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Groundwater Exceptionalism: The Disconnect between Law and Science

Christine A. Klein

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GROUNDWATER EXCEPTIONALISM: THE DISCONNECT BETWEEN LAW AND SCIENCE

*Christine A. Klein**

ABSTRACT

Most judges, legislators, and regulators would be hard-pressed to articulate a comprehensive legal theory of groundwater. And yet, this under-appreciated, over-used, life-sustaining resource plays an increasingly pivotal role in prominent legal controversies. In defiance of hydrologic reality, lawmakers have routinely singled out groundwater for unique treatment and decoupled it from surface water. This Article dubs such phenomenon “groundwater exceptionalism,” and identifies groundwater as an under-theorized aspect of both property law and water law. It brings to light the numerous legal doctrines infected by exceptionalism, including state water rights law, the federal reserved rights doctrine, the apportionment of interstate waters, and the scope of jurisdiction under the federal Clean Water Act. This Article constructs a typology of the purported justifications for exceptionalism and identifies its two key consequences: the over-propertization and under-regulation of groundwater. It argues that these distortions must be corrected, not solely as a normative matter, but also as essential reforms to bring the law into alignment with science and promote analytical coherence, faithfulness to doctrinal purpose, and sustainable water use. This Article concludes by culling the lessons from over a century and identifying promising analytical tools to move the law from exceptionalism toward integrity. More broadly, this analysis offers a roadmap for integrating law and science in the context of resource management, a challenge that will become increasingly critical in the face of climate change.

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INTRODUCTION

[O]ne cannot separate ground water and surface water. What is surface water at one time is ground water the next. What is ground water today becomes surface water tomorrow. Any concept dealing with all water must correlate ground water and surface water.

—Williams v. Wichita (1962)¹

What is groundwater and why should the law care? As a textbook explanation, hydrologists might define groundwater as “water found within the pore spaces beneath the surface of the Earth” and regard it as “an integral part of the hydrologic cycle.”² But in the hands of judges and legislators, this simple definition can become tortured beyond all hydrologic recognition. Worse, lawyers have a knack for couching their extra-scientific views in technical sounding jargon seemingly beyond reproach. And perhaps worst of all, the law seems to delight in crafting fine distinctions between groundwater and surface water in defiance of scientists’ understanding of the water cycle. In short, groundwater is both a hydrologic category and legal construct, often with no clear alignment of the two.

¹ Williams v. Wichita, 374 P.2d 578, 590 (Kan. 1962) (quoting Frank C. Foley, *Water and the Laws of Nature*, 5 KAN. L. REV. 492, 497 (1957) (citing to a “scientific premise” implicit in challenged legislation and upholding the constitutionality of 1945 legislation regulating both surface water and groundwater).

² THOMAS V. CECH, PRINCIPLES OF WATER RESOURCES 87 (2003); see also *Aquifers*, NAT’L GEOGRAPHIC SOC’Y: RES. LIBR. <https://www.nationalgeographic.org/encyclopedia/aquifers/> (last visited Dec. 16, 2021) (defining “groundwater” as “precipitation that has infiltrated the soil beyond the surface and collected in empty spaces underground”). This Article will follow the hydrologic convention of writing “groundwater” as a single word. In contrast, as one law professor quipped, “ground water” is “what you get when you put ice in a blender.” John Leshy, *Interstate Groundwater Resources: The Federal Role*, 14 J. ENV’T L. & POL’Y, 1475, 1475 (2008) (retelling engineer’s joke).

This Article uses the phrase “groundwater exceptionalism”³ to describe the law’s often unique treatment of groundwater, unmoored from its role in the hydrologic cycle. Why does it matter that the hydrologic and legal understandings of groundwater diverge and that the law distinguishes surface water from groundwater in numerous contexts? Certainly, it is the law’s prerogative—and even mandate—to draw fine lines that have important legal consequences. But what if the line-drawing exercise purports to rely on scientific principles, when it in fact departs from them? And what if supporting rationales are mere subterfuge to advance unacknowledged policy goals? In such cases, this Article argues, reliance on pseudo-scientific distinctions between surface water and groundwater skews legal policy and damages the integrity of the law. This is not to say that legal outcomes or policy must necessarily be changed. Instead, this Article argues that when courts and lawmakers except groundwater from rules applicable to surface water, they should do so based on transparent, coherent analysis. Such analysis should be ground-truthed for consistency with hydrologic reality and faithful to the goals of the relevant legal doctrine.

This Article makes two contributions to the literature. First, it brings to light the numerous and divergent legal doctrines that distinguish between surface water and groundwater, showing that each such distinction is part of a broader whole. Second, this Article tackles “groundwater” as an undertheorized legal construct, locating it as a species of water, which itself is a subspecies of property.

Part I sets the stage by exploring both hydrologic and legal understandings of groundwater; it then considers the extent to which the notion of “American exceptionalism” provides a useful analogy to furnish deeper insights into groundwater exceptionalism. Next, Part II identifies legal doctrines that incorporate the surface/groundwater divide, including (1) state water rights law; (2) the federal reserved rights doctrine; (3) federal law governing the allocation of interstate waters; and (4) the federal Clean Water Act. Constructing a typology of exceptionalism across legal doctrines, the analysis unpacks each doctrine’s rules, exceptions for groundwater, exclusionary rationales, and the consequences of such groundwater privileging. Finally, Part III charts a path forward, seeking to advance legal integrity through more coordinated and coherent legal treatment of surface water and groundwater.

³ I first coined the phrase “groundwater exceptionalism” in Christine A. Klein, *Owning Groundwater: The Example of Mississippi v. Tennessee*, 35 VA. ENV’T L.J. 474, 481–86 (2017).

Overall, this analysis reveals that exceptionalism produces two key results: the over-properization and under-regulation of groundwater. As this Article will argue, these distortions must be corrected, not primarily as a normative preference, but as a matter of analytical coherence. At the outset, it is critical to acknowledge that courts and lawmakers have made considerable progress toward harmonizing the treatment of surface water and groundwater, but that progress has been slow, inconsistent, and hindered by path dependence. Some water doctrines date back to the mid-1800s, at least fifty years before science firmly understood the hydrologic cycle and almost a century before widespread groundwater use became technologically feasible.⁴ Early legal exceptions for groundwater have remained surprisingly sticky, even after science knows they are suspect. No sooner is an exception rejected in one doctrine than it reappears in another. To firmly root out exceptionalism, this Article offers an inter-doctrinal and historical perspective that surveys both the best and worst lines of analysis from more than a century.

More broadly, this Article has profound implications for promoting resilience in the face of climate change. It provides a case study of how the law can impede the sustainable management of a critical resource—water—when it is not data-driven and rooted in science. But more hopefully, this project's historical analysis shows how the integration of law and science can prompt even a doctrine as tradition bound as water law to evolve into a powerful tool to address the challenges of a changing climate.

I. THE PUZZLE OF GROUNDWATER

Many disciplines face a tension between *lumping* and *splitting*:⁵ If the subjects of study are lumped into an unwieldy whole, then important nuances go undetected. But if the subjects are split into subcategories, then researchers must ensure the categories are meaningful and do not generate counterproductive complexity. The study of Earth's water poses such analytical challenges. Both hydrology and law recognize a split between surface water and groundwater. But as discussed in this Part, these distinctions serve critically different purposes. With little hyperbole, one could say that science segregates groundwater to better understand its complexity, whereas the law does so as an excuse to ignore that complexity.

⁴ See *infra* notes 9–11 and accompanying text.

⁵ See, e.g., Glenn Branch, *Whence Lumpers and Splitters?*, NAT'L CTR. FOR SCI. EDUC. (Dec. 2, 2014), <https://ncse.ngo/whence-lumpers-and-splitters> (crediting naturalist Edward Newman (1801–1876) as likely the first person to use *lumpers* and *splitters* in the same phrase).

