsurface space by gas, "whether to stimulate production of fugacious minerals, for storage, or for disposal . . . ."[203] These intrusions do not give rise to liability for trespass under Section 1.2D "because gases are not tangible objects"[204] and a prima facie case of trespass requires showing an entry "of a tangible thing or a person . . . ."[205] Instead, the comments explain, gas intrusions might give rise to liability under the tort of nuisance, which protects landowners from unreasonable interference with the right to use and enjoy their property.[206]

Section 1.2D is conceptually consistent with trespass law and has case support from decisions denying trespass liability for gas invasions at or near the surface of land.[207] When it comes to allegations of unauthorized gas migration

202. *Id.* vol. 1 § 1.17 reporters' note; *accord Sims*, 24 S.W. at 621–23 (Logan, J., dissenting). As the reporters' note points out, other commentators, including Professors Prosser and Keeton, criticized the majority's application of the *ad coelum* doctrine on similar grounds. *See, e.g.*, W. PAGE KEETON ET AL., PROSSER AND KEETON ON TORTS § 82 (5th ed. 1984). The possibility that a surface owner might block access throughout (and thereby destroy the usefulness of) a cave to which he had no ability to access also troubled Justice Thomas, who wrote a separate opinion concurring with the majority opinion in *Edwards v. Lee's Administrator*, affirming the trial court's award of damages to the plaintiff Edwards in the Great Onyx Cave case. Edwards v. Lee's Adm'r, 96 S.W.2d 1028, 1033–36 (Ky. 1936) (Thomas, J., concurring). Rather than carve out an exception to *ad coelum*, like Justice Logan and the *Restatement*, however, Thomas would have resolved the dog-in-the-manger problem by treating the cave as jointly owned between the owners of the land under which it traversed. *Id.* at 1035; *see* KEETON ET AL., *supra*, at § 82.

203. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D (A.L.I., Tentative Draft No. 4, 2023).

204. *Id.*

205. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.1(a) (A.L.I., Tentative Draft No. 2, 2021) (defining a prima facie case for trespass to require entry "of a tangible thing or a person").

206. RESTATEMENT (FOURTH) PROP. vol. 2 § 1.2D cmt. a (A.L.I., Tentative Draft No. 4, 2023).

207. *E.g.*, Fresh Air for the Eastside, Inc. v. Waste Mgmt. of N.Y., LLC, 405 F. Supp. 3d 408, 450–51 (W.D.N.Y. 2019).

in the deep subsurface, however, several cases[208] and a leading treatise[209] recognize trespass liability for subsurface invasions by a defendant's injected gases. Since gas storage field operators often have condemnation authority from the federal or state government, other cases have recognized liability for inverse condemnation based on the migration of injected gas under a plaintiff's tract.[210] The reporters' note to Section 1.2D (Vol. 2) does acknowledge that some contrary authority exists to the *Restatement*'s rule, though it understates just how much contrary authority there is.[211]

The reporters cite no cases rejecting trespass liability for migrating gas on the basis that gas is not a tangible object.[212] Indeed, it seems that cases rejecting trespass liability do so on the ground that the defendant abandoned its title to the gas upon injecting it into the subsurface so that the gas was unowned (and subject to the rule of capture) when it crossed the boundary into the plaintiff's

208. *See, e.g.*, ANR Pipeline Co. v. 60 Acres of Land, 418 F. Supp. 2d 933, 940 (W.D. Mich. 2006); Baatz v. Columbia Gas Transmission, LLC, 929 F.3d 767, 775 (6th Cir. 2019); Beck v. N. Nat. Gas Co., 170 F.3d 1018, 1021–22 (10th Cir. 1999); Regency Field Servs., LLC v. Swift Energy Operating, LLC, 622 S.W.3d 807 (Tex. 2021); *see also* Mich. GeoSearch, Inc. v. TC Energy Corp., No. 2:20-CV-12600, 2021 WL 2338380, at *7–8 (E.D. Mich. June 8, 2021) (finding that plaintiff's trespass claim based on invasion of defendant's storage gas was time-barred).

209. 1 KUNTZ, *supra* note 141, § 2.6 at 70 ("If the underground area is capable of being defined with certainty, ownership of the substances injected should not be lost, unless it appears that they have been abandoned. Further, the injector should be held to be a trespasser if the substance was intended to invade the land of another.").

210. *See* R. Lee Gresham & Owen L. Anderson, *Legal and Commercial Models for Pore-Space Access and Use for Geologic CO_2 Sequestration*, 72 U. PITT. L. REV. 701, 728–30 (2011) (citing Columbia Gas Transmission Corp. v. An Exclusive Nat. Gas Storage Easement, 747 F. Supp. 401 (N.D. Ohio 1990); Miss. River Transmission Corp. v. Tabor, 757 F.2d 662 (5th Cir. 1985)).

211. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D reporters' note (A.L.I., Tentative Draft No. 4, 2023) (citing only ANR Pipeline Co. v. 60 Acres of Land, 418 F. Supp. 2d 933, 940 (W.D. Mich. 2006)).

212. The reporters' note does cite one case, *ANR Pipeline Co. v. 60 Acres of Land*, that did deny inverse condemnation in a case involving the migration of native gas that was displaced from the formation by defendant's injection of foreign gas. 418 F. Supp. 2d 933 (W.D. Mich. 2006). The court denied inverse condemnation liability because "the underground movement of native gas across property boundaries does not constitute the kind of physical intrusion that would support an inverse condemnation claim." *Id.* at 940. The court nonetheless expressed the opinion that "if injected gas moves across boundaries there may be a trespass." *Id.* The court further recognized that the landowners may have a claim for inverse condemnation not based on a physical intrusion if they could show harms "such as 1) diminution in value, 2) serious injury to property, or 3) interference with use of the property" but it ultimately concluded that the evidence was insufficient to establish any such harm. *Id.* at 941 (citing Heinrich v. City of Detroit, 282 N.W.2d 448 (Mich. Ct. App. 1979)).

tract.[213] Yet the reporters reject this reasoning in favor of the intangibility rationale,[214] which courts do not seem to have adopted widely, if at all.[215]

Neither does Section 1.2D mention that some of the cases recognizing trespass liability for gas migration apply a modified definition of trespass. Consider two examples. In *Baatz v. Columbia Gas Transmission, LLC*, the United States Court of Appeals for the Sixth Circuit applied the same modified definition of subsurface trespass that the courts in *Honey Crest Acres* and *Tera II, LLC* applied to determine when a trespass by horizontal drilling occurred.[216] According to *Baatz*, that definition of subsurface trespass requires the plaintiff to show an "interference with a reasonable or foreseeable use of the subsurface" to establish a claim for trespass based on migration of the defendant's gas injected under a neighboring tract.[217]

The Texas Supreme Court likewise adopted its definition of subsurface trespass from *Lightning Oil* (horizontal wellbore case) to determine at what point the plaintiff's mineral interest was trespassed by migrating waste gas injected into the defendant's adjoining tract.[218] That Court concluded, in *Regency Field Services, LLC v. Swift Energy Operating, LLC*, that the plaintiff's claim for subsurface trespass accrued when the injected gas interfered with the plaintiff's chance to exercise its legal rights to explore, obtain, produce, and possess the minerals subject to the plaintiff's lease.[219] Under *Lightning Oil*'s "fair chance" principle, "the mere fact that contaminants have migrated into the subsurface space covered by a mineral lease does not itself establish that the lessee has sustained [legal injury]."[220]

To summarize, in its restating the law of trespass as applied to subsurface migration of gasses, the *Restatement* maintains fidelity to its traditional definition

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213. *See, e.g.*, Protz v. Peoples Nat. Gas Co., 93 Pittsburgh Leg. J. 139, *aff'd*, 94 Pittsburgh Leg. J. 239 (1945); Hammonds v. Cent. Ky. Nat. Gas Co., 75 S.W.2d 204 (Ky. 1934); W. Edmond Salt Water Disposal Ass'n v. Rosecrans, 226 P.2d 965 (Okla. 1950) (involving trespass claim from injected saltwater); *see generally* A. Petry, Annotation, *Rights and Liabilities with Respect to Natural Gas Reduced to Possession and Subsequently Stored in Natural Reservoir*, 94 A.L.R.2d 543 (1964) (collecting cases).

214. *See* RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D reporters' note (A.L.I., Tentative Draft No. 4, 2023).

215. *See, e.g.*, ANR Pipeline Co., 418 F. Supp. 2d at 940; Baatz v. Columbia Gas Transmission, LLC, 929 F.3d 767, 775 (6th Cir. 2019); Beck v. N. Nat. Gas Co., 170 F.3d 1018, 1021–22 (10th Cir. 1999).

216. 929 F.3d at 777; *see supra* text accompanying notes 155-62 (discussing *Tera II, LLC* and *Honey Crest Acres*).

217. *Baatz*, 929 F.3d at 773.

218. Regency Field Servs., LLC v. Swift Energy Operating, LLC, 622 S.W.3d 807, 820 (Tex. 2021); *see supra* text accompanying note 153 (discussing *Lightning Oil*).

219. *Swift Energy*, 622 S.W.3d at 816 (quoting Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 49 (Tex. 2017)).

220. *Id.* at 820. The plaintiff in *Swift Energy* also brought a claim for nuisance, which the court found accrued when the defendant's gas "substantially interferes with the [plaintiff's] use and enjoyment . . . ." *Id.* at 816. Note the similarity between the standard for nuisance—substantial interference with the plaintiff's use and enjoyment—and the standard for subsurface trespass articulated in *Swift Energy* and *Baatz*—interference with the plaintiff's actual use, right to use, or chance to exercise its rights of use.

of trespass but chooses not to depict what appears to be animating the bulk of the case law. That bulk of modern cases seems to support the following contrary proposition: where title to the injected gas remains with the defendant, the migration of that injected gas into a plaintiff's pore space without permission constitutes a trespass (or applicable, an inverse condemnation) *if* the intrusion actually interferes with the plaintiff's existing or foreseeable use of the pore space.

b. Intrusions by Liquids and Solids

Section 1.2E of the *Restatement* applies traditional trespass to intrusions into pore space of tangible fluids and solids, but still "limits trespass liability as a matter of common law unless the producer intends or knows to a near certainty that the injected fluid will migrate into the subsurface rights of another."[221] This makes sense at a conceptual level, because intent is an uncontroversial requirement for trespass liability. There is, for instance, case law support for denying trespass liability for accidental contamination of soil and groundwater in the shallow subsurface. Thus, a defendant who was unaware that pollutants were escaping from his tract and migrating into the shallow subsurface of the plaintiff's tract was not liable for trespass, despite having caused a physical entry into the plaintiff's land.[222] Section 1.2E accurately reflects near-surface pollution cases like these.

The lack-of-intent rationale does not make sense, however, when the actor intentionally injects fluids into an interconnected subsurface formation for disposal, storage, or stimulation of oil and gas reservoirs. Neither is it consistent with existing case law. There are many cases denying trespass liability for these activities, but not because the defendant lacked the requisite intent. Two themes emerge that undermine Section 1.2E's descriptive power: (i) courts apply a modified version of trespass to deep subsurface fluid encroachments and (ii) when they deny liability for encroachments, they do so on grounds other than the injector's lack of intent. The discussion that follows focuses primarily on

221. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023). Section 1.2E provides that an actor with rights to pore space may inject liquids or solids to stimulate production, for storage, or for disposal, "without fear of trespass liability . . . provided the actor does not intend or know to a near certainty that the material will migrate into subsurface space" of another. *Id.* at vol. 2 § 1.2E.

222. OBG Tech. Servs. v. Northrop Grumman Space & Mission Sys. Corp., 503 F. Supp. 2d 490, 526, 530 (D. Conn. 2007); *see also* Phillips v. Sun Oil Co., 121 N.E.2d 249, 250–51 (N.Y. 1954) (finding that trespass liability must stem from an intentional act that is or produces an "unlawful invasion" that is an "immediate or inevitable consequence" of the intentional act); Hudson v. Peavey Oil Co., 566 P.2d 175, 177 (Or. 1977) (reiterating that trespass liability will not attach to an unintentional trespass unless it stems from the defendant's negligence or "extrahazardous activity"). *But see* Hoery v. United States, 64 P.3d 214, 217–18 (Colo. 2003) (recognizing trespass claim for underground migration into groundwater of pollution).

the cases cited in the reporters' note to Section 1.2E, which are emblematic of the larger body of case law.[223]

i. Modified Trespass

Whereas Section 1.2E suggests that ordinary trespass applies in these cases but that most of the time defendants are not liable because they lack the requisite intent, the deep subsurface cases tend to apply modified definitions of trespass and hardly mention the injector's knowledge or intent. Instead, the cases denying liability tend to do so because the plaintiff suffered no actual damage or harm as required by the courts' modified definition of trespass.

In the first sentence of the reporters' note, the reporters cite *Cassinos v. Union Oil Co.*, as a decision "applying traditional trespass liability to subsurface fluids . . . ."[224] While the opinion indeed says that "causing subsurface migration of fluids into a mineral estate without consent constitutes a trespass," it is quite clear from a closer reading that the court applies a modified version of trespass that requires an entry into the plaintiff's subsurface *plus* actual damage to the plaintiff's property.[225] In the opinion, the *Cassinos* court examined a pair of 1950s cases from Oklahoma: one case, *West Edmond Salt Water Disposal Association v. Rosecrans*, where trespass liability was denied for entry of injected saltwater because it caused no damage to the plaintiff's property, and another case, *West Edmond Hunton Lime Unit v. Lillard*, where trespass liability was found for entry of injected saltwater that damaged the plaintiff's producing oil well.[226] Concluding that the case at bar was more like *Lillard* than *Rosecrans* because "the [plaintiffs] alleged and proved they were damaged by [defendant's] injection of its offsite wastewater," the *Cassinos* court found in favor of the plaintiff's trespass claim.[227]

Other courts explicitly require an additional showing of actual damage or harm to sustain subsurface trespass liability. The reporters' note cites *Baatz v. Columbia Transmission, LLC*, for example, which granted the defendant summary judgment on plaintiffs' claims for trespass because the plaintiffs failed to show

223. For broader surveys of the cases, *see* Joseph A. Schremmer, *Getting Past Possession: Subsurface Property Disputes as Nuisances*, 95 WASH. L. REV. 315, 343–55 (2020) [hereinafter Schremmer, *Getting Past Possession*]; Schremmer, *Unifying Doctrine*, *supra* note 26, at 571–73, 575–80; Gresham & Anderson, *supra* note 210, at 742–50; Owen L. Anderson, *Subsurface "Trespass": A Man's Subsurface Is Not His Castle*, 49 WASHBURN L.J. 247, 268–78 (2010); Hall, *supra* note 143, at 380–84; Christopher S. Kulander & R. Jordan Shaw, *Comparing Subsurface Trespass Jurisprudence—Geophysical Surveying and Hydraulic Fracturing*, 46 N.M. L. REV. 67, 76–79 (2016).

224. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023) (citing Cassinos v. Union Oil Co., 18 Cal. Rptr. 2d 574, 578 (Cal. Ct. App. 1993)).

225. *See Cassinos*, 14 Cal. Rptr. 2d at 578. Indeed, even the case cited in support of the proposition that "causing subsurface migration of fluids into a mineral estate without consent constitutes a trespass" had held that a defendant was liable for injection operations "which caused damage to neighbor's lease . . . ." *Id.* (citing Tidewater Oil Co. v. Jackson, 320 F.2d 157, 163 (10th Cir. 1963)).

226. *Id.* at 1781–82 (citing W. Edmond Hunton Lime Unit v. Lillard, 265 P.2d 730, 731–32 (Okla. 1954); W. Edmond Salt Water Disposal Ass'n v. Rosecrans, 226 P.2d 965, 968–69 (Okla. 1950)).

227. *Id.* at 1782.

that the defendant "interfered with the possessory interest in their subsurface (i.e., interference with a reasonable or foreseeable use of the subsurface)."[228]

The requirement that the defendant's fluid injection interferes with a reasonable or foreseeable use of the plaintiff's subsurface applied in *Baatz* comes from the 1996 Ohio Supreme Court case of *Chance v. B.P. Chemicals, Inc.*[229] The reporters' note to Section 1.2E cites *Chance* as "[t]he leading case" concerning trespass liability for injection of waste materials.[230]

Chance involved claims by landowners for trespass arising from the migration under their land of hazardous waste injected by the defendant in connection with its petrochemicals refining operation.[231] The plaintiff landowners argued for liability under traditional trespass because as the owners of land the plaintiffs "have the right to exclude others."[232] *Chance* rejected this traditional rule (noting it "has no place in the modern world"[233]) and reasoning that "[j]ust as a property owner must accept some limitations on the ownership rights extending above the surface of the property, we find that there are also limitations on property owners' subsurface rights."[234] Under this view, landowners' "subsurface rights in their properties include the right to exclude invasions of the subsurface property that actually interfere with [their] reasonable and foreseeable use of the subsurface."[235]

Later courts have interpreted *Chance* to require proof of the following elements to establish a prima facie claim for subsurface trespass: (1) an invasion of the plaintiff's property and (2) that the invasion has caused either substantial physical damage to the land or substantial interference with the plaintiffs' reasonable and foreseeable use of the land.[236] As already seen, courts have applied this modified definition of trespass in cases involving intrusions by fracking and horizontal drilling[237] as well as by injected gasses.[238] *Chance* itself applied the modified definition to fluid wastes, as have other courts.[239]

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228. Baatz v. Columbia Gas Transmission, LLC, 929 F.3d 767, 773 (6th Cir. 2019) (citing Chance v. B.P. Chems., Inc., 77 Ohio St. 3d 17, 24–25, 670 N.E.2d 985 (1996)).

229. *Chance*, 77 Ohio St. 3d at 26–28.

230. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023).

231. *Chance*, 77 Ohio St. 3d at 17.

232. *Id.* at 24.

233. *Id.* at 25 (quoting Vill. of Willoughby Hills v. Corrigan, 29 Ohio St. 2d 39, 49, 278 N.E.2d 658 (1972)).

234. *Id.* at 26.

235. *Id.*

236. Baker v. Chevron U.S.A. Inc., 533 F. App'x 509, 523 (6th Cir. 2013).

237. *See supra* text accompanying notes 155-62 (discussing *Tera II, LLC* and *Honey Crest Acres*).

238. *See supra* text accompanying notes 216-17 (discussing *Baatz*).

239. *E.g.*, *Baker*, 533 F. App'x at 524.

Courts outside of Ohio also require damage or harm in addition to the entry of fluids into the plaintiff's tract. Although the question remains unanswered by the Texas Supreme Court,[240] Texas lower courts require the additional element of harm to establish trespass by fluid migration.[241] In reasoning that resembles *Chance*, one Texas Court of Appeals explained that "property owners do not have the right to exclude deep subsurface migration of fluids."[242] Thus, it is likely that in Texas, as in Ohio, "some measure of harm must accompany the migration . . . ."[243] Likewise, Louisiana law requires a plaintiff to show that his property was "actually damaged" to recover against a fluid injector for trespass.[244] Earlier surveys of the case law argue that courts around the country require an additional element of harm as well.[245]

ii. The Role of Intent in the Decisions

Cassinos v. Union Oil, which adopted a modified definition of trespass, is also notable in that it found the defendant liable for trespass even though the defendant's injection could not have satisfied the *Restatement*'s standard for intent. Section 1.5 of the *Restatement* requires knowledge or "near certainty" on the part of the defendant that the defendant's conduct will cause a physical entry into the plaintiff's subsurface.[246] Mere awareness that injected fluid "might migrate into various subsurface fissures in unpredictable ways, then migrat[e] into [the plaintiff's subsurface tract] would not constitute a trespass."[247] Yet, the *Cassinos* defendant was liable for trespass even though the trial court concluded that "[t]he wastewater [defendant] injected into A-16 spread and communicated with other oil-producing lease wells in the unusual fractured shale Escolle formation, although the extent of migration is 'largely impossible to predict'"[248] and the appellate court acknowledged that "[h]ere it is impossible to trace the entire migration or effect of the wastewater injected."[249] Clearly, *Cassinos* neither supports the *Restatement*'s position that

240. Env't Processing Sys., L.C. v. FPL Farming Ltd., 457 S.W.3d 414, 416 (Tex. 2015) (declining to answer the question).

241. Iskandia Energy Operating, Inc. v. SWEPI LP, 697 S.W.3d 281, 301–05 (Tex. Ct. App 2023), *review denied* (Apr. 4, 2025); FPL Farming, Ltd. v. Tex. Nat. Res. Conservation Comm'n, No. 03-02-00477-CV, 2003 WL 247183, *4 (Tex. Ct. App. Feb. 6, 2003).

242. *Tex. Nat. Res. Conservation Comm'n*, 2003 WL 247183 at *3.

243. *Id.* at *4.

244. Boudreaux v. Jefferson Island Storage & Hub, LLC, 255 F.3d 271, 275 (5th Cir. 2001) (citing Nunez v. Wainoco Oil & Gas Co., 488 So.2d 955, 964 n.29 (La. 1986); Raymond v. Union Tex. Petrol. Co., 697 F. Supp. 270, 274 (E.D. La. 1988)).

245. *See supra* note 223.

246. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.5 (A.L.I., Tentative Draft No. 2, 2021).

247. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E cmt.c (A.L.I., Tentative Draft No. 4, 2023).

248. Cassinos v. Union Oil Co., 18 Cal. Rptr. 2d 574, 577 (Cal. Ct. App. 1993).

249. *Id.*

traditional trespass applies to subsurface fluids nor Section 1.2E's reasoning that defendants are generally not liable due to a lack of intent.

Cassinos is not alone in downplaying the intent of an injector for purposes of determining trespass liability. Of the dozen cases cited in the reporters' note, only two make any mention of intent.[250] The rest are completely silent on the issue, even those which rejected trespass liability, strongly suggesting that Section 1.2E's rationale lacks supporting authority. The two cases that do mention the defendant's intent do not treat it as dispositive, but instead find or deny liability based on whether the plaintiff suffered some harm in addition to the unauthorized migration of fluids.[251]

It is perhaps not surprising that the cases place little emphasis on an injectors' intent, since it might well be assumed in most cases. Operators of injection wells generally inject huge volumes of fluid over long periods of time. As fluid is discharged into the porosity of the formation where the well is bottomed, it migrates toward permeable areas of lower pressure within the formation.[252] Although it is not possible to predict or "control *precisely* where in the formation the [injected] substances will travel,"[253] it is known that the substances will travel.[254] Given that subsurface rock formations frequently traverse many separate tracts of land, it is likely that substances injected into a well on a tract of ordinary size will eventually travel well beyond the boundary of the tract.[255]

Moreover, the typical injection well operator likely holds personal, actual knowledge that the injected substances will eventually travel to other land. Most, if not all, injectors are specialists in subsurface operations, most often through upstream oil and gas production, where fluid injection is a routine practice.[256] What is more, injection well operators must give notice to the surrounding owners of subsurface property before beginning injection

250. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023).

251. *See* Tidewater Oil Co. v. Jackson, 320 F.2d 157, 163–64 (10th Cir. 1963) (noting that the defendant acted intentionally in injecting saltwater that invaded the plaintiff's tract but holding that the intentional act was actionable only if "they caused substantial injury to the claimants"); Baatz v. Columbia Gas Transmission, LLC, 929 F.3d 767, 770–73 (6th Cir. 2019) (denying plaintiffs' trespass claim even though they alleged that defendant "intentionally invaded the subsurface of their properties to store natural gas without their permission" because they failed to allege any harm to their reasonable or foreseeable use of the subsurface).

252. *See* HYNE, *supra* note 32, at 426–27, 439–48.

253. 1 THOMPSON, THOMPSON ON REAL PROPERTY § 49.04(b) (David A. Thomas, ed. LexisNexis 2012).

254. HYNE, *supra* note 32, at 402, 416.

255. *Id.* at 416.

256. HYNE, *supra* note 32, at xxxiv, xxxvi.

operations, precisely because it is understood that encroachment is likely.[257] Surrounding subsurface owners often have standing to challenge applications for injection permits because they are likely to suffer actual injury or economic damages from encroachment of the injected substances.[258]

The operator of an injection well resembles the owner of a factory that emits particles from its smokestack that come to rest on neighboring land. Ordinarily, the owner of the factory would be sufficiently certain that the particles will encroach other land to be liable for trespass or nuisance.[259] The same is true for injection well operators in most cases.

iii. Other Rationalizations

There are ways to rationalize the general lack of trespass liability in fluid intrusion cases other than on the basis of intent. For instance, the reporters' note to Section 1.2E identifies one alternative rationalization, citing cases that reject trespass liability for certain fluid encroachments because they were authorized by a relevant regulatory authority.[260] This rationale suffers from two problems. First, it is widely accepted that administrative agencies lack jurisdiction to immunize a private party from tort liability.[261] Second, several cases (including some cited in the reporters' note) hold defendants liable for trespass when their operations damage the plaintiff's existing oil and gas operations, even though the defendant's injection was authorized by an administrative authority.[262] There are even a few cases (two of which are cited by the reporters) that hold injectors liable even though no physical damage

257. 40 C.F.R. § 146.6(a) (2024). It is common for states to require notice to all subsurface owners within one-fourth of a mile of a proposed wastewater disposal well or injection well for secondary or enhanced recovery. *See, e.g.*, ILL. ADMIN. CODE tit. 62, § 240.370(b) (2024); 312 IND. ADMIN. CODE 29-5-2(a) (2023); 805 KY. ADMIN. REGS. 1:110(3) (2025).

258. *See, e.g.*, Hanson v. Indus. Comm'n of N.D., 466 N.W.2d 587, 594 (N.D. 1991); Env't Processing Sys., L.C. v. FPL Farming Ltd., 457 S.W.3d 414, 417 (Tex. 2015); R.R. Comm'n v. Apache Corp., No. 07-22-00014-CV, 2023 WL 2138962, at *1 (Tex. App. Feb. 21, 2023), *review granted, opinion vacated* (Feb. 23, 2024).

259. RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM § 1 illus. 3 (A.L.I. 2010).

260. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023). Most of these cases involve agency-authorized units for pressure maintenance or secondary or enhanced hydrocarbon recovery, all of which require injection of fluids throughout a common pool of oil or gas.

261. Snyder Ranches, Inc. v. Oil Conservation Comm'n of N.M., 798 P.2d 587, 590 (N.M. 1990); Tidewater Oil Co. v. Jackson, 320 F.2d 157, 160–61 (10th Cir. 1963); *see also* FPL Farming Ltd. v. Env't. Processing Sys. L.C., 351 S.W.3d 306, 313–14 (Tex. 2011) (clarifying that the court's holding in *Railroad Commission v. Manziel* was that agency-authorized secondary recovery projects "are not subject to injunctive relief based on trespass claims" rather than that agency authorization immunized the injector from trespass liability).

262. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023) (citing Tidewater Oil Co. v. Jackson, 320 F.2d 157 (10th Cir. 1963)); Hartman v. Texaco Inc., 937 P.2d 979 (N.M. Ct. App. 1997)).

results to the plaintiff.[263] These cases raise the additional question of why regulatory approval does not always preclude trespass liability.

It is also plausible the cases could be rationalized based on the notion of possible effective possession, as elsewhere suggested by Merrill and Smith.[264] Cases where the defendant's injection interferes with the plaintiff's existing wells present a clear instance of interference with effective subsurface possession. But Merrill and Smith contend that in cases where the defendant's injected waste merely migrates under the plaintiff's land, it might not interfere with the plaintiff's possible effective possession because, they surmise, it is "quite possible that in a number of these cases the complaining surface owner would not find it economically justifiable to drill a well for the sole purpose of disposing the waste water generated in another producer's operations."[265]

It may be true in many cases that plaintiffs would not benefit economically from drilling their own injection well, but this conclusion requires an assumption about facts that is not always fair and that the opinions usually do not address. Moreover, it is not clear why a defendant's injection into a formation does not establish that plaintiff's effective possession of the same space is possible, unless some unique surface features preclude drilling from the plaintiff's land.[266] While not always the case, each surface owner overlying a common formation usually has the same objective ability to access the formation by drilling (which is not to say they have the same economic resources, know-how, or appetite for doing so). For this reason, pore space does not pose the same dog-in-the-manger problem that characterizes caves with only one natural entrance.[267] To the contrary, each owner can generally access the resource from his or her own tract at similar trouble and expense.

* * *

To summarize, while Section 1.2E seems to describe accurately soil and groundwater contamination cases involving near-surface migration of pollutants, it fails to capture what courts do in cases involving injection of fluids

263. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E reporters' note (A.L.I., Tentative Draft No. 4, 2023) (first citing Young v. Ethyl Corp., 521 F.2d 771, 774 (8th Cir. 1975); and then citing Jameson v. Ethyl Corp., 609 S.W.2d 346 (Ark. 1980)).

264. *See* Merrill & Smith, *Briggs*, supra note 19, at 15.

265. *Id.*

266. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E illus. 6 (A.L.I., Tentative Draft No. 4, 2023). Consider Illustration 6 in the comments to Section 1.2 in which Irene is liable for subsurface trespass to Hal's subsurface by mining solid minerals from under Hal's land, because Irene's extraction of the minerals demonstrated that the space under Hal's land is subject to possible effective development.

267. *See* KEETON, ET AL., *supra* note 202, § 82.

in the deep subsurface. These cases do not seem to apply the traditional rule of trespass, as Section 1.2E advocates, and when they deny liability for fluid incursions, they do not do so based on a lack of intent. Because of these defects, Section 1.2E cannot explain why some fluid intrusions into deep pore space are not trespasses while others are.