This Part examines these divergent hydrologic and legal understandings. Section A presents a brief overview of groundwater from a scientific perspective, observing that hydrologists isolate groundwater to better understand its movement and its integral role in the planet's water cycle. Section B then turns to the law, which has long characterized groundwater as distinct from surface water, employing hydrologic classifications unsupported by science. Relying on these extra-scientific distinctions, the law has sometimes treated groundwater as subject to ownership as part of the overlying surface estate and has often deemed it too mysterious or difficult to understand, much less regulate. Finally, section C explores the concept of "American exceptionalism" as an analogy to offer insights into the notion of "groundwater exceptionalism" developed in this Article.

A. *Groundwater as Hydrologic Category*

A critical portion of the water available for human use resides underground. Only 2.5% of the water on Earth is non-saline freshwater; less than one-third of that freshwater is in liquid form—not frozen in glaciers or in ice caps.⁶ Most of that precious supply of fresh, unfrozen water resides underground in *aquifers*,⁷ which hydrogeologists define as "saturated soil or rock layer[s] with spaces that allow water to move through [them]."⁸ Groundwater remained relatively inaccessible for human use until the mid-twentieth century invention of the high-speed centrifugal pump in 1937 and subsequent technological innovations.⁹ These advances encouraged about a 240% surge in groundwater pumping in the generation following World War II,¹⁰ a phenomenon styled the *groundwater revolution*.¹¹

⁶ *Groundwater Storage and the Water Cycle*, U.S. GEOLOGICAL SURV., https://www.usgs.gov/special-topic/water-science-school/science/groundwater-storage-and-water-cycle?qt-science_center_objects=0#qt-science_center_objects (last visited Dec. 16, 2021).

⁷ *Id.* (locating Earth's freshwater in glaciers and ice caps (68.7%), groundwater (30.1%), and surface water or elsewhere (1.2%).)

⁸ *Groundwater and Aquifers*, OR. ST. UNIV. (2021), <https://wellwater.oregonstate.edu/groundwater/understanding-groundwater/groundwater-and-aquifers>.

⁹ BARTON H. THOMPSON, JR., JOHN D. LESHY, ROBERT H. ABRAMS & SANDRA B. ZELLMER, LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS 447 (6th ed. 2018); John D. Leshy, *Interstate Groundwater Resources*, *supra* note 2, at 1475; ROBERT GLENNON, WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS 26 (2002).

¹⁰ THOMPSON ET AL., *supra* note 9 (documenting an increase in groundwater extraction in the United States "from about 34 billion gallons per day . . . in 1950 to a peak of 83 billion gallons per day . . . in 1980").

¹¹ See Burke W. Griggs, *Interstate Water Litigation in the West: A Fifty-Year Retrospective*, 20 WATER L. REV. 153, 158 (2017) [hereinafter Griggs, *A Fifty-Year Retrospective*].

Hydrologists, like lawyers, initially thought that groundwater was distinct from surface water.¹² But by at least the early twentieth century, scientists had developed a firm understanding of the interconnectedness of all water through the hydrologic cycle (also known as the “water cycle”).¹³ Scientists now know that precipitation and surface streams replenish aquifers.¹⁴ Conversely, aquifers can feed surface stream flow.¹⁵ This constant interaction between above- and below-ground water creates the potential for conflict between water users who rely on diversions from surface streams and those who rely on well withdrawals from aquifers.¹⁶ In the Great Plains region, for example, groundwater users have dried up an estimated 350 miles of surface streams since 1950, affecting farmers, ranchers, and others who rely on those flows, as well as the natural environment.¹⁷

Today, the critical issue for hydrologists is not whether water moves continuously through the hydrologic cycle, but rather the speed and direction of that movement, as affected by the characteristics of subsurface geologic materials.¹⁸ For example, water can remain underground for periods ranging from a few weeks to thousands of years—the so-called “residence time” in the aquifer.¹⁹ Relatedly, there is wide variability in the rates at which surface water and precipitation migrate downward into the aquifer—known as the “recharge rate.”²⁰ Although scientists now have a clear grasp of broad hydrogeologic principles, it can remain difficult in particular cases to identify the complex

¹² See CECH, *supra* note 2, at 89 (asserting “the ancients . . . espoused certain bizarre theories regarding the origin of groundwater,” but by about 23 BCE “altered [their] misconception[s] and correctly hypothesized that precipitation and surface water infiltration was the source of all groundwater”).

¹³ See, e.g., *Wisconsin v. Michels Pipeline Const., Inc.*, 217 N.W.2d 339, 345 (Wis. 1974) (“Even [by] 1903, the awe of mysterious, unknowable forces beneath the earth was fast becoming an outmoded basis for a rule of law.”); First Interim Report of the Special Master at 45, *Montana v. Wyoming*, 563 U.S. 368 (2011) (No. 137) (asserting scientists and courts recognized connection between surface water and groundwater at least by the 1920s). See generally *Water as One Resource: How Interactions Between Groundwater and Surface Water Impact Water Available*, AM. GEOSCI. INST. (July 13, 2015), <https://www.americangeosciences.org/webinars/water-as-one-resource> (discussing hydrologic interactions and their implications for effective water management).

¹⁴ Barton H. Thompson, Jr., *Beyond Connections: Pursuing Multidimensional Conjunctive Management*, 47 IDAHO L. REV. 273, 279–80 (2011).

¹⁵ *Id.* at 278–79 (explaining that about forty percent of the nation’s surface stream flow relies on groundwater and concluding that “the potential for groundwater withdrawals to affect the availability of surface water is obvious”).

¹⁶ Griggs, *A Fifty-Year Retrospective*, *supra* note 11.

¹⁷ THOMPSON ET AL., *supra* note 9, at 448.

¹⁸ See CECH, *supra* note 2, at 105 (identifying “the direction and speed of groundwater movement [as] extremely important in many facets of groundwater hydrology”).

¹⁹ *Id.* at 106–07.

²⁰ *Id.* at 93–94.

interactions between surface and underground water. Such determinations rely primarily on the expensive and time-consuming development of computer groundwater models.²¹ More recently, a pair of NASA-launched satellites that measure changes in Earth's gravity caused by groundwater movement have begun to develop the capacity to monitor groundwater from space.²²

B. Groundwater as Legal Construct

Water law began to develop at least by the mid-nineteenth century,²³ about fifty years before science understood the hydrologic cycle²⁴ and almost a century before the “groundwater revolution” vastly increased our ability to efficiently pump groundwater.²⁵ As a consequence, the law has been slow to reflect scientific knowledge, instead separating water into rigid categories that make little hydrologic sense.²⁶ In the hands of jurists, the descriptor “groundwater” can ossify the location of a particular molecule of water at a particular point in time into an immutable characteristic, with little recognition of water's movement throughout the hydrologic cycle.²⁷ Factually inaccurate understandings of groundwater remained surprisingly sticky in the law, even after scientists had refined their knowledge.²⁸ Perhaps this can be explained as

²¹ Leshy, *supra* note 2, at 1479; Joseph W. Dellapenna, *The Geology and Hydrology of Groundwater*, in 2 WATERS AND WATER RIGHTS § 18.02 (2021) (Amy K. Kelley ed., 3d ed. 2020) (explaining that “[u]ncertainties still exist about physical conditions of groundwater” and the “precise constitution, location, extent, and other characteristics of [certain] aquifers are expensive and time-consuming to determine, if they can be determined at all”); DAVID H. GETCHES, WATER LAW IN A NUTSHELL 254–55 (5th ed. 2015) (explaining that it “can be difficult and expensive” to prove a tributary connection between groundwater and surface streams); *see also* Taiawagi Helton & Rhett Larson, *Prior Appropriation: Introduction and Background*, in 1 WATERS AND WATER RIGHTS § 11.06 (1.01) (Amy K. Kelley ed., 3d ed. 2020) (observing “even where groundwater was included in the prior appropriation system, it was often not managed conjunctively with surface water”).

²² Gloria Hicks, *Getting at Groundwater with Gravity: Scientists Use a Pair of New Satellites to Keep Up with Groundwater Resources*, NASA EARTHDATA, <https://earthdata.nasa.gov/learn/sensing-our-planet/getting-at-groundwater-with-gravity> (Dec. 27, 2020, 8:02 PM).