III. A HARM-BASED ACCOUNT OF SUBSURFACE TRESPASS

As it pertains to fugacious minerals like oil and gas and subsurface fluid migration, the *Restatement*'s account of subsurface trespass is needlessly inaccurate. On these matters, the reporters have sacrificed descriptive accuracy in an otherwise worthwhile attempt to systematize trespass law within the "architecture" of in rem rights of exclusion. The sacrifice is unnecessary, as I endeavor to show in the rest of the article, because an accurate and coherent account of the cases that also harmonizes with the *Restatement*'s "architectural" view of property is possible.

What is missing from the sections of the *Restatement* that fail to accurately depict the cases is the element of harm to the plaintiff's interest, in addition to a defendant-side act that causes a physical entry into the plaintiff's tract. The recognition of harm as a required element of subsurface trespass in common pools of fugacious minerals and pore space reconciles the otherwise disparate case law. The presence of harm is why producing slant wells are always actionable trespasses but fracking and nonproducing wellbores might or might not be actionable. Harm is also the reason that some gas intrusion and fluid intrusion cases are actionable and others are not. The *Restatement*'s rejection of harm as an element of prima facie liability also ignores the explicit definition of subsurface trespass that has been adopted by many jurisdictions, including important oil and gas jurisdictions like Texas, Ohio, and Louisiana. In these ways, although it restates the law of near-surface trespasses and trespasses to solid minerals successfully, the *Restatement*'s commitment to the architecture of exclusive possession and no-harm trespass misses the mark for oil and gas and pore space resources.

There is substantial precedent for a harm-based account of subsurface trespass for fugacious minerals and interconnected pore space in the jurisprudence of oil and gas law. This scholarship has grounded the modified version of trespass in the fluid, interconnected, and correlative nature of oil and gas reservoirs. Building on this jurisprudence, in previous work, I developed an account of subsurface trespass, the "fair opportunity doctrine," that is based on harm and is grounded in the idea of correlative, rather than exclusive rights, in accordance with the case law. This Part begins with a survey of the relevant oil and gas literature and then describes and applies the fair opportunity doctrine

to the varieties of subsurface intrusions involving fugacious minerals and substances injected into pore space.[268]

A. The Correlative Conception of Rights

1. Oil and Gas Law Scholarship

In considering what constitutes a wrongful act in developing common pools of fugacious minerals like oil and gas, the oil and gas scholarship traditionally focused on three common law qualifications to the rule of capture. Subsurface trespass is only one of these common law limitations. The other two, which are mostly overlooked in the *Restatement*, are correlative rights and waste.[269] Consider how the literature has developed each of these doctrines.

a. Subsurface Trespass

When early courts and commentators referred to subsurface trespass as a limit on the rule of capture, they referred only to slant wells.[270] Later, contemporary jurisprudence had to grapple mightily with whether to expand the category of subsurface trespass to include intrusions of other sorts, like fracking, horizontal drilling, and fluid injection.[271] For this reason, liability for slant wells might be thought of as subsurface trespass *simpliciter* to distinguish it from later and more controversial kinds of intrusions.

Owen Anderson advanced a theory in this vein which rejects trespass liability for all intrusions that are caused by socially beneficial technologies, including hydraulic fracturing or carbon dioxide sequestration.[272] Anderson's theory nevertheless holds that actors should pay compensation for any actual

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268. *See generally* Schremmer, *Pore Space*, *supra* note 26 (offering the fair opportunity doctrine as an alternative to strictly instrumentalist or formalist alternatives); Schremmer, *Unifying Doctrine*, *supra* note 26 (advancing the fair opportunity doctrine as a more equitable and methodical approach to the current state of subsurface property law); Schremmer, *Subsurface Trespass*, *supra* note 26 (explaining and applying the fair opportunity doctrine).

269. *See* LOWE, ET AL., *supra* note 143, at 51–54 (discussing the common limits on the rule of capture as including correlative rights, waste, and slant-well trespass); *see also* HEMINGWAY, *supra* note 143, at 173–77 (discussing subsurface trespass and correlative rights as limits on the rule of capture).

270. *See* Note, *Suing a Slant-Hole Driller for Subsurface Trespass or Damage*, 15 STAN. L. REV. 665, 680 (1963); *see also* 1 SUMMERS, *supra* note 141, § 2:4 (typically addressing controversies arising out of directional well drilling).

271. *See* Pierce, *supra* note 42, at 4–47.

272. Anderson, *supra* note 223, at 247; *see generally* Owen L. Anderson, *Lord Coke, the Restatement, and Modern Subsurface Trespass Law*, 6 TEX. J. OIL GAS & ENERGY L. 203 (2010-2011) (arguing subsurface trespass liability should not extend to intrusions that serve an "important societal need" and does not cause any actual harm to the plaintiff).

damages their entries cause to ongoing subsurface activities.[273] Subsurface trespass *simpliciter* in Anderson's theory would remain a per se category of liability and an exception to the rule of capture.[274]

Keith Hall proposed an application of trespass to hydraulic fracturing in which an actor would be subject to liability only if "he designed the fractures to extend beneath the neighbor's land or the fractures extended further beneath the neighbor's subsurface than the maximum typical discrepancy between planned and actual fracture lengths."[275] He argues that a view that would deny liability no matter how far hydraulic fractures intrude into a plaintiff's tract may require extensive regulation by an administrative authority to protect correlative rights and prevent waste.[276]

More recently, Hall proffered a theory of trespass liability for the migration of injected carbon dioxide for CCS.[277] Distinguishing cases involving injection disposal of saltwater and other wastes, Hall argues that public policy favoring CCS supports recognizing trespass liability based solely on entry of carbon, but denying injunctive relief that might block such projects.[278] A significant reason for this arrangement, in Hall's view, is that "[a]llowing monetary liability for trespass would not significantly inhibit CCS . . . ."[279]

The debate over whether subsurface intrusions should constitute exceptions to the rule of capture like subsurface trespass *simpliciter* continues, as courts have not apparently adopted either scholarly theory.[280]

b. Waste and Correlative Rights

Mineral law scholars have also analyzed liability for horizontal drilling, hydraulic fracturing, and CCS under the waste and (especially) correlative rights doctrines.[281] In modern law, prohibitions against waste and protections for correlative rights in common pools of oil or gas are codified in state statutes regulating production and conservation of oil and gas resources.[282] Their

273. Anderson, *supra* note 223, at 249–50.

274. *Id.* at 282.

275. Hall, *supra* note 143, at 361.

276. *See id.* at 405–06.

277. *See generally* Hall, *supra* note 5, at 384 (considering whether subsurface migration of carbon dioxide is considered a trespass).

278. *Id.* at 384, 405–07.

279. *See id.* at 384, 405–07.

280. *See id.* at 404–05.

281. Waste doctrine received significantly less scholarly treatment until recently. The doctrine of waste generally prohibits squandering the contents of a common reservoir of oil or gas, the use of highly inefficient production practices that place large portions of the reservoir out of reach of future extraction, and the accidental or intentional destruction of the reservoir. *See* Tara K. Righetti & Joseph A. Schremmer, *Waste and the Governance of Private and Public Property*, 93 U. COLO. L. REV. 609, 637 (2022); Hall, *supra* note 143, at 371–73 (2023).

282. Righetti & Schremmer, *supra* note 281, at 638–41.

codification in comprehensive oil and gas acts, starting in earnest in the 1930s, likely contributed to the oft-observed fact that these two common law doctrines are not well developed in most jurisdictions.[283] Despite, or perhaps in response to, the relative dearth of decisional law, generations of oil and gas scholars have studied these common law qualifications on the rule of capture, especially the "growing concept of correlative rights."[284] The study of correlative rights was reinvigorated with the advent of horizontal drilling and hydraulic fracturing, which fell outside the scope of existing oil and gas legislation and challenged old understandings of the rule of capture.[285]

Two respected treatise writers of the twentieth century, W.L. Summers and Eugene Kuntz, contributed significantly to developing judicial notions of correlative rights. Correlative rights, Summers wrote, "were not created by . . . statute . . . *but existed because of the physical properties of oil and gas*."[286] The fluid and interconnected nature of oil and gas pools is a common focus of all correlative rights jurisprudence.

Summers's definition of "correlative rights" proved influential to later courts:

> (a) each owner of an interest in a common source of supply of oil and gas has a legal privilege, as against the other owners, to take oil and gas by lawful operations, limited by dual duties to the other owners (b) not to injure the source of supply, and (c) not to take an undue proportion of the oil and gas.[287]

Subsequent courts and commentators came to understand prong (c) of Summer's definition to refer to owners' fair *opportunity* to produce their proportion of the oil and gas, rather than an absolute right to a share of the production.[288]

Kuntz's contribution to the development of correlative rights consists of his conception of the owners within a common reservoir as a community in which each is bound to the other by socially constructed standards of conduct. Correlativity, to Kuntz, "serves to refine and to complement the law of capture by providing the fundamentals required for determining when property rights

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283. *See* 1 KUNTZ, *supra* note 141, § 4.3 at 119 ("[T]he elements which are included within the collective term 'correlative rights' have not been judicially classified or analyzed . . . ."); *see also* David E. Pierce, *Carol Rose Comes to the Oil Patch: Modern Property Analysis Applied to Modern Reservoir Problems*, 19 PENN. ST. ENV'T. L. REV. 241, 249 (2011) (calling correlative rights "somewhat of a sleeping right").

284. *See* 1 KUNTZ, *supra* note 141, § 4.3 at 117.

285. *See supra* note 42; Pierce, *supra* note 283, at 243, 249.

286. 1 SUMMERS, *supra* note 141, § 3:4 (emphasis added).

287. *Id.* § 3:3.

288. *See* Wronski v. Sun Oil Co., 279 N.W.2d 564, 569–70 (Mich. Ct. App. 1979) (quoting Seldon B. Graham, Jr., *Fair Share or Fair Game? Great Principle, Good Technology—But Pitfalls in Practice*, 8 NAT. RES. LAW. 61, 64–65 (1975)).

recognized by the law of capture must be modified by rules of fair play."[289] Whether particular conduct within a reservoir to produce the oil and gas is "fair play" depends, in Kuntz's view, on "standards applicable to conduct generally" as well as the "utility of the conduct in the light of its peculiar consequences to others operating in the same community."[290] In substance, this amounts to prohibitions against waste, spoilage of the source of supply, malicious depletion of the source of supply, and guarantees the right to a fair opportunity to extract from the source of supply and to conduct secondary recovery operations.[291]

Writing decades later, after horizontal drilling and large-scale hydraulic fracturing technologies had changed the paradigm of upstream exploration and production, David Pierce melded Summers's and Kuntz's work on correlative rights with Carol Rose's theory of "limited common property."[292] Pierce observed that Rose's concept of a limited commons, in which resources are held commonly among a defined community which holds exclusively of the rest of the world, resembles the oil and gas reservoir community of Kuntz.[293]

Pierce also recognized that the horizontal drilling revolution wrought changes in established understandings of property rights in oil and gas, just as Rose predicted would happen by her theory that property rights become more nuanced in response to new stressors.[294] Synthesizing Rose and Kuntz, Pierce devised the "reservoir community analysis" under which the standards for conduct within a reservoir would be determined based on consideration of the characteristics of the reservoir as well as current technologies and oilfield practices.[295] The goal of the analysis is to privilege those activities that are "necessary to maximize development and value from" the reservoir, even if they cross property lines.[296] In formations that can only be developed through hydraulic fracturing, for example, boundary crossings by fractures and fluids would not be wrongful because prevailing standards of conduct within the reservoir community sanction such actions.

Pierce's theory is limited by its own terms to activities to produce oil and gas. It does not provide criteria for evaluating invasions of subsurface space for purposes unrelated to oil and gas extraction, like carbon dioxide sequestration.

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289. Eugene Kuntz, *Correlative Rights of Parties Owning Interests in a Common Source of Supply of Oil or Gas*, 17 INST. ON OIL & GAS L. & TAX'N 217, 225 (1966); *see also* Eugene Kuntz, *Correlative Rights in Oil and Gas*, 30 MISS. L.J. 1, 8 (1958) (defining the correlative rights doctrine as a "simple doctrine" that requires owners of a common resource supply to not inflict socially undesirable loss upon each other) [hereinafter Kuntz, *Correlative Rights*].

290. 1 KUNTZ, *supra* note 141, § 4.3, at 120.

291. *Id.* § 4.3, at 119.

292. Pierce, *supra* note 283, at 244.

293. *Id.* at 244–46 (citing Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trades and Ecosystems*, 83 MINN. L. REV. 129, 132 (1998)).

294. *Id.* at 243 (citing Carol M. Rose, *Property in All the Wrong Places?*, 114 YALE L.J. 991, 1017 (2005)).

295. David E. Pierce, *Employing a Reservoir Community Analysis to Define and Marshal Correlative Rights in the Oil and Gas Reservoir*, 76 LA. L. REV. 787, 796, 803–05 (2016).

296. *Id.* at 805, n. 104.

However, recognizing the potential for limited common property theory and correlative rights to clear the path for large-scale carbon dioxide sequestration, Tara Righetti applied the theory to pore space.[297] Righetti concludes that within this frame, "rather than treating ownership as exclusive, the rights of each owner within the private interconnected storage complex would be shared among members of the reservoir community based on principles of proportionate and coequal rights of use."[298] Standing alone, the mere fact of entry by a migrating plume of carbon would not entitle the owner to a remedy.

c. Insights and Observations from the Scholarship

There are important insights from the oil and gas scholarship concerning both correlative rights and subsurface trespass, which could enrich an account of trespass. For one, the literature recognizes that rights in common pools of oil or gas are correlative because of the nature of the resource.[299] I would encapsulate this lesson as follows: practically speaking, legal rights in oil and gas or pore space can extend only as far as their nature permits. Because these resources are found within permeable, interconnected rock formations that extend laterally below many legally distinct tracts of land, no single owner can exclusively possess any isolated portion of them while in place underground. Rather, oil, gas, and fluids injected into pore spaces migrate throughout a formation along a pressure gradient, ensuring that what substances exist under a tract of land today may wander off tomorrow. The maximum legal rights that may be acquired in such resources are qualified by the inherent fact that they will be affected by the legitimate activities of neighboring owners with rights in the same resource. An owner's rights in such interconnected and fugacious things are thus correlative with those of her neighbors in the common source of supply.

A second insight from this scholarship is that, owing ultimately to the interconnected and correlative nature of oil and gas reservoirs, the *ad coelum* rule applies loosely in this context, which justifies courts requiring some element of harm in addition to an unauthorized intrusion into a landowner's subsurface to give a remedy for the intrusion.[300] The mere fact of entry is not the sole criterion for liability, since the fluid and interconnected nature of the resource is such

297. Tara K. Righetti, *Correlative Rights and Limited Common Property in the Pore Space: A Response to the Challenge of Trespass in Carbon Capture and Sequestration*, 47 ENV'T L. REP. 10420 (2017).

298. *Id.* at 10421.

299. *E.g.*, 1 SUMMERS, *supra* note 141 § 3:4, at 147 ; Kuntz, *Correlative Rights*, *supra* note 289, at 1–2; Pierce, *supra* note 283, at 242; Righetti, *supra* note 297, at 10433; Hall, *supra* note 143, at 365–70.

300. Anderson, *supra* note 223, at 248–49; Hall, *supra* note 143, at 380–83; Kulander & Shaw, *supra* note 223, at 77.

that the resource cannot be exclusively controlled.[301] This is all the more true given the manner in which oil and gas are developed. Hydraulic fracturing and horizontal drilling technologies are essential to developing certain kinds of tight formations, and thus to artificially impose strict trespass principles would diminish the usefulness of the resource.[302] Thus, unless an entry somehow damages or harms the plaintiff's correlative property interest, the entry must not be wrongful. In this aspect, the problem of subsurface "trespass" actually resembles the tort of nuisance, as I have argued at length elsewhere.[303]

In defining the kind of harm that makes an unauthorized entry actionable, the literature and the case law take a decidedly functional, policy-oriented approach.[304] As Merrill and Smith observed, "many courts explicitly take hydraulic fracturing as a discrete policy problem and then work backwards to a rule that will serve the purpose. And in recent times commentators have likewise applied the same standard to judicial reasoning in this as in so many areas."[305] This can be seen in Anderson's and Hall's theories of subsurface trespass, Righetti's theory of correlative rights to conduct CCS,[306] and Pierce's and Kuntz's views of acceptable conduct in a reservoir,[307] each of which, to varying degrees, treats the question of what constitutes wrongful conduct in a common reservoir as a matter of public policy.

2. The Fair Opportunity Doctrine

Persuaded that the nature of oil and gas reservoirs and pore space necessitate a different legal regime than exclusion and ordinary trespass, but dissatisfied with the policy-oriented focus of the scholarship and case law, as well as the disaggregation of subsurface trespass from correlative rights and waste, I proposed a synthesis of the cases into the "fair opportunity doctrine."[308] The fair opportunity doctrine seeks to explain the common law doctrines of subsurface trespass, correlative rights, and waste under a broad, unifying principle that emanates from the case law.[309] By seeking a unifying

301. *See* Pierce, *supra* note 295, at 795–96; Righetti, *supra* note 297, at 10433.

302. *See* Pierce, *supra* note 295, at 805; Hall, *supra* note 143, at 399–401; Anderson, *supra* note 223, at 259 (discussing *Garza*).

303. Schremmer, *Getting Past Possession*, *supra* note 223.

304. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 537–54 (characterizing the predominate approach as functional).

305. Merrill & Smith, *Briggs*, *supra* note 19, at 18.

306. *See* Anderson, *supra* note 223, at 251; Righetti, *supra* note 281, at 634.

307. *See* Pierce, *supra* note 283, at 263–64; Kuntz, *Correlative Rights*, *supra* note 289, at 8.

308. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 529, 534 (discussing the dual problems of fragmentation and functionalism in the jurisprudence); *see generally* Schremmer, *Pore Space*, *supra* note 26 (applying fair opportunity doctrine to pore space rights); Schremmer, *Subsurface Trespass*, *supra* note 26 (exploring remedies for and regulation of subsurface trespass through fair opportunity doctrine); Merrill & Smith, *Briggs*, *supra* note 19, at 10–12 (discussing fair opportunity doctrine).

309. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 558–60.

principle, the fair opportunity doctrine bridges the gaps among these doctrinal areas and also manages to account both for rights to capture fugacious minerals and rights to inject into interconnected pore space.[310] By seeking an explanation of rights in these resources from an immanent principle in the case law rather than in public policy, the fair opportunity account of rights generates formal, workable rules for conduct in a common reservoir that can guide and coordinate private activities.[311] Deciding cases on grounds of public policy impoverishes the common law's ability to guide conduct ex ante.[312]

Much like exclusivity forms the unifying architecture of property rights in the *Restatement*'s theory, the fair opportunity doctrine is built on a basic principle. Instead of exclusivity, however, the unifying principle is correlativity. This principle is not the result of abstract reasoning but of reading the cases. The principle that rights are correlative and not exclusive emanates from the case law, as has been identified by commentators stretching back generations. Correlativity means that each owner with land overlying a common source of supply enjoys the equal right (or "opportunity") to enjoy the resource underlying the owner's tract, or its equivalent, without unreasonably interfering with the correlative right of other owners to the do the same.[313]

The elements of a prima facie case of trespass to an owner's corelative rights under the fair opportunity doctrine derive from the fair opportunity principle, as well as the basic structure of tort law, which requires an affirmative act, intent, and causation. Thus, liability requires an affirmative and intentional act of the defendant that causes an interference with the plaintiff's right to capture resources from or inject into the portion of a common reservoir underlying the plaintiff's tract. The cases demonstrate that such an interference generally also requires a physical invasion of the subsurface space underlying

310. I have explicitly extended my fair opportunity theory to also cover pore space in interconnected rock formations. *See id.* at 558; Schremmer, *Pore Space*, *supra* note 26, at 68–71. The fair opportunity doctrine excludes from its coverage trespasses to the immediate reaches of a subsurface tract or to solid, hard-rock minerals for the simple reason that these resources are exclusive, not correlative, in nature. Schremmer, *Unifying Doctrine*, *supra* note 26, at 530–34.

311. Schremmer, *Unifying Doctrine*, *supra* note 26, at 558.

312. At the base of this formal approach is a conception of private law as, first and foremost, a source of "practically reasonable normative guidance" for individual members of society in planning and ordering their affairs, pursuing their moral interests, and coordinating their conduct with that of others toward their common good. *See* Miller, *supra* note 56, at 178. While private law also has a remedial function, courts should not subordinate their responsibility in shaping doctrine to provide comprehensible guidance to the goal of optimizing results in the adjudication of disputes. In adjudicating disputes and remedying wrongs, courts should take care to maintain and improve the usefulness of the abstract general principles of the common law that guide third parties in their own conduct. Paul B. Miller & Jeffrey A. Pojanowski, *The Internal Point of View in Private Law*, 67 AM. J. JURIS. 247, 267 (2022).

313. Schremmer, *Unifying Doctrine*, *supra* note 26, at 559.

the plaintiff's parcel,[314] although there are occasions in which the defendant may be subject to liability for wasting the common source of supply without entering the plaintiff's land.[315] In either case, harm to the plaintiff's operations to capture or inject below the plaintiff's tract, or the plaintiff's right to do so, is essential to the actor's liability.

Stated as an elements test, an actor is subject to liability if (1) by an affirmative act, (2) the actor intentionally causes a physical invasion of the plaintiff's property boundaries that (3) harms the plaintiff's existing use of the subsurface space below the plaintiff's tract for capturing mineral or injecting substances in a common source of supply, or otherwise substantially impairs the plaintiff's equal right to do so.[316]

Trespass liability requires invasion of *ad coelum*-defined boundaries coupled with actual harm.[317] The invasion requirement helps to determine causation by delineating whose rights may have been infringed based on whose tract was intruded upon.[318] Thus, the theory does not disregard the *ad coelum* principle but, consistent with the cases, instead limits it to identifying the portion of a common reservoir that an owner alone may drill to extract or inject and the proportional share of the oil and gas or storage capacity of the reservoir the owner may generally enjoy.[319] The invasion requirement also ensures that a plaintiff may recover only by demonstrating that it is more likely than not that the defendant's activity crossed the boundary line into the plaintiff's tract. Given the difficulty in monitoring deep subsurface boundaries, this has the practical effect of deterring litigation over questionable or merely suspected boundary invasions.[320]

Physical invasion is necessary to liability under the fair opportunity doctrine, but it is not sufficient.[321] The harm requirement must be satisfied as well.[322] In the fair opportunity account of harm, a plaintiff's actual use of a common reservoir to capture minerals or inject substances may be harmed, such as where the defendant's physical invasion interferes with the operation of the plaintiff's oil well, but a plaintiff's *right to capture or inject* into the portion of the reservoir underlying her land may also be harmed.[323] A plaintiff's *right to capture or inject* might be harmed when an actor injects saltwater into the reservoir for a secondary recovery project that encroaches into the plaintiff's tract and

314. *Id.* at 566–70.
315. *Id.* at 583.
316. *Id.* at 591.
317. *Id.* at 559–60.
318. *Id.* at 566–70.
319. *Id.* at 560–63.
320. *See id.*; Merrill & Smith, *Briggs*, *supra* note 19, at 16–18.
321. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 559–60.
322. *Id.*
323. Schremmer, *Unifying Doctrine*, *supra* note 26, at 570–71.

precludes the plaintiff from sinking her own well to capture minerals or inject into the reservoir.[324] This articulated definition of harm accounts for cases finding defendants liable for subsurface trespass even though their actions caused no physical damage or interference to the plaintiff's existing subsurface activities.

The fair opportunity doctrine also accounts for cases in which a plaintiff suffered harm to her right to enjoy a common reservoir but is denied recovery nonetheless because she had previously rejected a reasonable chance to participate with the defendant in the conduct that caused the harm.[325] This is the "fair offer" exception, and it applies most commonly to secondary and enhanced recovery operations that tend to require the consent of subsurface owners throughout a reservoir.[326] The exception might also be relevant to a defendant's use of a reservoir for CCS.[327] By receiving a bona fide offer to participate in an operation of this kind, the plaintiff might be thought of as enjoying the full benefit of her equal opportunity to enjoy a proportional share of the common resource.

As noted, the fair opportunity doctrine also recognizes that an actor may be subject to liability for waste even if the actor did not cause a physical invasion of the plaintiff's subsurface.[328] Although not a trespass, liability for waste also hinges on the defendant's conduct harming the plaintiff's right to capture minerals or inject into a common reservoir. This will be explained more fully below.[329]

B. Applying Harm-Based Trespass

1. Fugacious Minerals

The following Parts demonstrate how the fair opportunity doctrine describes and explains the case law within a correlative rights framework. This Part covers cases involving intrusions to fugacious resources like oil and gas. The next details intrusions of pore space by migration of injected fluids.[330]

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324. *See id.* at 576–80.

325. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1023–25.

326. Schremmer, *Unifying Doctrine*, *supra* note 26, at 580–83.

327. *Id.* at 592; Schremmer, *Pore Space Property*, *supra* note 26, at 70–72.

328. Schremmer, *Unifying Doctrine*, *supra* note 26, at 583.

329. *See infra* Part III.C.

330. Throughout the discussion, it is helpful to recall that a single subsurface intrusion may cause injury to at least two distinct property interests—the surface estate and a severed mineral estate. Under the fair opportunity doctrine, the standard that applies to invasions of the surface estate may differ from that which applies to an estate in fugacious minerals. For example, where a defendant drills a slant well into a neighbor's

a. Slant Wells

The slant well cases provide the best evidence that ordinary principles of trespass apply to deep subsurface entries, as asserted in the *Restatement*. Accordingly, they present the hardest cases for a harm-based account like the fair opportunity doctrine to explain. But, subsurface trespass *simpliciter* is commonly presented as coexisting with judicial notions of correlative rights as limits on the rule of capture,[331] and a proper framing of the *ad coelum* principle demonstrates how slant well trespass is consistent with a harm-based conception of liability.

Ad coelum does not define an owner's zone of exclusive possession within a common reservoir, wherein the owner may block any unwanted intrusions, but it does delineate the portion of the reservoir that the owner alone is entitled to use and enjoy free from interference with that use and enjoyment. *Ad coelum* does not, strictly speaking, determine the owner's proportional share of the contents of a common pool. Rather, it entitles the owner to exercise her equal opportunity, free from the interference of similarly entitled owners, to enjoy the portion of the pool that underlies her particular *ad-coelum*-defined tract. Thus, under *ad coelum*, the owner of land overlying a common reservoir of oil or gas is entitled to capture through a wellbore whatever oil and gas may naturally be in place under (or because of pressure changes caused by the owner's well, might migrate into) *that very tract of land*, free from interfering intrusions from others in the reservoir.[332]

The difference is critical because oil- and gas-bearing formations are not uniform across their entire extent in terms of their stratigraphic location in the subsurface, their thickness, porosity, permeability, oil saturation, or other relevant qualities.[333] The portion of the Viola formation that underlies Blackacre, for example, may be more favorable for oil production than the portion that underlies Whiteacre, next door. Each tract owner is equally entitled to conduct operations to capture the oil or gas that may be in place from time to time in the Viola formation underlying the owner's own tract. If each owner

tract to extract oil and gas, the injury to the owner of the oil and gas rights in the invaded tract may suffer injury from drainage of oil and gas, while the owner of the surface estate in the invaded tract may suffer injury from the penetration of solid rock formations that are part of the surface estate. Ordinary trespass principles would apply to the invasion of the surface estate owner's solid rock formations, while modified trespass would apply to the invasion of the mineral owner's interest in the oil and gas. When an invasion involves the migration or storage of fluids in pore space, the same standard might apply to determine the injury to both estates. For instance, where a defendant injects fluids that migrate into a neighboring tract, the owner of the oil and gas interest in the tract might suffer injury to the owner's opportunity to produce the oil and gas in the tract, while the owner of the surface estate might suffer injury to the opportunity to use the pore space for beneficial purposes. In this case, because both estate owners enjoy only correlative rights (one in pore space, the other in oil and gas), the same modified definition of trespass would apply to both.

331. *See, e.g.*, LOWE ET AL., *supra* note 143, at 51–54; HEMINGWAY, *supra* note 143, at 176–77.

332. *See* Alphonzo E. Bell Corp. v. Bell View Oil Syndicate, 76 P.2d 167, 171–72 (Cal. Dist. Ct. App. 1938).

333. *Id.* at 172.

exercises this right with diligence, the owner of Blackacre will probably capture more of the Viola's contents than Whitacre. This is each owners' common law correlative right.[334]

If the owner of Whiteacre were to deviate a well into the portion of the Viola formation underlying Blackacre and produce the oil and gas in place, the slant well would interfere with the owner of Blackacre's opportunity to capture oil and gas from her own portion of the formation. Merely drilling her own well into the formation (either under Blackacre or under Whiteacre) probably would not make whole the lost opportunity of Blackacre's owner to capture oil and gas from the full extent of her portion of the reservoir, because the reservoir's characteristics differ from tract to tract and from location to location within a tract. Since "doing likewise" is not a viable option for the affected owner, a cause of action for trespass is necessary to rebalance the owners' correlative rights in the Viola formation.