²³ *See infra* Part II.A.1.

²⁴ *See supra* notes 13–17 and accompanying text.

²⁵ *See supra* notes 9–11 and accompanying text.

²⁶ Although some jurists acknowledged hydrologic connections by the early-twentieth century, many continued to persist in willful ignorance until much later. *See, e.g.*, Samuel C. Wiel, *Need of Unified Law for Surface and Underground Water*, 2 S. CAL. L. REV. 358, 362 (1929) (noting the “connection between surface streams and groundwater is usual, and in fact invariable”) (emphasis omitted); Leshy, *supra* note 2, at 1478 (explaining the law continued to “turn a blind eye” to the connection between surface water and groundwater, and showed little desire to obtain detailed information until long after scientists recognized hydrologic connections).

²⁷ *See, e.g.*, *Wisconsin v. Michels Pipeline Const., Inc.*, 217 N.W.2d 339, 345 (Wis. 1974) (describing as “arbitrary” a “distinction between the rules to be applied to water on the basis of where it happens to be found” and concluding there is “little justification for property rights in ground water to be considered absolute while rights in surface streams are subject to a doctrine of reasonable use”).

²⁸ *See, e.g., infra* Parts II.A.3, II.B.3, II.C.3 & II.D.3 (discussing rationales offered in support of various

“path dependence”—the tendency for early outcomes to set in motion a sequence of events that shape later outcomes, establishing a path that is not necessarily efficient, logical, or easy to predict.²⁹ But when lawmakers and advocates embrace outmoded hydrologic understandings, they risk tainting the analysis as an exercise in willful ignorance, strategic manipulation, or disingenuous post-hoc rationalization of desired outcomes.

In the context of state water rights, one legendary practitioner quipped that the law created a “hydrologic bicycle” that allocated rights to use surface water and groundwater under two distinct legal regimes without regard for the intimate connection of all water sources.³⁰ Not content with creating an artificial chasm between surface and underground water, jurists crafted still more extra-scientific subcategories of groundwater. In an influential 1894 text, attorney Clesson S. Kinney posited an inexhaustible supply of groundwater, which he subdivided into subcategories based more on subjective human understanding than hydrologic principles: “subterranean watercourses”; water “percolating” through “unknown channels”; and the known “subflow” of surface streams.³¹ Such classifications, with some modifications, have endured, and today most states recognize the bifurcation of groundwater into *underground streams* (or *underflow*) regulated under the same rules as surface water, and *percolating* groundwater regulated (if at all) under more lenient rules.³² This shunting of groundwater into its own category is assisted by legal presumptions. In many

groundwater exclusions).

²⁹ See, e.g., Oona A. Hathaway, *Path Dependence in the Law: The Course and Pattern of Legal Change in a Common Law System*, 86 IOWA L. REV. 601, 604–05 (2001) (observing that “courts’ early resolutions of legal issues can become locked-in and resistant to change” and that legal rules can “fail to respond to changing underlying conditions”). The theory of path dependence has been applied in a variety of contexts, including economics, history, and the social sciences. See generally Lucian Arye Bebchuk & Mark J. Roe, *A Theory of Path Dependence in Corporate Ownership and Governance*, 52 STAN. L. REV. 127 (1999) (evaluating the theory in the context of economics); Joseph Russomanno, *The “Central Meaning” and Path Dependence: The Madison-Meiklejohn-Brennan Nexus*, 20 COMMC’N L. & POL’Y 117 (2015) (evaluating the theory in the context of history and philosophy).

³⁰ Leshy, *supra* note 2, at 1480 (citing Raphael Moses, *Basic Groundwater Problems*, 14 ROCKY MTN. MIN. L. INST. 501, 503 (1968)).

³¹ GLENNON, *supra* note 9, at 29–30 (complaining that “[u]nfortunately, American groundwater law has never recovered from the contributions of Clesson Kinney” and noting it is “relatively easy” to obtain groundwater rights, in contrast to new surface water rights). As one geologist-turned-law-professor recalled, “Although I studied hydrogeology as an undergraduate and then worked as an environmental geologist, I never even heard the phrase ‘known and definite channels’ before coming to law school.” Dave Owen, *Taking Groundwater*, 91 WASH. U. L. REV. 253, 268 n.103 (2013) [hereinafter Owen, *Taking Groundwater*].

³² See generally Joseph L. Sax, *We Don’t Do Groundwater: A Morsel of California Legal History*, 6 WATER L. REV. 269, 273–74 (2003) (arguing such water law terms “are geographic conceptions fundamentally at odds with science’s understanding of water’s movement” and that such terms erroneously assume “there is a fixed space within which water is the underflow of a stream, and beyond that space the water is something else”).

cases, the law presumes underground water is *percolating* groundwater, and therefore insufficiently connected to surface water to justify regulation.³³ The burden of proof—too difficult or expensive for many small water users to satisfy—is generally on those who seek to integrate groundwater into the hydrologic cycle.³⁴

The law's over-classification impulse manifests also as a distinction between water quantity and water quality. This artificial distinction often seeks refuge under the umbrella of federalism.³⁵ Matters of water quantity have long been the province of state water rights law,³⁶ whereas water quality is protected primarily by federal pollution control law.³⁷ The quantity/quality divide is bolstered also by textualism. In determining the scope of federal authority over water pollution, Justice Scalia and other textualists defined hydrologic terms by reference to lay sources such as *Webster's Second International Dictionary* rather than scientific authorities.³⁸

The failure of lawmakers to acknowledge basic hydrologic principles diminishes the integrity of the law. With reference to California water law, Professor Joseph Sax complained that reliance on pseudo-scientific language to construct legal categories “give[s] the enterprise a somewhat daffy air.”³⁹ Likewise, Professors Robert Glennon and Thomas Maddock criticized a decision of the Arizona Supreme Court that turned on a distinction between tributary groundwater and subflow, even though the court acknowledged the distinction to be “less precise than current theories.”⁴⁰ They retorted that the court's analysis indeed represented an understanding of hydrology less precise than modern knowledge “in the same way that the nineteenth century practice of medicine, with bloodletting and leeches, is less precise than today's medical knowledge.”⁴¹

³³ See *infra* Part II.A.2.

³⁴ See GETCHES, *supra* note 21, at 254–55.

³⁵ See, e.g., *infra* Part II.D.3.

³⁶ See *infra* Part II.A (considering state water rights). See generally Anne W. Squier, *Water Quality, Water Quantity: The Reluctant Marriage*, 21 ENV'T. L. 1081 (1991) (summarizing the proceedings of Lewis & Clark Law School's “Reluctant Marriage” conference).

³⁷ See *infra* Part II.D (considering the federal Clean Water Act).

³⁸ See *infra* Part II.D.3.

³⁹ Sax, *supra* note 32, at 273.

⁴⁰ Robert Jerome Glennon & Thomas Maddock, III, *In Search of Subflow: Arizona's Futile Effort to Separate Groundwater from Surface Water*, 36 ARIZ. L. REV. 567, 572–74 (1994) (criticizing *In re Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source*, 857 P.2d 1236, 1243 (Ariz. 1993)).

⁴¹ *Id.* at 572.