Producing minerals through a slant well is thus always wrongful, not simply because it constitutes a physical entry into the plaintiff's tract but also because it invariably interferes with the plaintiff's equal chance to capture the resource underlying the plaintiff's tract. Appling the fair opportunity doctrine's element test for trespass liability, in a typical slant well case (1) the actor affirmatively (2) causes a physical entry into the plaintiff's tract by drilling a wellbore that (3) harms the plaintiff by substantially impairing her equal right to capture the oil and gas from under her own tract.

Because it is a trespass to drill and produce minerals from a slant well, the rule of capture does not apply and the resulting production is a conversion.[335] Accordingly, the remedies for a trespass by slant drilling may include nominal damages for the trespass as well as compensatory damages for the value of the converted minerals.[336] The plaintiff may also be entitled to an injunction prohibiting the continued operation of the well.[337] Contrary to the *Restatement*'s position, these remedies do not depend on a showing that the plaintiff's equal right to capture oil and gas has been impaired because such an injury is inherent in liability for the trespass in the first place. Rather, the availability of these remedies follows from the fact of liability for trespass.

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334. *Id.* at 171–172.

335. *Id.* at 175.

336. HEMINGWAY, *supra* note 143, at 173–74; *e.g.*, Edwards v. Lachman, 534 P.2d 670, 677 (Okla. 1974).

337. Union Oil Co. of Cal. v. Domengeaux, 86 P.2d 127, 129 (Cal. Dist. Ct. App. 1939); *see generally* Schremmer, *Subsurface Trespass*, *supra* note 26, at 1045–46 (considering the practical likelihood of injunctive relief following a subsurface trespass claim).

b. Horizontal Drilling

Although the *Restatement* struggles to explain why defendants seem to be subject to liability for producing slant wells but not necessarily for nonproducing wellbores,[338] the fair opportunity doctrine explains this difference as well as why the cases differ as to whether a defendant may be subject to trespass liability for a nonproducing well or tunnel. It is essentially a matter of fact whether the mere presence of an unwanted wellbore or tunnel interferes with the surface owner's ability to use or enjoy her portion of subsurface space, including by capturing hydrocarbons located under the land. Where the facts support a finding that the invading wellbore impairs the plaintiff's opportunity to develop his own portion of the subsurface, defendants may be subject to liability, and where the facts do not support such a finding, defendants are not liable.[339]

Compare the *Lightning Oil* and *Howell* cases discussed in connection with *Restatement* Section 1.2F.[340] In *Lightning Oil*, the court affirmed the trial court's grant of partial summary judgment to the defendant, finding that the plaintiff offered only its own speculation that the proposed wells would interfere with the "subsurface spaces necessary for it to exercise its right to develop the minerals in the future."[341] Mere speculation "is not enough" to establish the plaintiff's entitlement to injunctive relief for a trespass.[342] In *Howell*, by contrast, the court affirmed the trial court's preliminary injunction prohibiting drilling of the defendant's traversing wellbore through the plaintiff's minerals, finding that there was competent evidence of damage to "the oil, gas and mineral formation under the surface" to support the plaintiff's claim for trespass.[343] The two cases differ in their evidentiary records.

It is clear from the diversity of results in the cases that harm is a necessary element of trespass liability. Furthermore, many of these cases explicitly require harm as part of the court's definition of a subsurface trespass.[344] This rationale makes sense in the context of correlative rights. Unlike a slant well that

338. *See supra* Part II.B.1.

339. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 573–75.

340. *See supra* Part II.B.2.

341. Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 49 (Tex. 2017).

342. *Id.*

343. Chevron Oil Co. v. Howell, 407 S.W.2d 525, 528 (Tex. App. 1966); *accord* Tera II LLC v. Rice Drilling D, LLC, 679 F. Supp. 3d 620, 643 (S.D. Ohio 2023), *on reconsideration in part*, No. 19-CV-2221, 2024 WL 231456 (S.D. Ohio Jan. 22, 2024), *opinion clarified*, No. 19-CV-02221, 2024 WL 248889 (S.D. Ohio Jan. 22, 2024) (finding that facts in the discovery record supported conclusion that defendant's drilling under Plaintiffs' tract would substantially impact "the stability and use of subsurface minerals, leading to the logical conclusion that Plaintiffs' reasonable and foreseeable use of the hydrocarbons in the Point Pleasant would be impacted"); Honey Crest Acres, LLC v. Rice Drilling D, LLC, 723 F. Supp. 3d 617, 625 (S.D. Ohio 2024) (denying motion to dismiss plaintiff's subsurface trespass claims based on evidence that the drilling would damage the reservoir under plaintiff's land and cause hydrocarbons to migrate away).

344. *See supra* Part II.B.3.

produces minerals from under the plaintiff's tract directly, divesting the plaintiff of the opportunity to obtain minerals from a wellbore drilled in the same location, a nonproducing wellbore conceivably could be harmless. Nevertheless, the presence of a nonproducing wellbore often, and perhaps usually, will interfere in some manner with the plaintiff's opportunity to drill or produce minerals, perhaps for no reason other than the fact that the wellbore will have destroyed some minerals in its construction and that its presence in the subsurface will block locations that the plaintiff might otherwise have placed wellbores of her own. Whether these conditions exist is a question of fact, which means that results in cases will vary as their facts vary.

c. Hydraulic Fracturing

Similarly, intrusions by hydraulic fracturing may or may not be actionable trespasses based on difficult fact questions, namely whether there is in fact a crossing of the boundary into the plaintiff's tract and, if so, whether the crossing somehow impaired the plaintiff's ability to develop the minerals underlying her own tract.[345] The fact of an intrusion by fracking is likely much harder to prove than an intrusion by a wellbore. It is also probably more difficult to prove that a fracking intrusion impairs the plaintiff's equal rights to develop the minerals underlying the invaded tract.

It is on this basis that we can distinguish between slant wells that capture oil and gas from the plaintiff's land and hydraulic fractures that do so. As I have argued before:

> The presence of a slant-hole wellbore physically precludes the plaintiff from placing a well in the same location and producing the proximate oil or gas; the presence of frack fissures, in contrast, does not prevent the plaintiff from drilling or fracking into the same portion of the reservoir. State well-spacing regulations, furthermore, prohibit the drilling of new wells within the near vicinity of existing wells but do not generally limit the placement of wells in the vicinity of frack fissures. Consequently, the damage done by a producing slant-hole wellbore is not necessarily remediable by simply allowing the plaintiff to drill its own slant-hole wellbore, whereas the damage done by cross-boundary frack fissures can be remedied by allowing the plaintiff to do the same. The distinction thus turns on the conduct's effects on a plaintiff's fair opportunity to develop its portion of the subsurface.[346]

Consistent with the fair opportunity doctrine, the actor is generally subject to liability when frac fissures damage a plaintiff's producing well. One case, *Yoho*

345. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 573–75.

346. *Id.* at 575.

v. Southwestern Energy Co., has held that a defendant may be subject to liability for nuisance and negligence for a hydraulic fracturing operation that physically damaged a producing well on the plaintiffs' tract—an event called a *frac hit* or *frac bash*.[347] Consistent with the fair opportunity doctrine, the plaintiff was able to state a claim for relief based on a defendant-side act that caused an entry into the plaintiff's tract that harmed the plaintiff's well "and its production capabilities moving forward."[348]

Yoho went on to hold, contrary to the *Restatement*'s position in Section 1.2F(b), that the rule of capture was not applicable to privilege the defendant's conduct because "[t]he Rule of Capture was formulated to address the factual scenarios where a well on one property is draining oil and gas from an adjacent property, without any intervening negligence, trespass, or nuisance."[349] Hence, in the event a defendant is subject to liability for trespass, nuisance, or negligence that results in drainage of fugacious minerals from the plaintiff's tract, the drainage would not be privileged under any circumstance. This is contrary to the *Restatement* but consistent with the conventional view and the fair opportunity doctrine.

2. *Subsurface Spaces*

a. *Intrusion by Injected Gasses*

The major difficulty of *Restatement* Section 1.2D in restating trespass principles as applied to migration of injected gasses, is the existence of several cases finding trespass liability even though gas is not traditionally a "tangible" object capable of causing a trespass.[350] The fair opportunity doctrine suffers from no such difficulty because it does not require, as traditional trespass does, entry of the plaintiff's close by a tangible person or object. It instead requires only a physical entry of the kind that would satisfy the requirements of nuisance law.[351] Physical invasion of a plaintiff's tract by gasses certainly may qualify as a nuisance, even though most courts would not consider it tangible for trespass purposes.[352] Courts have found actionable invasions of subsurface rights by a wide variety of things and substances, many of which would not traditionally support trespass liability. These include natural gas, toxic gas, fire, air, vibrations, and pressure.[353] Hydraulic fractures would also satisfy the fair

347. Yoho v. Sw. Energy Co., 688 F. Supp. 3d 345, 355 (N.D. W. Va. 2023).
348. *See id.* at 350–55.
349. *Id.* at 354.
350. *See supra* Part II.C.2.a.
351. Schremmer, *Unifying Doctrine*, *supra* note 26, at 566–70.
352. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D cmt. a (A.L.I., Tentative Draft No. 4, 2023).
353. Schremmer, *Unifying Doctrine*, *supra* note 26, at 567 (collecting cases).

opportunity doctrine's physical invasion requirement, even though it is unclear whether they would under the *Restatement*.[354]

Rather than focusing on the entry requirement, the fair opportunity doctrine centers the analysis on the harm element, which is precisely where the cases focus their attention. Defendants may be subject to liability when injected gasses cross into a plaintiff's subsurface space if the intrusion interferes with the plaintiff's existing operations (such as where it diminishes the productivity of plaintiff's oil and gas wells)[355] or otherwise impairs the plaintiff's equal right to use the subsurface storage space taken up by the defendant's gas.[356]

By recognizing a looser standard for physical invasions, the fair opportunity doctrine sacrifices none of the advantages of requiring a physical entry that are touted by the reporters and Merrill and Smith. The fair opportunity doctrine does require a showing that the defendant's conduct caused an entry into the plaintiff's tract.[357] The theory's physical invasion requirement both helps to establish and maintain the boundary between subsurface rights holders, which the *Restatement* explains is essential to determining parties' correlative rights.[358] Moreover, the invasion requirement helps to clarify causation by distinguishing the sufferer (the owner of the invaded tract) from the doer (the defendant whose conduct caused the invasion) of the wrong.[359] Finally, the fair opportunity doctrine's physical invasion requirement also helps filter out tenuous claims for relief by "permitting claims for invasions that are likely to also satisfy the third element of liability (interference with the plaintiff's existing operations or its fair opportunity to use) to proceed while throwing up an obstacle to those claims that are unlikely to satisfy the third element."[360] The physical invasion requirement thus serves the same functions as the *Restatement*'s physical entry requirement.

354. *See id.* at 568–69; RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D cmts. b, c (A.L.I., Tentative Draft No. 4, 2023).

355. *See, e.g.*, Regency Field Servs., LLC v. Swift Energy Operating, LLC, 622 S.W.3d 807, 816 (Tex. 2021); Colt Energy, Inc. v. S. Star Cent. Gas Pipeline, Inc., No. 22-3099, 2022 WL 1288482, at *2–3 (D. Kan. Apr. 29, 2022), *aff'd*, No. 22-3099, 2023 WL 5126892 (10th Cir. Aug. 10, 2023).

356. *See, e.g.*, Baatz v. Columbia Gas Transmission, LLC, 929 F.3d 767, 777 (6th Cir. 2019).

357. Schremmer, *Unifying Doctrine*, *supra* note 26, at 566–70.

358. RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2C cmt. b (A.L.I., Tentative Draft No. 4, 2023).

359. *Cf.* Richard A. Epstein, *Nuisance Law: Corrective Justice and Its Utilitarian Constraints*, 8 J. LEGAL STUD. 49, 57–60 (1979) (demonstrating how the physical invasion requirement of nuisance law informs questions of causation).

360. Schremmer, *Unifying Doctrine*, *supra* note 26, at 569–70.

b. Intrusion by Injected Fluids

The fair opportunity doctrine's correlative conception of rights in common reservoirs also explains the case law involving migration of injected fluids and solids. By its nature, pore space within a permeable formation allows fluids to migrate throughout the formation.[361] When actuated by the drilling of a well, this characteristic enables the capture of fugacious minerals, which flow into the well from the surrounding reservoir.[362] This characteristic also enables the disposal or storage of substances in the reservoir by permitting fluids injected through the well to flow away from the well into the surrounding reservoir.[363] Thus, just as the production of fugacious minerals from a common reservoir might drain neighboring tracts and diminish the resources available under those tracts, the injection of fluids into a reservoir entails migration into neighboring tracts and a reduction of the amount of open storage space within those tracts.[364] In short, the nature of the resource does not permit exclusion of foreign substances.

Accordingly, courts have recognized an owner's right to inject substances within a reservoir underlying the owner's tract but generally have not endowed owners with a right to exclude substances injected by others. Although the intrusion of unwanted fluids is unavoidable and thus, not actionable, intrusions that harm an owner's use of or opportunity to use subsurface resources are actionable as trespasses. There are many examples in the cases. Some of these cases involve fluids injected for disposal that interfered with oil wells and contaminated oil reserves.[365] Other cases involve fluids injected for secondary hydrocarbon recovery pursuant to administrative authority that did the same.[366]

Conceptually, even if migrating fluid does not interfere with a reservoir owner's current activities, it might nonetheless harm the owner's *right to* conduct lawful activities in the reservoir. Although fewer examples of this kind of harm can be found in the cases (perhaps because this kind of harm is more difficult to prove), examples can be found where one party's injections into the reservoir practically preclude the plaintiff owner from using the portion of the reservoir underlying her tract.[367] Most of the time, however, one party's injection into a reservoir (for either disposal or secondary recovery) does not harm another's

361. Schremmer, *Pore Space*, *supra* note 26, at 7–8.

362. *Id.* at 8.

363. *Id.*

364. *Id.*; *see also* Hall, *supra* note 5, at 389, 402 (explaining the creation of storage formations and the practice of underground injection disposal).

365. *See, e.g.*, W. Edmond Hunton Lime Unit v. Lillard, 265 P.2d 730, 731 (Okla. 1954).

366. *See, e.g.*, Tidewater Oil Co. v. Jackson, 320 F.2d 157, 159–60 (10th Cir. 1963).

367. *See, e.g.*, Jameson v. Ethyl Corp., 609 S.W.2d 346, 350–51 (Ark. 1980); *see also* Chance v. BP Chems., Inc., 77 Ohio St. 3d 17, 25–28, 670 N.E.2d 985 (1996)) (defining harm to include interference with "reasonable *and foreseeable use*") (emphasis added).

actual operations or preclude another's foreseeable operations and thus does not harm the plaintiff's use of or right to use the resource.[368]

This description of the property interest in subsurface space also explains a set of cases entirely ignored by the *Restatement*. Where an injector so completely occupies the plaintiff's portion of the reservoir as to harm the plaintiff's right to use it, the actor might nonetheless avoid liability by offering the plaintiff an opportunity to participate on a proportional basis in the benefits and burdens of the injection activity.[369] Scenarios like this most commonly arise in connection with a defendant's permitted secondary recovery operation. Courts typically bar a plaintiff from recovering for a trespass that drains oil or gas from the plaintiff's tract into the defendant's wells if the plaintiff received and rejected a fair, reasonable, and nondiscriminatory offer to participate in the operations.[370] In the fair opportunity account, this result is justified because the plaintiff's opportunity to use and enjoy her portion of the reservoir is vindicated by receipt of a bona fide and fair offer to participate.

C. Accounting for Common Law Waste

Another feature of the fair opportunity doctrine is that it accounts for the common law doctrine of waste. The judicial doctrine is distinct but related to legislative waste prohibitions adopted in all oil and gas producing states dating back to the beginning of the twentieth century.[371] As with correlative rights, waste doctrine is basically ignored in the *Restatement*'s treatment of oil and gas rights and trespass.[372]

Waste liability is not coextensive with trespass liability. Like trespass liability, it arises from violation of another reservoir owner's correlative rights.[373] A surface owner's correlative rights in reservoirs of oil and gas (and

368. *See, e.g.*, W. Edmond Salt Water Disposal Ass'n v. Rosecrans, 226 P.2d 965, 968–70 (Okla. 1950); Boudreaux v. Jefferson Island Storage & Hub, LLC, 255 F.3d 271, 275 (5th Cir. 2001); R.R. Comm'n v. Manziel, 361 S.W.2d 560, 568–69 (Tex. 1962); Budd v. Ethyl Corp., 474 S.W.2d 411, 412 (Ark. 1971).

369. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 580–81; Schremmer, *Subsurface Trespass*, *supra* note 26, at 1023–25; 1 KUNTZ, *supra* note 141, § 4.8 at 131–34.

370. *See, e.g.*, Baumgartner v. Gulf Oil Corp., 168 N.W.2d 510, 515–16 (Neb. 1969); Tide Water Associated Oil Co. v. Stott, 159 F.2d 174, 178–79 (5th Cir. 1946); Reed v. Tex. Co., 159 N.E.2d 641, 633–44 (Ill. App. Ct. 1959).

371. 1 KUNTZ, *supra* note 141, § 4.4 at 121 ("Independent of statute, some limitation upon the rights under the law of capture are recognized at common law."). *See generally* Righetti & Schremmer, *supra* note 281, at 637–40 (discussing relationship between waste doctrine and regulation).

372. Although the comments and reporters' note to Section 1.2C mention prohibitions on waste of common sources of oil and gas, the image of waste that emerges is little more than a regulatory limitation on the rule of capture. *See* RESTATEMENT (FOURTH) PROP. vol. 2 § 1.2C cmts. d, g, reporters' note (A.L.I., Tentative Draft No. 4, 2023).

373. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 583.

pore space) entitle the owner to be free from the wasteful acts of other owners, much as they entitle the owner to be free from unauthorized physical invasions that harm the owner's use or opportunity to use the portion of the resource under the owner's tract.[374] In essence, waste is an act that makes all or a portion of a common reservoir unavailable for capture or use by other owners for no beneficial or legitimate purpose.[375] It occurs when producers negligently damage or destroy a common reservoir of hydrocarbons,[376] when they use highly inefficient production means that prematurely strand substantial portions of oil or gas in place,[377] and when they dissipate the contents of a reservoir without selling them or putting them to beneficial use.[378]

Waste liability is similar to liability for trespass in that the ultimate interest that is protected is the plaintiff's correlative right to an opportunity to enjoy the underlying share of the common resources.[379] It differs from liability for trespass in that it arises, not from a physical invasion of the plaintiff's *ad coelum* boundaries, but from spoilage, dissipation, or destruction of the reservoir, regardless of where it occurs.[380] Many cases finding a defendant liable for waste in a common reservoir do not involve physical invasions of the boundaries of the plaintiff's tract and thus should not subject the actor to trespass liability (under either a traditional or harm-based account).[381] Instead, cases recognizing liability for common law waste involve relatively obvious and easy-to-monitor actions that clearly wrong the plaintiff's interest in the common oil or gas pool.[382] While not physical entries, these obvious actions perform many of the same functions of the physical invasion requirement, such as ensuring the likelihood that the defendant has acted, that his actions are causally related to the consequences to the plaintiff's property, and that the consequences are significant enough to justify a judicial remedy.

The *Restatement*'s account of subsurface trespass, in contrast, is inconsistent with common law waste doctrine. The relevant blackletter sections pertaining to rights to capture fugacious minerals mention trespass as the only common law limit on the rule of capture, although they acknowledge that the rule of capture is subject to positive legislation and regulation.[383] The blackletter of the

374. *See* 1 KUNTZ, *supra* note 141, § 4.4 at 121.

375. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1025.

376. *See* Elliff v. Texon Drilling, 210 S.W.2d 558, 563 (Tex. 1948).

377. *See* Mfrs.' Gas & Oil Co. v. Ind. Nat. Gas & Oil Co., 57 N.E. 912, 914–15, 917 (Ind. 1900).

378. *See* Louisville Gas Co. v. Ky. Heating Co., 77 S.W. 368, 369–70 (Ky. 1903).

379. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1025.

380. *Id.* at 1025.

381. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 583.

382. Smith, *supra* note 55, at 1030–32.

383. *See* RESTATEMENT (FOURTH) PROP. vol. 1 § 1.16 (A.L.I., Tentative Draft No. 4, 2023) (defining a landowner's rights in fugacious minerals and providing that a landowner "is entitled to capture oil, gas, and other fugacious minerals that enter the subjacent space, and may extract these minerals by any method that does not entail an unauthorized entry"). While the section caveats this broad declaration of the rule of capture

Restatement thus adopts an unqualified view of the rule of capture. This view is often associated with the infamous case of *Hague v. Wheeler*, where it was held that the owner in a common pool of natural gas was entitled to waste the gas by venting it from a well on his land.[384] Because "the owner of the surface is an owner downward to the center, . . . [h]is dominion is, upon general principles, as absolute over the fluid as the solid minerals."[385] According to Kuntz, *Hague* "represents the high water mark of the law of capture in the recognition that an owner may use or abuse his right to extract substances from the land without regard to the interests of owners in the common source of supply" and is "radically" out of line with the prevailing "judicial attitude."[386]

* * *

In summary, the fair opportunity doctrine manages to account for the cases involving slant wells, fracking, horizontal drilling, and migrating gasses, solids, and liquids by a single test requiring a defendant-side act that causes a physical invasion of the plaintiff's tract and harms the plaintiff's use or right to use the portion of the resource underlying the plaintiff's tract. It explains why defendants are virtually always subject to trespass liability for producing slant wells (subsurface trespass *simpliciter*) but may or may not be liable for drilling or tunnelling through a plaintiff's tract or for capturing minerals through fracking. By applying the same basic principles and focusing on the kinds of interferences that may harm an owner's existing uses or fair opportunity to use the underlying portion of a formation, the fair opportunity doctrine also makes sense of the disparate case law involving migration of injected fluids. Finally, unlike the *Restatement* which ignores waste as a common law limit on the rule of capture, the fair opportunity doctrine accounts for the judicial waste doctrine recognized in case law. In these ways, the fair opportunity doctrine achieves a greater fidelity to the existing cases than the *Restatement* by embracing precisely what the *Restatement* rejects: a harm-based account of subsurface trespass.

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with the proviso that "[t]his power is subject to positive legislation and regulation," neither the blackletter nor the comments acknowledge a common law waste limitation. *See id.* at vol. 1 § 1.16 cmts. a–g. Section 1.2C (Vol. 2) on trespass to fugacious minerals also does not mention waste in the blackletter, though comment d acknowledges that producers may be liable for waste under judicial doctrine. *Id.* vol. 2 § 1.2C cmt. d.

384. 27 A. 714, 719–20 (Pa. 1893).

385. *Id.* at 719.

386. 1 KUNTZ, *supra* note 141, § 4.4 at 121.

IV. ADVANTAGES OF THE HARM-BASED ACCOUNT

The mere fact that a harm-based account of subsurface trespass, along the lines of the fair opportunity doctrine, restates the existing cases more accurately may be sufficient reason to prefer it to the *Restatement*'s approach. It might be wondered, however, whether a case could be made that the *Restatement*'s adoption of ordinary trespass for all subsurface intrusions is preferable on normative grounds to acknowledging that a modified, harm-based tort applies to certain kinds of resources. If, as Merrill and Smith contend, standard principles of exclusion and trespass when applied to fugacious minerals and interconnected pore space serve the guidance function of law and furnish a good baseline for more specialized rulemaking by contract and regulation,[387] then the *Restatement* should indeed prioritize articulating this legal architecture rather than describing the decisional law more precisely.

Fortunately, there is no need to choose between the normative benefits of the architectural approach and the descriptive fidelity of a harm-based account. On the contrary, the normative goals of Merrill and Smith and the *Restatement* in articulating the architecture of property law are *better served* by adopting a harm-based account of trespass to fugacious minerals and interconnected pore space that is built on a foundation of correlative rights. In addition to being more faithful to the case law, the correlative understanding of common law rights in oil and gas and pore space enjoys an advantage over the *Restatement*'s interpretation because it justifies, rather than inhibits, effective administrative regulation of rights in these resources. What is more, although public regulation can refine and enhance the common law in creating an integrated governance regime, the correlative, harm-based interpretation of the common law is effective by itself, even without public regulation, in guiding and coordinating private developers of oil and gas and pore space.

A. Modified Trespass as a Regulatory Baseline

In Merrill and Smith's view, a good interpretation of common law property rights is one that guides effectively and helps instead of hinders other legal institutions, like administrative regulatory bodies, in resolving problems that common law doctrine is not adept at addressing.[388] By this measure, the fair opportunity doctrine's conception of correlative rights and harm-based account of trespass outperforms the ordinary trespass-based theories of Merrill and Smith and the *Restatement*. Beyond being more faithful to the case law, the most important advantage the harm-based account of subsurface trespass enjoys over

387. *See* Merrill & Smith, *Briggs*, *supra* note 19, at 20.

388. *See supra* Part I.B.

the *Restatement* is that it justifies, rather than complicates, efforts at refining common law rights and duties through regulation.

The harm-based account's comparative advantage in this regard has to do with regulatory takings jurisprudence. States have the inherent police power to regulate private rights, including the exercise of private property rights, but this power is limited by the constitutional prohibition against "takings" of private property for public use without just compensation.[389] Historically, states have adopted extensive regulation of private rights in common pools of oil and natural gas.[390] This "conservation regulation" has consistently passed constitutional muster under the takings clause and other constitutional provisions on the premise that it prevents waste and protects correlative rights in a common resource.[391] Yet, while courts tend to be highly deferential to exercises of state police power toward these ends, actions that cause an owner to suffer a physical occupation of her land without just compensation are held to be unconstitutional takings per se.[392] The per se rule against physical invasions undermines the ability of states that adopt a definition of subsurface trespass like the *Restatement*'s to apply time-honored regulatory mechanisms from oil and gas conservation to conserve other interconnected resources like pore space. On the other hand, states that adopt a harm-based view of trespass based on a correlative understanding of property rights in pore space will thereby ease the way for legislatures and administrative agencies to further protect property rights.

To demonstrate, I will compare three cases. The first two cases upheld conservation laws governing rights in common pools of oil and gas against constitutional challenge based on a correlative and harm-based understanding of oil and gas property. The third is a recent case that struck legislation intended to modify landowners' rights in interconnected pore space on the theory that the legislation removed a landowner's right to exclude migrating fluids.

1. Correlative Rights and Regulation

The first case demonstrating how correlative rights justify regulatory limits intended to conserve a common resource is the venerable *Ohio Oil Co. v.*

389. U.S. CONST. amend. V.

390. *See generally* BRUCE M. KRAMER & PATRICK H. MARTIN, 1 THE LAW OF POOLING AND UTILIZATION § 3.02 (3d ed. 1995) (explaining the historical approaches of the states to regulating common pools of oil and natural gas).

391. *See* Kerns v. Chesapeake Exploration, LLC, 762 F. App'x 289, 296–97 (6th Cir. 2019).

392. Cedar Point Nursery v. Hassid, 594 U.S. 139, 147–48 (2021); Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 425–26 (1982).

Indiana.[393] In *Ohio Oil*, the United States Supreme Court considered an appeal from the Indiana Supreme Court on the validity of state legislation proscribing the venting of natural gas into the open air from oil and gas wells.[394] The State of Indiana sued to enjoin Ohio Oil Company from operating an oil well that produced associated natural gas.[395] Ohio Oil allowed this gas to escape into the air, thereby releasing back pressure on the well and enabling production of the oil.[396] Lacking any pipeline or processing or manufacturing facility for the gas, Ohio Oil had to choose whether to release the gas or shut in the well entirely.[397] Ohio Oil challenged the statute as a taking of property and a denial of due process under the Fourteenth Amendment.[398]

The Court began its analysis by establishing that the:

> [P]eculiar character of the substances, oil and gas, . . . [in] the manner in which they are held in their natural reservoirs, [and] the method by which and the time when they may be reduced to actual possession or become the property of a particular person, cause them to be exceptions to the general principles applicable to other mineral deposits, [namely the *ad coelum* doctrine.][399]

"It follows from the essence of their right and from the situation of the things" the Court continued,

> [T]hat the use by one of his power to seek to convert a part of the common fund to actual possession may result in an undue proportion being attributed to one of the possessors of the right to the detriment of the others, or by waste by one or more to the annihilation of the rights of the remainder.[400]

This fact—that rights in a common pool of oil or gas are inherently correlative and inherently vulnerable to the misuse of other correlative rights holders—justifies exercise of the police power to protect those rights from waste and annihilation. Per the Court:

> Hence it is that the legislative power, from the peculiar nature of the right and the objects upon which it is to be exerted, can be manifested for the purpose of protecting all the collective owners, by securing a just distribution, to arise from the enjoyment, by them, of their privilege to reduce to possession, and to reach the like end by preventing waste.[401]

Ohio Oil thus identified prevention of waste and harm to correlative rights as ample justification for regulation. It rejected the takings challenge because

393. 177 U.S. 190, 202–05 (1900).
394. *Id.* at 190–92.
395. *Id.* at 192.
396. *Id.* at 193.
397. *Id.* at 199.
398. *Id.* at 201.
399. *Id.* at 202.
400. *Id.* at 210.
401. *Id.*

rather than violate the defendant's rights, the statute protected them by preventing waste of the common pool and "preventing it from being taken by one of the common owners without regard to the enjoyment of the others."[402] The rationale of harm prevention supports many of the basic features of oil and gas conservation statutes including: prohibitions on physical and economic waste, limitations on venting and flaring, well spacing and density rules, "prorationing" and production "allowables," and regulation of gas-to-oil ratios.[403]

The second case for consideration demonstrates that the correlativity of oil and gas rights also justifies police power regulation that combines or reorders rights in a common pool, such as by compulsory pooling or fieldwide unitization.[404] These mechanisms join together separately owned mineral interests for wholistic development that typically cannot be achieved under conditions of unregulated freedom. In a case challenging Ohio's compulsory pooling regulation as a taking, *Kerns v. Chesapeake Exploration, L.L.C.*, the Sixth Circuit Court of Appeals encapsulated the justification for pooling and unitizing mineral interests for common development:

> Allowing unfettered drilling of the same reservoir has consequences. In the case of oil, for instance, with each new drill site the reservoir loses more pressure, thus leaving much of the oil unobtainable. Conflicting hydraulic fracturing operations can likewise result in unnecessary drilling with less overall output. But under the common-law rule of capture, a landowner always has an incentive to quickly drill his own well, regardless of the waste, because if he fails to capture the resources, his neighbor will drill his own well and licitly take it all for himself. To address this problem, Ohio requires "pooling" or "unitization" prior to drilling. This means that if separate-yet-adjoining tracts of land have a common natural resource below them, the tracts are combined into a single "unit" and drilling operations must be coordinated and spaced within the unit. Tract owners then share in the benefits commensurate

402. *Id.*

403. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1065–67. Prevention of harm to correlative rights is also a goal of unitization. *See* Trees Oil Co. v. State Corp. Comm'n, 105 P.3d 1269, 1277 (Kan. 2005) ("Prevention of harm to correlative rights is one of the principal goals of the Unitization statute and supports keeping the Trees tract in the Unit.").