C. *Groundwater as Exceptional*

As this Article will explore, numerous legal doctrines recognize exceptions for groundwater and treat it differently than surface water. Often, this creates loopholes that water users can exploit to circumvent the more onerous rules that generally apply to surface water. The legal treatment of groundwater in the United States is exceptional in an additional sense: As many countries across the globe experience water shortages due to drought, climate change, and other factors, each must struggle to develop an effective response. Increasingly, such responses incorporate elements of so-called “conjunctive management,” which recognizes the connectedness of the hydrological cycle and the need to coordinate use of surface water and groundwater into a single portfolio of resources.⁴² Although an international comparative analysis is beyond the scope of this Article, as a general matter the success of such efforts depends, in part, on the ability of individual nations to engage in collective action.⁴³ In that sense, groundwater management in the United States is “exceptional” from that of other nations, and is shaped by the United States’ character, experience, and governance structures.⁴⁴

What can account for groundwater exceptionalism’s tenacity, even as advances in scientific knowledge weaken its underpinnings? Beyond the potential explanation supplied by the theory of path dependence,⁴⁵ the broader notion of *American exceptionalism* furnishes some insights into the deeply rooted national values that nourish special treatment of groundwater. According to one historian, American exceptionalism is more than the truism that each nation—including the United States—is unique from all others.⁴⁶ Instead, it is

⁴² See, e.g., Cameron Holley, Darren Sinclair, Elena Lopez-Gunn & Edella Schlager, *Conjunctive Management Through Collective Action*, in INTEGRATED GROUNDWATER MANAGEMENT 230 (A.J. Jakeman et al. eds., 2016) (warning against the undesirable effects of “the ‘disjointed’ use of groundwater”); see *infra* Part II.A.2 (identifying conjunctive management as a promising development in state water rights law to move beyond groundwater exceptionalism).

⁴³ Holley et al., *supra* note 42, at 231 (asking “what types of settings encourage broad-based collective action by water users and governments to deliver conjunctive management?” and examining the relative feasibility of collective action in Australia, Spain, and the western United States as “three leaders in water reform and conjunctive management approaches”); Andrew Ross, *Speeding the Transition Towards Integrated Groundwater and Surface Water Management in Australia*, 567 J. HYDROLOGY e1, e2 (2017) (comparing conjunctive water management in Australia and the western United States, and identifying barriers to conjunctive water management).

⁴⁴ See Holley et al., *supra* note 42 (suggesting broad-based collective action is useful for adequately addressing water shortages); see also Dave Owen, *Law, Land Use, and Groundwater Recharge*, 73 STAN. L. REV. 1163, 1212 (2021) [hereinafter Owen, *Law, Land Use*] (suggesting a “communitarian” ethic could facilitate groundwater reform in underdeveloped law of groundwater recharge).

⁴⁵ See *supra* note 29 and accompanying text.

⁴⁶ Ian Tyrrell, *American Exceptionalism, from Stalin with Love*, AEON (Oct. 10, 2016), <https://aeon.co/>

an assertion that the United States “follows a path of history different from the laws or norms that govern other countries,” a path that can make the United States morally superior.⁴⁷ Core attributes hailed as evidence of American superiority include prosperity, capitalism, and liberty.⁴⁸ Exceptionalism represents a powerful cultural narrative that Americans tell themselves to explain why they are not subject to the same rules that apply to other nations.⁴⁹ Even if not literally true, the story reveals the profound aspirations of those who tell it.

As relevant to this Article, groundwater exceptionalism builds on the same storied national attributes of prosperity, capitalism, and liberty that undergird American exceptionalism. And it likewise weaves those traits into a narrative as to why groundwater should not be subject to the same rules that apply to its surface counterpart. Emphasizing prosperity, exceptionalists celebrate the abundance of natural resources American settlers had at their disposal as they pushed the frontier westward.⁵⁰ Later, lawyers such as Clesson Kinney applied a similar narrative of abundance to groundwater, with a supply he regarded as inexhaustible.⁵¹ The capitalism norm, as relevant to water, pushes for the commodification or privatization of natural resources, including water and wetlands in some cases. In the view of one environmental economist, American exceptionalism is marked principally by secure private property rights in land and other physical resources.⁵² Finally, the norm of liberty manifests in the hydrologic context as antipathy to regulation. One water scholar perceives manifestations of “individualism” in groundwater doctrines, which generally

ideas/american-exceptionalism-from-stalin-with-love [hereinafter Tyrrell, *American Exceptionalism*].

⁴⁷ *Id.*; see also Ian Tyrrell, *American Exceptionalism in an Age of International History*, 96 AM. HIST. REV. 1031, 1033–34 (1991) [hereinafter Tyrrell, *An Age of International History*] (criticizing American exceptionalism as an “occupational hazard among all historians” that threatens to obscure transnational similarities and interconnections). *But see* Michael Kammen, *The Problem of American Exceptionalism: A Reconsideration*, 45 AM. Q. 1 (1993) (identifying Ian Tyrrell as a polarizing figure).

⁴⁸ Tyrrell, *American Exceptionalism*, *supra* note 46 (identifying a dichotomy between Europe and America as “the crucible in which American exceptionalist thinking formed”).

⁴⁹ *Id.* (arguing that the current “hyperbolic use” of the phrase has rendered exceptionalism into a counterfactual political ideology).

⁵⁰ Tyrrell, *An Age of International History*, *supra* note 47, at 1034–35, 45.

⁵¹ See *supra* notes 31–32 and accompanying text.

⁵² See generally Gary D. Libecap, *Property Rights to Frontier Land and Minerals: US Exceptionalism* (Nat’l Bureau of Econ. Rsch., Working Paper No. 24544, 2018) [hereinafter Libecap, *Property Rights to Frontier Land and Minerals*] (asserting “[t]he distinct assignment of property rights to land and minerals is likely a basis for long-term US exceptionalism in economic performance, individualism, mobility, and optimism”); Gary D. Libecap, *American Exceptionalism: Due Principally to Secure Private Property Rights*, in AMERICAN EXCEPTIONALISM IN A NEW ERA 31, 31 (Thomas W. Gilligan ed., 2018), https://www.hoover.org/sites/default/files/research/docs/amerex_ch3.pdf [hereinafter Libecap, *American Exceptionalism*] (asserting “[t]he United States has been unusual in its protection of property, especially in the realm of physical resources like land”).

tolerate unregulated “freedom of action” to pump groundwater in the absence of specific proof of harm.⁵³ Another commenter celebrates the United States’ “distinctive” regulatory takings doctrine as preserving a type of liberty to freely use land, water, and other resources without what he views as “expansive regulatory overreach.”⁵⁴

II. THE DOCTRINES: A TYPOLOGY

This Part develops a typology of groundwater exceptionalism with the goal of uncovering patterns that manifest across doctrines, as summarized in Table 1. Four doctrines form the basis of the analysis: (1) state water rights law; (2) the federal reserved rights doctrine; (3) interstate water allocation; and (4) the Clean Water Act’s jurisdictional definitions of the waters subject to protection and the polluting discharges subject to regulation. The first three doctrines concern themselves with water *quantity*—the allocation of use rights among competing claimants. The fourth category deals instead with water *quality*—the regulation of pollution. Each doctrine has recognized exceptions for groundwater, treating it more leniently than surface water or exempting it from regulation altogether. Likewise, each doctrine has struggled as advancing hydrologic knowledge makes it increasingly untenable to draw a bright legal line between surface and underground water. Overall, the law is clearly moving away from exceptionalism, but this progress has been inconsistent and still has far to go.

For each doctrine, Part II will present a *summary* of the relevant water doctrine; an identification of the *exceptions* recognized for groundwater; the *rationales* offered in support of such exceptions; and the legal and practical *consequences* of subjecting groundwater and surface water to often inconsistent regulations. As the analysis will reveal, the most prevalent rationales fall into four groupings: (1) *hydrologic ignorance*: groundwater is too “secret” to regulate (or too difficult or expensive to study fully in relation to surface water); (2) *water is land*: groundwater should be regarded as part of the overlying surface estate and subject to the same rules of ownership and use; (3) *federalism*: groundwater should be regulated, if at all, by the states; and (4) *textualism*: Congress (or the parties to an agreement) did not clearly indicate an intent to regulate or allocate groundwater use.

⁵³ THOMPSON ET AL., *supra* note 9, at 473 (attributing the trait of “individualism” to groundwater doctrines which promote “freedom of action where the effects of individual action cannot be demonstrated with specific proof” (citing Joseph W. Dellapenna, *Legal Classifications*, in 2 WATER AND WATER RIGHTS § 19.05(b)(3) (Amy K. Kelley ed., 3d ed. 2017))).

⁵⁴ Libecap, *American Exceptionalism*, *supra* note 52, at 31–32 (highlighting the United States’ “distinctive” takings doctrine).

The study will suggest two groupings of consequences. First, the special treatment of groundwater leads to two macro-consequences: *over-propertization* and *under-regulation*. Importantly, the descriptors “over” and “under” are *not* primarily intended to advance normative claims as to the degree to which water should be privatized or regulated to promote subjective policy goals. Rather, this Article contends that exceptionalism goes too far when it supports bifurcated treatment of groundwater and surface water based on nothing more than whether a particular molecule is above- or below-ground at a particular moment in time. Second, the study will also bring to light a number of adverse micro-consequences, including *hydrologic defiance* (when the law draws lines between surface water and groundwater in ways that do not conform to the actual movement of water through the hydrologic cycle); *analytical incoherence* (when groundwater exceptions lack supportable, consistent, and cogent explanations); and *doctrinal undermining* (when exceptionalism creates loopholes and other obstacles that prevent doctrines from achieving their underlying purposes, including the allocation of scarce water supplies and environmental protection).

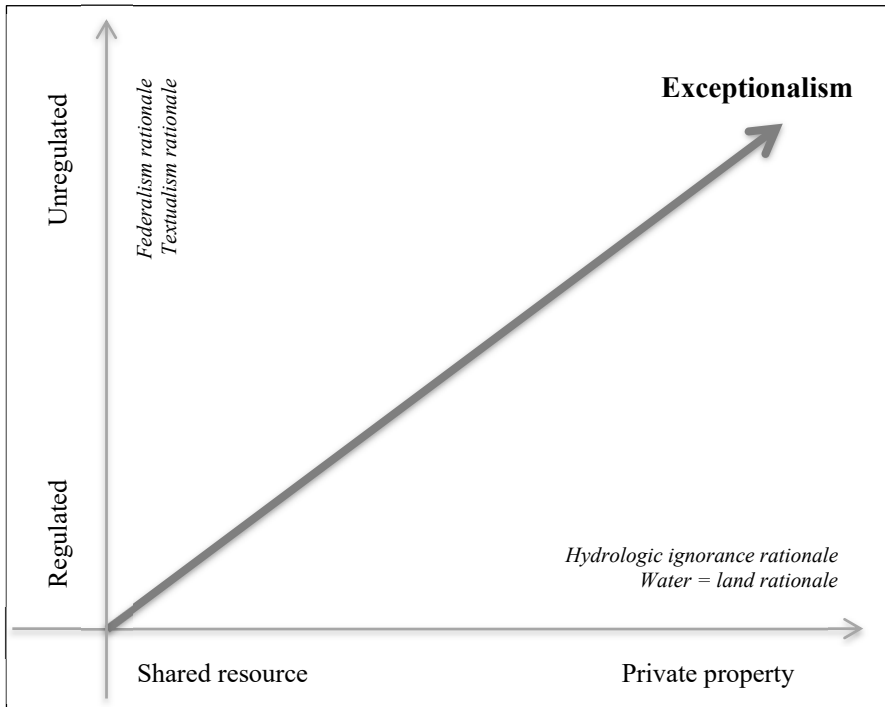
Table 1. A Typology of Groundwater Law

Doctrines	Rationales	Consequences
(1) State water rights (2) Federal reserved rights (3) Interstate allocation <ul style="list-style-type: none"> • Interstate compacts • Equitable apportionment (4) The Clean Water Act <ul style="list-style-type: none"> • Jurisdictional waters • Jurisdictional discharges 	(1) Hydrologic ignorance (2) Water is land (3) Federalism (4) Textualism	(1) Macro-consequences <ul style="list-style-type: none"> • Over-propertization • Under-regulation (2) Micro-consequences <ul style="list-style-type: none"> • Hydrologic defiance • Analytical incoherence • Doctrinal undermining

Overall, three broad patterns will emerge. First, Figure 1 conceptualizes exceptionalism as a catalyst for the over-propertization and under-regulation of groundwater. Although the mapping of rationales and consequences is imperfect, the *ignorance* and *land* rationales provide an excuse for groundwater

privatization;⁵⁵ relatedly, the *federalism* and *textualism* rationales can impede groundwater regulation. It might be possible to craft groundwater exclusions that reconcile intra-doctrinal tensions and competing policy goals. But when jurists and advocates proffer pseudo-scientific explanations untethered to the hydrologic cycle, such assertions can mask subjective value preferences and stifle robust policy debate.

Figure 1. Exceptionalism's Supporting Rationales and Macro-Consequences



As a second broad pattern unpacked in this Part II, courts and legislators have made significant progress toward integrating their treatment of surface water and groundwater, but the progress has been inconsistent. In many cases, they have been willing to support the regulation of groundwater that poses a *threat* to surface water through depletion or pollution long before—often decades or even a century before—they have been willing to recognize

⁵⁵ See *infra* Part III.A.

groundwater as a *protected resource* subject to regulation or protection in its own right.⁵⁶

Finally, as a third pattern, the rejection of exceptionalism has been hindered by path dependence.⁵⁷ If one considers groundwater exceptionalism as the original sin of water doctrines, then mid-nineteenth century state water rights law is the place where the sin was first committed.⁵⁸ After the surface water/groundwater divide became established in that context, it spread to other water-related doctrines, often without analysis as to whether such cross-pollination was warranted. As a result, the law continued down the path of exceptionalism long after science recognized the intricate interrelationships of the hydrologic cycle.

A. State Water Rights Law

Each state has developed a body of “water rights” law to allocate the right to use water among competing claimants. Riparianism is the prevalent doctrine in the relatively water-rich states east of the hundredth meridian—the longitudinal line passing through North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.⁵⁹ The more arid states to the west of that divide generally adhere to the prior appropriation doctrine.⁶⁰ Yet other states follow a complicated hybrid of both canons.⁶¹ Despite their doctrinal differences, virtually all states have succumbed to the temptation to exempt vast quantities of underground water from the common law rules governing surface water use, with apparently little regard for basic hydrologic principles.⁶² This may have mattered little before we developed the technological capacity to withdraw vast quantities of groundwater. But after the 1937 invention of the high-speed centrifugal pump and the groundwater revolution it spawned,⁶³ disputes over

⁵⁶ See *infra* Parts II.B.2 (federal reserved rights), II.C.2 (interstate allocation) & II.D.2 (Clean Water Act).

⁵⁷ See *supra* note 29 and accompanying text.

⁵⁸ See *infra* Part II.A.2.

⁵⁹ CHRISTINE A. KLEIN, FEDERICO CHEEVER, BRET C. BIRDSONG, ALEXANDRA KLASS & ERIC BIBER, *NATURAL RESOURCES LAW: A PLACE-BASED BOOK OF PROBLEMS AND CASES* 911 (4th ed. 2018). The 100th meridian has been described as an “aridity boundary.” The area east of the 100th meridian averages precipitation of fifty-one centimeters (twenty inches) per year and makes farming possible without irrigation. Climate scientists have noted, however, that this climatic boundary line is moving eastward as a consequence of climate change and predict that the dry-humid boundary could shift to the ninety-eighth meridian by 2100. Harvey Leifert, *Dividing Line: The Past, Present and Future of the 100th Meridian*, *EARTH MAG.* (Jan. 9, 2018), <https://www.earthmagazine.org/article/dividing-line-past-present-and-future-100th-meridian>.

⁶⁰ KLEIN ET AL., *supra* note 59, at 922.

⁶¹ GETCHES, *supra* note 21, at 187–88 (describing hybrid riparian/appropriation systems).