404. Compulsory pooling is the administrative combination of separately owned and operated leases and mineral interests to form a drilling unit that complies with applicable spacing and density regulations. 1 KUNTZ, *supra* note 141, § 78.1. Unitization is the combination of the leases and mineral interests within a common source of supply for the purpose of converting the field from primary to secondary or enhanced recovery methods like waterfloods and CO_2 floods. Unitization is usually accomplished through statutory procedures enabling an owner or operator of minerals in the field to petition the state's administrative authority to compel the participation of all owners in the field. Statutes typically condition exercise of the unitization power on proof that a substantial portion of the ownership interest in the field consents to unitization and the specific plan of operations. *Id.*

> with their acreage. Owners can agree to voluntarily pool their properties, but in the absence of agreement, the State of Ohio can also compel pooling.[405]

While at first blush this might sound like state-enforced collectivization, *Kerns* explains that compulsory pooling and unitization ensure the enjoyment of private correlative rights in oil and gas pools.[406] *Kerns* explained that as landowners with a property interest in subjacent minerals, the plaintiff had "an attendant right to recover those minerals without needless waste—as does his neighbor"[407] and that the state could exercise its police power "in the service of protecting property rights by requiring a just, orderly, and efficient process for neighbors to extract common resources."[408] Applying basically this reasoning, courts around the country have upheld the state's police power to protect the correlative rights of owners in a common source of oil and gas through pooling and unitization.[409]

In Smith's earlier work explaining the exclusion theory of property rights, he acknowledged the benefits of a judicial scheme of correlative rights to legislative efforts to conserve common pools of oil and gas.[410] He explained that judicial doctrines of corelative rights and waste can supplement the rule of capture by protecting against the "grossest forms of waste" by aiming at "very easy-to-monitor actions" rather than attempting directly to regulate the quantity or rate of oil extraction.[411] This more fine-tuned regulation is better achieved by legislation and regulatory agencies, but the common law doctrine "forms the foundation for rules of governance by administrative bodies, which can claim to be operating consistently with all owners' exclusion rights."[412] Thus, Smith concludes that "the most important contribution of the correlative rights doctrine, if any, . . . is that it may have eased the way for legislatures and administrative agencies (such as the Texas Railroad Commission) to intervene, without having to worry about takings claims."[413]

The same principles that make correlative rights in oil and gas effective as a baseline for common-pool regulation apply to pore space in interconnected reservoirs.[414] The physical qualities of interconnected subsurface spaces and

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405. 762 F. App'x 289, 291 (6th Cir. 2019).

406. *Id.* at 296–98; *see generally* 5 KUNTZ, *supra* note 141, § 77.1 (discussing the purposes and types of the regulation of the density of drilling); *id.* at § 78.1 (discussing unionization).

407. *Kerns*, 762 F. App'x at 296.

408. *Id.* at 297.

409. *See id.* at 296–97 (citing Patterson v. Stanolind Oil & Gas Co., 77 P.2d 83, 89 (Okla. 1938); Gawenis v. Ark. Oil & Gas Comm'n, 464 S.W.3d 453, 457–58 (Ark. 2015); Sylvania Corp. v. Kilborne, 271 N.E.2d 524, 527 (N.Y. 1971)); Cities Serv. Gas Co. v. Peerless Oil & Gas Co., 340 U.S. 179, 185–86 (1950); Ancora Corp. v. Miller Oil Purchasing Co., 396 So.2d 672, 676 (Ala. 1981).

410. *See* Smith, *supra* note 55, at 1027–37.

411. *Id.* at 1030, 1032.

412. *Id.* at 1032.

413. *Id.* at 1032–33.

414. *See* Schremmer, *Subsurface Trespass*, *supra* note 26, at 1069–79.

their manner of use implicate the same practical issues that the Court identified in *Ohio Oil* as threatening an owner's rights in oil and gas. Space in common, interconnected reservoirs is finite, and no owner can exercise their right to occupy space or transfer fluids through space "without, to an extent, diminishing" the space available for use by all other owners.[415] Thus, waste of space by one owner "caused by a reckless enjoyment of his right of striking the reservoir, at once, therefore, operates upon the other surface owners" just like with oil and gas.[416] Regulations limiting the drilling of injection wells, rates and volumes of injection, and the like may be justified as protecting the correlative rights of landowners in subsurface space.[417]

Likewise, it may equally protect correlative rights in pore space to authorize administrative combination of separately owned tracts of pore space to enable fieldwide storage projects for CCS.[418] Indeed, several states have adopted legislation empowering agencies to force pool or unitize pore space for CCS.[419] Compulsory unitization of pore space for enterprises that require the entire storage capacity of a reservoir would likely preclude a nonparticipating owner from "doing likewise" with their portion of the pore space. But rather than confiscate their property, compelling owners' participation in fieldwide storage operations can ensure, and likely enhance, the use and value of their correlative rights, just as pooling and unitization are designed to do for oil and gas.[420]

2. Exclusivity Hindering Regulation

Now consider a recent decision of the North Dakota Supreme Court, which illustrates the pitfalls for public law regulation of an exclusive possessory view of subsurface property. In *Northwestern Landowners Association v. North Dakota*, an association representing landowners challenged on takings grounds the constitutionality of North Dakota Senate Bill 2344.[421] Among other things, the legislation amended portions of the state's oil and gas conservation act and its property act with the basic aim of immunizing licensed oil and gas operators from liability for causing injected substances to occupy the pore space of nonconsenting landowners in connection with oil and gas operations.[422]

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415. Ohio Oil Co. v. Indiana, 177 U.S. 190, 203 (1900).

416. *Id.*

417. Schremmer, *Subsurface Trespass*, *supra* note 26, at 1069–71, 1072–74.

418. *Id.* at 1074–79.

419. *Id.* at 1069–74.

420. For a fuller discussion of the practical difficulties in pore space unitization for carbon sequestration, *see id.* at 1072–74.

421. 978 N.W.2d 679, 685–86 (N.D. 2022); S.B. 2344, 66th Legis. Assemb., Reg. Sess. (N.D. 2019).

422. S.B. 2344, 66th Legis. Assemb., Reg. Sess. (N.D. 2019).

The amendment declared that oil and gas operators "conducting unit operations for enhanced oil recovery, utilization of carbon dioxide for enhanced recovery of oil, gas, and other minerals, disposal operations, or any other operation authorized by the commission under this chapter" are entitled to use subsurface cavities and voids for such operations.[423] The amendment further provided that no provision of law may "be construed to entitle the owner of a subsurface geologic formation to prohibit or demand payment for the use of the subsurface geologic formation" for such operations.[424] The accompanying amendment to the state's property code likewise declared that injection or migration of substances into pore space for any of the previously enumerated operations "is not unlawful and, by itself, does not constitute trespass, nuisance, or other tort."[425]

The district court enjoined enforcement of Senate Bill 2344, finding that it constituted a per se taking of landowners' property under *Loretto v. Teleprompter Manhattan CATV Corp.*, because it required landowners to suffer a permanent physical occupation of their pore space.[426] The North Dakota Supreme Court affirmed the district court's decision and reasoning, resting its decision on the view that property rights in subsurface space are possessory and exclusive:

> Senate Bill 2344 constitutes a per se taking. It allows third-party oil and gas operators to physically invade a landowner's property by injecting substances into the landowner's pore space. As demonstrated in *Arkansas Game & Fish Comm'n v. United States*, . . . physical invasion by water, even for a limited duration, results in a per se taking. Furthermore, because S.B. 2344 permits oil and gas operators to use pore space to temporarily or permanently store or dispose of gases and wastes, the bill authorizes an occupation of the landowners' property. Similar to the unconstitutional regulation in *Cedar Point Nursey*, S.B. 2344 grants oil and gas operators a right of access to the landowners' private property. Further, as in *Loretto*, . . . S.B. 2344 restricts landowners from having any control over the "timing, extent, or nature of the invasion." As amended, the statutes would allow anyone conducting operations under Chapter 38-08 to inject waste into a surface owner's pore space without the surface owner's consent. . . . *Allowing such usage takes away one of the most treasured property rights because it takes away landowners' right to exclude oil and gas operators from trespassing and disposing waste into their pore space.*[427]

Notably, each of the cited cases involved takings of land itself, which of course entails the right to exclusive possession.

Because the legislation was held to be a taking per se, there was no possibility for the court to justify it as an exercise of the state's police power to

423. *Nw. Landowners Ass'n*, 978 N.W.2d at 685 (citing S.B. 2344, 66th Legis. Assemb., Reg. Sess. (N.D. 2019)).

424. *Id.*

425. *Id.* at 686.

426. *Id.* at 686–87, 690–91.

427. *Id.* at 691–92 (internal citations omitted) (emphasis added).

regulate property. "Here," the court explained, "the takings claim is not premised on a regulation of what the surface owners may do with their property, but rather on the State's granting a broad authorization to third parties to physically occupy the surface owners' pore space."[428] In other words, the exclusion-based theory precluded any consideration of whether the legislation harmed or protected pore space owners' rights relative to each other, or served a compelling interest of the public. The only relevant fact was the physical presence of injected substances under nonconsenting landowners' tracts.

It might well be that the legislation was repugnant to the correlative rights of pore space owners and exceeded the reasonable bounds of the police power—it might have gone "too far."[429] Indeed, it appears the legislation could have deprived pore space owners of the right or opportunity to use it for any lawful purposes and could have been struck as a taking accordingly. The important point, however, is that under an exclusion-based view, the question of whether the regulation is justified as protecting private rights against harm or waste, or instead if it goes too far, is never to be asked.

Following its victory against Senate Bill 2344, the Northwest Landowners Association brought a similar challenge to North Dakota Century Code section 38-22-10 entitled "Amalgamating property interests."[430] That section authorizes compulsory unitization of pore space for CCS.[431] The complaint cites *Northwestern Landowners Association* throughout and alleges that by force of that precedent, the amalgamation statute amounts to a per se physical taking of pore space.[432] This result, if indeed it occurs, may well be the first time an appellate court has found a pooling or unitization statute constitutionally invalid.[433] Such a ruling would have immediate consequences for the prospects of carbon dioxide sequestration in North Dakota and any state that might follow it. The only means of assembling pore space throughout the whole extent of a formation for a sequestration project left after *Northwestern Landowners Ass'n* would be private bargaining or eminent domain.

Although the Northwestern Landowners Association litigation directly involves regulation of rights in pore space, there are implications for oil and gas regulation as well. Pooling and unitization of oil or gas involve physical invasions by vertical and horizontal wellbores and occupation by tangible

428. *Id.* at 694.

429. Pa. Coal Co. v. Mahon, 260 U.S. 393, 415 (1922).

430. *See* Complaint, Nw. Landowners Ass'n v. North Dakota, 978 N.W.2d 679 (N.D. 2022).

431. *See* N.D. CENT. CODE § 38-22-10. The lawsuit also challenges section 38-25-08, which authorizes amalgamation for underground storage of hydrocarbons. *See* N.D. CENT. CODE § 38-25-08.

432. *See* Complaint, Nw. Landowners Ass'n, *supra* note 430.

433. *See* Kerns v. Chesapeake Expl., L.L.C., 762 F. App'x 289, 296 (6th Cir. 2019) ("In fact, the landowners here cannot point to a single case that holds a unitization or pooling scheme unconstitutional.").

substances like saltwater and carbon dioxide. If it is a per se taking to require a pore space owner to suffer fluid migration, it should likewise be a taking to require surface owners to suffer the physical entry of a horizontal well or occupation by fluids injected for secondary recovery.

A modified view of trespass, which harmonizes with correlative rights and waste, avoids this problem. Recall the *Kerns* case challenging Ohio's oil and gas pooling regulation.[434] The plaintiff there also alleged a taking by the physical occupation of his subsurface by the horizontal wells to be drilled through the plaintiff's land as part of the pooled unit.[435] Applying the *Chance* test for subsurface trespass, the court denied the claim because the plaintiffs' complaint failed to allege any actual harm to their subsurface property from the horizontal drilling.[436] The Sixth Circuit set forth the standard for establishing a takings claim on this basis:

> [A] takings claim could conceivably lie based upon subsurface occupation. But alleging a party's mere presence below the ground is not enough to make out a takings claim. Ohio's actual-interference requirement means that the landowners' property interests in the space beneath their land springs to life only if Chesapeake's drilling "actually interfere[s]" with their "reasonable and foreseeable use of the subsurface." In other words, there must be "some type of physical damages or interference with use."[437]

The same court considering the same argument but applying the *Restatement* or the rule from *Northwestern Landowners Association* would be forced to find a taking or uphold the pooling regime on other grounds.[438]

* * *

In sum, a correlative conception of subsurface property rights and harm-based account of trespass does not just leave room for regulatory fine tuning: it enables tailored governance by these institutions more effectively than the *Restatement*'s architecture of exclusive possession. The correlative conception of rights embraced in the fair opportunity doctrine lends itself to police power adjustments to protect private rights, whereas an exclusive, possessory conception complicates regulatory efforts by implicating per se constitutional limits to regulation.