⁶² *Id.*

⁶³ See *supra* note 11 and accompanying text.

groundwater use intensified.⁶⁴ Today, states confront the legacy of such bifurcation as they struggle to conjunctively manage interconnected surface water and groundwater resources, and to regulate two distinct sets of water users whose expectations developed under inconsistent sets of rules.⁶⁵ Even California, the vanguard of many innovations, lags behind and did not legislate a statewide framework for long-term groundwater protection until the Sustainable Groundwater Management Act of 2014.⁶⁶

1. *The Law*

a. *The Riparian Doctrine*

The riparian doctrine predicates the right to use water on the ownership of “riparian land,” typically defined as property that abuts a natural watercourse.⁶⁷ This linkage between land and water is one of the core tenets of common law riparianism, which views land and water as a single, inseparable unit.⁶⁸ This association is also one of the most criticized aspects of the doctrine, privileging waterfront landowners to the exclusion of all others.⁶⁹ Those who qualify as riparian landowners have the right to divert from adjacent surface streams and lakes, whereas nonriparians have no such right and must rely on more expensive groundwater pumping or other means of satisfying their needs.⁷⁰

Despite their broad advantage, riparian landowners must observe two qualifications.⁷¹ First, the use must be “reasonable” in terms of both purpose and quantity of water used. The law declares a use “unreasonable” if it interferes with the reasonable use of competing riparians, at times employing the maxim of nuisance law, “*sic utere tuo, ut non alienum laedas.*”⁷² This comparative

⁶⁴ Joseph W. Dellapenna, *A Primer on Groundwater Law*, 49 IDAHO L. REV. 265, 267 (2013) [hereinafter Dellapenna, *A Primer on Groundwater Law*] (noting the increase of groundwater litigation and legislative intervention, particularly after World War II).

⁶⁵ Thompson, Jr., *supra* note 14, at 280.

⁶⁶ See *Sustainable Groundwater Management Act (SGMA)*, CAL. DEP’T OF WATER RES., <https://water.ca.gov/programs/groundwater-management/sgma-groundwater-management> (last visited Dec. 16, 2021) (providing overview of legislation).

⁶⁷ GREGORY S. WEBER, JENNIFER L. HARDER & BENNETT L. BEARDEN, *CASES AND MATERIALS ON WATER LAW* 250 n.2 (9th ed. 2014).

⁶⁸ *Id.* at 253 n.9 (noting riparian rights have been described as “part and parcel of the land itself”).

⁶⁹ *Id.* at 252 (“It is impossible for all people to be riparians.”).

⁷⁰ *Id.*

⁷¹ See AM. SOC’Y OF CIV. ENG’RS, *REGULATED RIPARIAN MODEL WATER CODE*, at viii (2004).

⁷² See BLACK’S LAW DICTIONARY (11th ed. 2019) (translating maxim as “[u]se your property so as not to damage another’s”); see also *Tyler v. Wilkinson*, 24 F. Cas. 472, 474 (C.C.D.R.I. 1827) (No. 14,312) (quoting maxim without translation and holding that each riparian is entitled to make a reasonable use of the stream that does not interfere with the reasonable use of others); RESTATEMENT (SECOND) OF TORTS § 849, ch. 13, topic 3,

reasonableness analysis takes place against an ever-shifting landscape: A use adjudged reasonable at one point in time can become unreasonable as more riparians and more intensive uses come to depend on the same waterbody.⁷³ As a consequence, the scope of a riparian water right is imprecise, making it difficult for landowners to plan and invest with certainty in the future uses of their property.⁷⁴ As a second limitation, riparian law regulates the place of use. Under the so-called “on tract rule,” landowners must use water on the same parcel of land that abuts the source from which the water was drawn.⁷⁵ Under the overlapping “watershed limitation,” water must be used in the same watershed from which it was extracted and may not be transported across a hydrologic divide to a different basin.⁷⁶ Both rules aim to restrict use to nearby lands so that any unused amounts return by gravity flow to the watercourse from which the water was diverted.⁷⁷ Overall, both rules reinforce the concept of water as an inseparable component of real property.⁷⁸

Common law riparianism thus takes on the aura of property law—limiting water use to people who own riparian land and places near the water source. At the same time, riparianism resembles tort law as it weighs the impact of each landowner’s water use on fellow riparians sharing the same source.⁷⁹ Toward the end of the twentieth century, the law began to emphasize the latter aspect. The 1979 Restatement (Second) of Torts, for example, locates the riparian rights doctrine within chapters on tort law, not property.⁸⁰ But despite its nod toward tort law, the Restatement (Second) clings also to property-based policy, particularly in the context of groundwater. It asserts that “water is for many purposes treated like a part of the land over which it flows, and the rights, duties and privileges with respect to its use are not different in principle from those with respect to the soil, minerals and other substances that make up the land.”⁸¹ Section 858 specifically addresses liability for the use of groundwater. As the

intro. note (AM. L. INST. 1979) (applying common law maxim requiring landowners to use their own property in such a manner as to not injure that of another).

⁷³ Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 MARQ. L. REV. 53, 69–70 (2011).

⁷⁴ *Id.*

⁷⁵ THOMPSON ET AL., *supra* note 9, at 29–30.

⁷⁶ Joseph W. Dellapenna, *The Right to Use Water*, in 1 WATERS AND WATER RIGHTS § 7.02(a)(1.01)(2) (2021) (Amy K. Kelley ed., 3d ed. 2020) (explaining watershed limitation).

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ RESTATEMENT (SECOND) OF TORTS §§ 841–857 (AM. L. INST. 1979).

⁸⁰ *Id.* § 849, intro. note (explaining that with the advent of the Industrial Revolution, courts desired to permit “the fullest beneficial use of the rivers and streams,” and thus “[t]he use, not the stream, came to be the thing protected by law, and injury to a reasonable use became the tort”).

⁸¹ *Id.*

comments explain, that section “retains the property basis of the common law rules pertaining to ground water” and encourages “more or less unrestricted development of the [groundwater] resource by those who have access to it.”⁸²

Despite riparianism’s effort to thread the needle between overly-rigid property law and imprecisely-comparative tort law, commentators remain unconvinced of the doctrine’s continued usefulness—whether in the form of the common law or of the Restatement.⁸³ Instead, a number of states have enacted statutory water codes that supplant or supplement common law riparianism—generally under the name of “regulated riparianism.”⁸⁴

b. The Prior Appropriation Doctrine

Most western states rejected riparianism, instead adopting the prior appropriation doctrine—a system they saw as more compatible with the arid conditions of the American West.⁸⁵ The doctrine protects only “beneficial uses” of water,⁸⁶ a rough counterpart to riparianism’s analysis of the reasonableness of both the purpose and amount of water diverted from natural sources.⁸⁷ Also like riparianism, common law appropriation focused almost exclusively on diversions from surface water supplies such as streams and lakes.⁸⁸ But the similarities stop there: two of appropriation’s defining characteristics depart dramatically from eastern riparianism. First, the appropriation doctrine allocates water supplies according to temporal priority⁸⁹ rather than require sharing among users. The governing rule is “first in time, first in right,” a principle often said to be rooted in the customs of California and Colorado mining camps that sprang up during the gold rush of the 1840s and 1850s.⁹⁰ The oldest “senior”

⁸² *Id.* § 858, cmt. (b); *see also* J. David Aiken, *Hydrologically Connected Ground Water, Section 858, and the Spear T Ranch Decision*, 84 NEB. L. REV. 962, 988 (2006) (suggesting § 858 confines its regulatory scope to “subflow” in close proximity to surface streams, leaving unregulated other tributary groundwater located further from the surface channel).

⁸³ Robert H. Abrams, *Charting the Course of Riparianism: An Instrumentalist Theory of Change*, 35 WAYNE L. REV. 1381, 1400–02 (1989) (opining that the Restatement (Second) offers “little help indeed” in the resolution of recurrent “hard cases”).

⁸⁴ Joseph W. Dellapenna, *Adapting Riparian Rights to the Twenty-First Century*, 106 W. VA. L. REV. 539, 583–93 (2004) (estimating that about half of the eastern states had developed “administrative permit systems to replace traditional riparian rights” as of 2004, and observing that few realize “regulated riparianism represent[s] a truly different model of water law”); REGULATED RIPARIAN MODEL WATER CODE, *supra* note 71.

⁸⁵ KLEIN ET AL., *supra* note 59, at 921–23.

⁸⁶ *Id.* at 922.

⁸⁷ *See supra* notes 72–74 and accompanying text.

⁸⁸ KLEIN ET AL., *supra* note 59, at 921–23.

⁸⁹ Whereas the riparian analysis tends to compare one water use to another, appropriation’s beneficial use analysis considers only the subject water use apart from all others. *See id.* at 922–23.

⁹⁰ *See, e.g., Coffin v. Left Hand Ditch Co.*, 6 Colo. 443, 447 (1882) (recognizing appropriation doctrine

water users are entitled to fully satisfy their water rights before more recent “junior” water users receive even a single drop of water.⁹¹ Second, unlike riparianism, appropriation does not regulate the place of use. Instead, it is common for appropriators to dig ditches to transport streamflow long distances to the ultimate place of use—often across watershed boundaries or even across mountain ranges.⁹²

Some of the oldest surface water rights date back to the mid-nineteenth century.⁹³ In contrast, groundwater pumping by high capacity wells did not become technologically or economically feasible until about a century later—around the time of World War II.⁹⁴ Because common law appropriation doctrine excepted some or all groundwater, well owners simply began to pump from their wells without the need for legal authorization, effectively jumping the line in terms of priority where underground and surface sources were hydrologically connected.⁹⁵ As a consequence of the long-standing exception of groundwater from regulation, the law would struggle to play “catch up” to coordinate surface water and groundwater law.

c. *Groundwater Doctrines*

Many states have separate rules for the diversion of surface water and the pumping of groundwater. Notably, groundwater use is either generally unregulated or more leniently regulated than diversions from surface watercourses.⁹⁶ In California, for example, most groundwater was classified as “percolating” and free of any state permit requirements until the passage of

in Colorado); *Irwin v. Phillips*, 5 Cal. 140, 146–47 (1855) (recognizing prior appropriation doctrine in California). See generally Burke W. Griggs, *Water: Practical Challenges and Legal Rights to Acquire and Recycle Water for Hydraulic Fracturing*, in 2018 ROCKY MTN. MIN. L. FDN. J. 10-1, 10-15 (2019) [hereinafter Griggs, *Water: Practical Challenges*] (tracing the history of the prior appropriation doctrine to California during the 1840s and Colorado during the 1850s).

⁹¹ KLEIN ET AL., *supra* note 59, at 922–23; see also GETCHES, *supra* note 21, at 105 (explaining that the prior appropriation doctrine “allows the full senior right to be exercised before the junior can use any water” in times of shortage).

⁹² See GETCHES, *supra* note 21, at 152, 154 (describing transbasin diversions and diversions across the continental divide).

⁹³ See *supra* note 90 and accompanying text.

⁹⁴ See Glennon, *supra* note 9, at 26; Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 166.

⁹⁵ See, e.g., *Fellhauer v. People*, 447 P.2d 986, 991–92 (Colo. 1968) (acknowledging the detrimental impact of well pumping on senior surface water rights holders).

⁹⁶ See, e.g., Kevin O’Brien, Richard Frank, Andy Sawyer, Alletta Belin & Paul Kibel, *Proceedings of the 2019 California Water Law Symposium Panel Organized by GGU School of Law: SGMA and Interconnected Groundwater-Surface Water*, 12 GOLDEN GATE U. ENV’T L.J. 81, 83, 85 (2020) (citing California as an extreme example of a state that long failed to integrate the law of surface water and groundwater).

groundwater legislation in 2014.⁹⁷ Groundwater rules fall into roughly five categories—sometimes overlapping and confused with one another. First, early courts applied a rule of capture called the “absolute dominion doctrine” (also known as the “English rule” or “absolute ownership rule”),⁹⁸ which views underground water as part of the surface estate that “belongs” to the landowner and that can be pumped without regard for impact on others.⁹⁹ As groundwater use increased by the middle of the twentieth century, many states found the doctrine unworkable.¹⁰⁰ Instead, judges and legislators adopted second and third doctrines they called “correlative rights” and “reasonable use,” or a confusing hybrid of both.¹⁰¹ Yet a fourth group of jurisdictions has followed the approach of the Restatement (Second) of Torts, although commentators do not agree on whether the Restatement set forth a new rule or codified existing common law.¹⁰² Overall, though, these departures from the absolute dominion rule apply some restrictions to groundwater pumping and require some degree of sharing in times of shortage.¹⁰³ Finally, a fifth group of states has extended the western prior appropriation doctrine to groundwater, but with modifications that provide for more relaxed restrictions on groundwater than surface water use.¹⁰⁴ Particularly of note, some western states allow for the “mining” of aquifers, which permits well pumping at rates anticipated to exhaust the underground

⁹⁷ *Id.* at 82–83, 85.

⁹⁸ Joseph W. Dellapenna, *The Rise and the Demise of the Absolute Dominion Doctrine for Groundwater*, 35 U. ARK. LITTLE ROCK L. REV. 291, 292, 297 (2013) [hereinafter Dellapenna, *The Rise and the Demise*]. See generally *Acton v. Blundell*, 152 Eng. Rep. 1223, 1226 (Exch. Chamber 1843) (cited by Dellapenna, *The Rise and the Demise*, *supra*, at 296, as the case that “has come to be identified as the source of the absolute dominion doctrine, notwithstanding its earlier adoption in Massachusetts”); *Greenleaf v. Francis*, 35 Mass. (18 Pick.) 117, 121, 123 (1836) (cited by Dellapenna, *The Rise and the Demise*, *supra*, at 295, as the first reported common law case that clearly articulated the doctrine).

⁹⁹ Dellapenna, *The Rise and the Demise*, *supra* note 98, at 300–01. Despite the language of “belonging,” courts rarely find that landowners have a sufficient property interest in groundwater to trigger takings liability if states enact legislation that purports to regulate groundwater use. *Id.* at 308–15.

¹⁰⁰ *Id.* at 305–06, 318–22 (suggesting only a handful of states, most notably including Texas, still adhere to the doctrine).

¹⁰¹ Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 270.

¹⁰² *Id.* at 294–97.

¹⁰³ *Id.* at 292–97 (arguing judicial ambiguity makes it impossible to definitively conclude whether the reasonable use doctrine weighs the harm caused by defendant’s pumping in the abstract or in relation to the plaintiff’s water use). States following the Restatement also relax surface riparianism’s rigid restrictions on the place of use. See RESTATEMENT (SECOND) OF TORTS § 858 (Am. L. Inst. 1979) (liability for use of ground water subject to a number of factors, none of which includes place of use); *id.* at cmt. d (“Whether ground water is used on or off the overlying land involves much the same considerations as whether stream water is used on riparian or nonriparian land.”).

¹⁰⁴ Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 299–302; Dellapenna, *The Rise and the Demise*, *supra* note 98, at 306–07; GETCHES, *supra* note 21, at 231 (“Allocation of rights in groundwater strictly based on prior use is not practical; a senior groundwater appropriator theoretically could demand that no pumping be allowed because virtually any new pumping causes some effect on existing wells.”).

supply over a specified period of time, generally measured by decades or even a century.¹⁰⁵ For example, 1965 Colorado legislation called for a 100-year life of specified aquifers.¹⁰⁶ This tolerance for draining underground aquifers in the name of maximum beneficial use stands in contrast to surface appropriation law, which premises water use on diversions of the annual water supply.

2. *The Exceptions*

Both the riparian and prior appropriation doctrines recognize exceptions for “percolating” groundwater—defined as groundwater that seeps through the pores of underground soil and rock, and interpreted as encompassing most groundwater.¹⁰⁷ Largely ignoring groundwater, each doctrine generally limits its focus to surface streams, their associated “subflow,”¹⁰⁸ and so-called “underground streams” (also called “subterranean streams”).¹⁰⁹ Despite the significant consequences flowing from these classifications, they have been created by lawyers with little regard for hydrologic principles or physical reality. As one law professor explains, “Not the least of the continuing disconnects between water science and water law is the continuing application, in most states, of different bodies of law to surface waters and to groundwater even though they are all part of a single hydrologic cycle—a fact that has long been known.”¹¹⁰ These extra-scientific classifications are afforded additional weight by a rebuttable presumption in many jurisdictions that underground water should be classified as percolating and therefore exempt from regulation under surface

¹⁰⁵ GETCHES, *supra* note 21, at 245–46 (discussing legislative schedules for groundwater mining, with examples of aquifer life limitations ranging from 20 to 100 years).