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434. *See id.* at 291.

435. *Id.* at 297.

436. *Id.* at 297–98.

437. *Id.* at 297–98 (quoting Chance v. BP Chems., Inc., 77 Ohio St.3d 17, 25–28, 670 N.E.2d 985 (1996)) (internal citations omitted).

438. For example, the *Kerns* court also denied the plaintiff's takings claim on the state action doctrine, reasoning that the oil and gas operator, Chesapeake, and not the state, was responsible for the action of drilling wells through the plaintiff's subsurface. *Id.* at 295.

B. Modified Trespass as Workable Guidance

The fair opportunity doctrine furnishes a superior baseline for regulation of common pool problems, but it also provides workable guidance for the coordination of activities within common reservoirs independently of such regulation.[439] Despite some unwarranted criticism from Merrill and Smith,[440] the fair opportunity doctrine provides useable and intuitive guidance to the owners and developers of oil, gas, and pore space resources. This guidance is effective because it reflects the physical nature of the resources and the ways they are used in modern practice. Thus, even in the absence of public regulation, the correlative rights understanding enforced by a harm-based account of trespass guides property owners in the beneficial use of subsurface resources while encouraging cooperation and discouraging opportunism.

Merrill and Smith suggest that the fair opportunity doctrine fails as a workable common law doctrine because it is indeterminate.[441] However, their critique is based on a misunderstanding of how the doctrine operates and particularly about the role of *ad coelum* in the scheme of correlative rights. "The problem with the fair opportunity solution" they write, "is that it does not tell us who is entitled to claim unfairness, nor does it tell us what is unfair."[442] Merrill and Smith's criticism errs by mischaracterizing the role of *ad coelum* in the theory. Perhaps this is because they seem to be deriving their understanding of the fair opportunity doctrine from an article that only briefly summarizes it.[443]

In the fair opportunity doctrine, the *ad coelum* doctrine defines the boundaries of an owner's property in the subsurface, including in reservoirs of oil, gas, and pore space.[444] As David Pierce described it, the *ad coelum* rule defines the "members" of a "reservoir community" with reference to ownership of the surface of the land overlying the reservoir.[445] The physical invasion element (element 2) of the fair opportunity doctrine's definition of trespass requires a crossing of the plaintiff's *ad coelum* defined subsurface

439. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 592.

440. *See* Merrill & Smith, *Briggs*, *supra* note 19, at 11–12.

441. *Id.*

442. *Id.*

443. Schremmer, *Subsurface Trespass*, *supra* note 26 at 1009, 1013–14, which, as *Subsurface Trespass* expressly states, merely summarizes the fair opportunity doctrine for purposes of extrapolating its consequences for the law of remedies and public regulation. *See id.* at 1019–25.

444. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 560–61.

445. David E. Pierce, *Resolving Intra-Reservoir Horizontal Drilling Conflicts Using a Reservoir Community Analysis*, 90 N.D. L. REV. 249, 250 (2014).

boundaries to establish a prima facie case for liability.[446] In combination with *ad coelum*, the physical invasion requirement structures the correlative relationship of owners in a common reservoir thusly:

> To make a prima facie case for violation of its subsurface rights, a plaintiff must show that the defendant's actions invaded the physical boundary lines defining the plaintiff's subsurface claim. The physical invasion requirement comports with the structure of the relationship among subsurface owners in a common resource. The rule of capture and offset drilling corollary protect owners' fair opportunity rights only if all subsurface owners are secure in their exclusive use of the portion of the common reservoir underlying their land. If the subsurface structures within an owner's claim are damaged or occupied by another, it could interfere with the owner's ability to "go and do likewise" and thus might infringe the owner's property right to a fair opportunity to use a proportional share of the common property. Moreover, the physical invasion requirement draws a bright line separating potentially actionable from nonactionable conduct, making it simpler to delineate the parties' property rights and determine causation in any given case.[447]

Thus, contrary to Merrill and Smith, the fair opportunity doctrine defines precisely who may claim unfairness from reservoir conduct: the owner of the *ad coelum* defined tract that was physically invaded by the actor's conduct. In this regard, the *Restatement* and the fair opportunity doctrine are indistinguishable.

Merrill and Smith are also mistaken in their claim that the fair opportunity doctrine fails to define what kind of conduct is "unfair."[448] As demonstrated at length in this Article and prior work, the definition of actionable conduct under the fair opportunity theory is that which either damages an owner's existing subsurface activities or impairs an owner's right to conduct subsurface activities within the owner's tract.[449] It is true, at least in cases of harm to a plaintiff's *right to use* the reservoir (as opposed to harm to the owner's existing use), that the harm requirement is more contextual and trickier to apply than the physical entry requirement of ordinary trespass. In fact, it resembles the harm requirement of nuisance law, which is notoriously indeterminate in comparison to trespass.[450] Thus, Merrill and Smith have a point—not that the fair opportunity doctrine fails to provide criteria for when invasions are wrongful—but that the criteria it provides require more factual context to apply.[451]

Even though the harm requirement makes the fair opportunity doctrine meaningfully more open-textured than ordinary trespass, this additional complexity is necessitated by the common-pool nature of the resources to

446. *See* Schremmer, *Unifying Doctrine*, *supra* note 26, at 566–70.
447. *Id.* at 566.
448. *See* Merrill & Smith, *Briggs*, *supra* note 19, at 11–12.
449. Schremmer, *Unifying Doctrine*, *supra* note 26, at 570; *see supra* Parts III.A.2, B.1.a.
450. *See* Schremmer, *Getting Past Possession*, *supra* note 223, at 317–19.
451. *See* Merrill & Smith, *Briggs*, *supra* note 19, at 11–12.

which the doctrine applies: fugacious minerals and interconnected pore space.[452] Looser, more nuisance-like "governance" standards like the harm requirement make better sense than stricter rules of exclusion for fluid and interconnected resources with common-pool characteristics, as Merrill and Smith have both observed.[453]

Because a harm-based tort matches the physical nature and typical manner of enjoyment of oil, gas, and pore space, the fair opportunity doctrine turns out to be more intuitive and coherent than ordinary trespass. The simplicity of trespass fights the complexity of the oil, gas, and pore space resource. The "Keep Out" imperative that rests "at the heart of trespass" does not make sense for resources that the owner cannot control exclusively.[454] Thus, although the elements of trespass are easy to remember and apply in the abstract, as applied to fluid and interconnected resources, trespass requires adjustments and carve-outs that muddy its crystalline simplicity. The *Restatement* demonstrates as much, with its special rule limiting the remedies for a trespass by slant wells and fracking,[455] its exempting gas intrusions from liability based on the dimensionality requirement,[456] and its exempting fluid intrusions based on assumptions about the injector's intent.[457] The adjustments needed to the basic principle of exclusion significantly undermine the workability of trespass as guidance to parties trying to privately order their activities in subsurface reservoirs.

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452. *See* Schremmer, *Pore Space*, *supra* note 26, at 7–11 (explaining why pore space is a common pool resource like oil and gas); *see also* Smith, *Property as the Law of Things*, *supra* note 54, at 1711 (explaining why property rights in common pool resources are necessarily more contextual).

453. *See* Henry E. Smith, *Governing Water: The Semicommons of Fluid Property Rights*, 50 ARIZ. L. REV. 445, 445–50 (2008) (providing an information-cost theory of governance regimes for fugitive resources like water and citing other scholarly work in the same vein, *e.g.*, Rance L. Craft, *Of Reservoir Hogs and Pelt Fiction: Defending the* Ferae Naturae *Analogy Between Petroleum and Wildlife,* 44 EMORY L.J. 697, 722–23, 727–28 (1995); Dean Lueck, *The Rule of First Possession and the Design of the Law,* 38 J.L. & ECON. 393, 425 (1995); Lior Jacob Strahilevitz, *Information Asymmetries and the Rights to Exclude,* 104 MICH L. REV. 1835, 1843 (2006)); Henry E. Smith, *Exclusion versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453, S485–86 (2002) (explaining how certain common-pool resources are subject to rules of exclusion as to outsiders and standards of governance among the "insider" owners within the resource); Thomas W. Merrill, *Trespass, Nuisance, and the Costs of Determining Property Rights*, 14 J. LEGAL STUD. 13, 14 (1985) ("The central thesis is that when the costs of transacting are low, the legal system will gravitate toward rules that determine entitlements at a low cost—such as the strict liability rule of trespass. . . . In contrast, when the costs of transacting are apt to be high, the legal system will incline toward rules for the determination of entitlements that are more expensive—such as the balancing or cost-benefit approach of nuisance.").

454. *See* RESTATEMENT (FOURTH) OF PROP. vol. 1 § 1.1 cmt. h (A.L.I., Tentative Draft No. 2, 2021).

455. *See id.* vol. 2 §§ 1.2C(b), 1.2F(b) (A.L.I., Tentative Draft No. 4, Vol. 2, 2023); *see supra* Part II.B.1 (discussing the special rule).

456. *See* RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2D (A.L.I., Tentative Draft No. 4, 2023); *see supra* Part II.C.2.a (discussing the exemption).

457. *See* RESTATEMENT (FOURTH) OF PROP. vol. 2 § 1.2E (A.L.I., Tentative Draft No. 4, 2023); *see supra* Part II.C.2.b (discussing the exemption).

While it may take relatively more information to adjudicate a dispute in court or to seek administrative relief, the principles of the fair opportunity doctrine are simple enough for property developers to use to sketch out their plans with reasonable certainty.[458] The fair opportunity doctrine centers on an underlying principle that matches the nature of the resources it applies to. It aligns with simple moral intuitions of reciprocity, fair use, and using one's own property so as not to harm others' (per the maxim, *sic utere tuo ut alienum non laedas*[459]). Thus, even though it is necessarily less determinate and more information-intensive to apply than the strict rule of ordinary trespass, the fair opportunity doctrine is relatively easy to comprehend, remember, communicate, and apply in rough outline.

Property developers (and their legal counsel) can readily apply the doctrine to assess the risk of subsurface projects. Projects that remain entirely within the developer's own tract pose no risk of liability so long as they do not waste any of the common source of supply (itself a fairly intuitive concept). Developers considering operations that might encroach into neighboring tracts can know that the encroachment may subject them to liability, and that the likelihood of this is greater where neighbors are themselves using the subsurface reservoir or the developer's own conduct is anticipated to be pervasive or to occupy the entire reservoir. In the latter case, the fair opportunity doctrine incentivizes the developer to seek the consent of others in the reservoir by privileging any resulting trespass against others who refused a reasonable chance to participate in the field-wide operations. In this way, the fair opportunity doctrine allows developers a relatively wide berth in developing oil, gas, and pore space resources, while at the same time discouraging opportunism and even encouraging a degree of cooperation with other reservoir owners.[460]

The fair opportunity doctrine is also workable for courts, which stands to reason since it is synthesized from existing case law. Although contextual and structured like nuisance, the fair opportunity doctrine proves that courts need not resort to utility balancing or policymaking to define harm as they sometimes do in applying nuisance.[461] Harm-based trespass is not a license for brass-tacks, results-oriented instrumentalism, nor is it beyond the ability of courts to adequately adjudicate. Courts can administer the harm requirement by giving the question to the trier of fact to determine whether the defendant's conduct satisfies the fair opportunity doctrine's formal standards for what constitutes harm. While the universe of relevant facts is theoretically greater than would be necessary for adjudicating a claim for ordinary trespass, the fair opportunity

458. *Cf.* Miller & Pojanowski, *supra* note 312, at 269–70 ("[T]he guidance supplied by the law of nuisance ex ante, while necessarily general, is valuable as I deliberate about how to use my property.").

459. Aldred's Case (1610), 77 Eng. Rep. 816 (KB).

460. Schremmer, *Unifying Doctrine*, *supra* note 26, at 592.

461. *Cf.* RESTATEMENT (SECOND) TORTS § 826 (A.L.I. 1979) (setting forth the utility-balancing definition of harm for nuisance).

doctrine nonetheless restrains the relevant facts to empirical ones concerning the location of defendant's conduct and its consequences for existing and future operations in the reservoir. Facts about the social value of the defendant's or plaintiff's actions and the needs of society are generally excluded from determinations of liability. In this sense, the fair opportunity doctrine is formal despite not being perfectly determinate.[462]

At bottom, the contrast between the *Restatement* and the fair opportunity doctrine in terms of providing workable common law guidance demonstrates the importance of tailoring property rights and tort rules for natural resources when circumstances call for it. Treating everything like land is not sensible when not everything is like land or is used like land. Courts have done a decent job with this in the context of well-understood subsurface resources, like oil and gas.[463] In restating the doctrine for these resources, it is advantageous to follow the courts' lead. For resources that are not as well understood, like pore space, taking this same approach ultimately produces a coherent and usable restatement of principles. Property law, while a sort of integrated system, does not mandate a one-size-fits-all model for all things. The goals of the system are better served by rules that are sensitive to the aspects of a resource that are easily known and salient to human use.

CONCLUSION

In its treatment of the law of trespass below ground, the tentative draft of the *Restatement* (Fourth) of Property is a mixed bag of successes and failures, demonstrating the promise and the limits of its architectural approach to property law. Users should be aware that the *Restatement*'s application of exclusive possession and ordinary trespass to entries below the surface accurately restates the existing law for some kinds of entries but not for others. For entries that occur in the immediate or near reaches of the surface and for those involving the mining of solid minerals, the *Restatement* provides accurate, reliable, and clarifying guidance. For entries in the deep subsurface that involve production of fugacious minerals like oil and gas and the injection of fluids into subsurface pore space, however, the *Restatement*'s insistence on ordinary trespass mischaracterizes the case law and the fundamental nature of the resources.

When the cases are allowed to drive the analysis, a principle emerges that can support a cogent alternative account of subsurface trespass to common

462. *See* Miller, *supra* note 56, at 209–11 ("Unlike rule formalists, the new formalists do not recoil from open-textured legal constructs, nor do they suppose that their invocation is a second-best (or worse) strategy for realizing legality.").

463. *See* Kerns v. Chesapeake Expl., L.L.C., 762 F. App'x 289, 291 (6th Cir. 2019).

pools of oil and gas and to interconnected pore space. Long recognized by scholars of oil and gas law, the principle of correlative rights both justifies and structures a harm-based account of trespass that accurately describes and rationalizes the existing cases. Using my own synthesis of correlative rights in the fair opportunity doctrine, I showed how a definition of trespass based on actual harm enjoys advantages over the *Restatement* in terms of its workability as common law doctrine to guide owners of oil, gas, and pore space in interconnected reservoirs toward beneficial and cooperative development of these resources. The harm-based account also furnishes a superior baseline for public regulation of fugacious and interconnected subsurface resources like pore space. The *Restatement*'s view of these subsurface resources, in contrast, significantly hinders beneficial legislative and administrative action aimed at preventing waste and protecting correlative rights in these important resources.