¹⁰⁶ See Colorado Groundwater Management Act of 1965, Colo. Rev. Stat. §§ 37-90-101, 37-90-102(2), 37-90-103(10.5)–(10.7).

¹⁰⁷ Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 268.

¹⁰⁸ See, e.g., *In re Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source*, 857 P.2d 1236, 1242–43 (Ariz. 1993).

¹⁰⁹ WEBER ET AL., *supra* note 67, at 366–67 (describing terminology and explaining “[t]he division of groundwater into underground streams and percolating waters has been criticized for ignoring physical reality”); Sax, *supra* note 32, at 272–73 (discussing historical treatment in California of underground watercourses, which the state terms “subterranean stream[s]”); see also *Woodsum v. Township of Pemberton*, 412 A.2d 1064, 1067 (N.J. Super. Ct. Law Div. 1980) (dividing groundwater into regulated underground streams and unregulated percolating waters, with a presumption in favor of the latter); *Pima Farms Co. v. Proctor*, 245 P. 369, 371 (Ariz. 1926) (applying prior appropriation law to groundwater demonstrated to flow as underground stream); *Hayes v. Adams*, 218 P. 933, 935 (Or. 1923) (distinguishing underground streams flowing in “a known and well-defined natural channel” from percolating waters, which are a “constituent part of the land and belong to the owner of the land”).

¹¹⁰ Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 268; see *supra* Part II.A.1.

doctrines.¹¹¹ This establishes a difficult burden of proof for surface riparians seeking regulation of competing well pumpers.¹¹²

Under a second exception of particular relevance in western states, “nontributary” groundwater is often exempt from regulation under the surface appropriation doctrine.¹¹³ Unlike the exception for percolating groundwater, which focuses on the physical location of water within an aquifer, the nontributary exception considers whether the subject groundwater has a sufficiently direct hydrologic connection to surface streams to support regulation.¹¹⁴ Although commendable for its focus on the functional impacts of groundwater use, the nontributary determination can be convoluted and mind-numbingly complex. For example, Colorado statutory law regulates groundwater with different degrees of stringency¹¹⁵ based on whether it is demonstrated to be “tributary,”¹¹⁶ “nontributary,”¹¹⁷ or “*not nontributary*”¹¹⁸—categories invented by lawyers, not hydrogeologists. As a positive sign, however, states such as Colorado follow a presumption that groundwater is tributary and therefore subject to regulation,¹¹⁹ the opposite of the common law presumption attached to the percolating groundwater exception in many instances.¹²⁰

¹¹¹ Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 268.

¹¹² GETCHES, *supra* note 21, at 221 (explaining that some states subject groundwater flowing as an underground stream to the law of surface streams rather than groundwater law).

¹¹³ See, e.g., Gregory J. Hobbs, Jr., *Protecting Prior Appropriation Water Rights Through Integrating Tributary Groundwater: Colorado’s Experience*, 47 IDAHO L. REV. 5, 11–12 (2010) (discussing historical development of groundwater regulation in Colorado); Safranek v. Town of Limon, 228 P.2d 975, 977 (Colo. 1951) (recognizing the presumption that all groundwater in Colorado is tributary to a surface stream and subject to prior appropriation).

¹¹⁴ See GETCHES, *supra* note 21, at 254 (defining “tributary” as “groundwater that has a hydrologic connection with a surface stream that is sufficiently direct to warrant legal attention”).

¹¹⁵ See *generally* *Groundwater Resources*, COLO. STATE UNIV., <https://waterknowledge.colostate.edu/hydrology/groundwater-resources> (last visited Dec. 16, 2021) (describing various categories of groundwater that are subject to different types of management in Colorado); Griggs, *Water: Practical Challenges*, *supra* note 90, at 10–12–14 (describing different legal classifications of groundwater under Colorado law).

¹¹⁶ GETCHES, *supra* note 21, at 255 (describing presumption that water is tributary if its pumping would affect a surface stream within forty years).

¹¹⁷ COLO. REV. STAT. § 37-90-103(10.5) (2021) (defining “nontributary groundwater” as groundwater located outside specified aquifers “the withdrawal of which will not, within one hundred years of continuous withdrawal, deplete the flow of a natural stream . . . at an annual rate greater than one-tenth of one percent of the annual rate of withdrawal”).

¹¹⁸ *Id.* § 37-90-103(10.7) (2021) (defining “not nontributary groundwater” as groundwater located in certain aquifers, “the withdrawal of which will, within one hundred years, deplete the flow of a natural stream . . . at an annual rate of greater than one-tenth of one percent of the annual rate of withdrawal”).

¹¹⁹ Hobbs, *supra* note 113, at 11 (discussing presumption of groundwater as tributary “[i]f the groundwater would reach the surface stream within one hundred years or its pumping would affect the surface stream within one hundred years”).

¹²⁰ See *supra* note 111 and accompanying text.

As yet a third exception, many states also exempt small domestic wells from regulation, presumably under the rationale that the impacts from such small-scale pumping will be de minimis.¹²¹ But this assumption is belied by the evidence: As demonstrated by one study, some 2.5 million domestic wells in the West enjoyed such an exemption, even though many likely pumped groundwater in competition with appropriators from nearby surface streams. The study's authors concluded that "[i]t is not sound policy to address the problem of large capacity groundwater wells interfering with surface flow and at the same time exempt small capacity wells which, cumulatively, may have an equally dramatic effect."¹²²

As early as 1929, prominent water lawyer Samuel Wiel viewed such exceptions unworkable in light of the hydrologic connection between surface water and groundwater.¹²³ Responding decades later,¹²⁴ the states have begun to move toward *conjunctive management*, defined by one source as "the integration of the management of surface water resources with the management of groundwater and other water resources (such as atmospheric waters)," under a regime that "takes into account the interconnections of surface and subsurface waters within the drainage basin."¹²⁵ For riparian jurisdictions, the 1997 *Regulated Riparian Model Water Code* prescribes water management "consistent with physical laws," including "ensuring conjunctive management of surface and underground waters."¹²⁶ Western states, too, have joined in.¹²⁷ But both eastern and western jurisdictions have been hindered by delays, costs, and lack of political will.¹²⁸ Overall, despite a growing recognition of the need

¹²¹ WEBER ET AL., *supra* note 67, at 369 (surmising that the domestic well exemption "apparently rests on the premise that it is not worth the time and trouble to require a permit for de minimis uses").

¹²² *Id.* (quoting Robert Jerome Glennon & Thomas Maddock, III, *The Concept of Capture: The Hydrology and Law of Stream/Aquifer Interactions*, 43 ROCKY MTN. MIN. L. INST. 22-1 (1997)) (measuring as of the start of the twenty-first century).

¹²³ Wiel, *supra* note 26, at 362-64.

¹²⁴ Colorado, for example, included some groundwater classified as "tributary" in its prior appropriation doctrine by 1969 legislation. Hobbs, *supra* note 113, at 13.

¹²⁵ Joseph W. Dellapenna, *The Necessity for Conjunctive and Integrated Management*, in 2 WATERS AND WATER RIGHTS § 18.03 (Amy K. Kelley ed., 3d ed. 2021); *see also* THOMPSON ET AL., *supra* note 9, at 537 (discussing conjunctive management).

¹²⁶ REGULATED RIPARIAN MODEL WATER CODE, *supra* note 71, § 1R-1-03, at 5.

¹²⁷ *See, e.g.*, *Kobobel v. Colo. Dep't of Nat. Res.*, 249 P.3d 1127, 1135 (Colo. 2011) (explaining how the state adopted legislation in 1969 to integrate the use of some groundwater known as "tributary" with the use of surface water after the state supreme court "acknowledged the detrimental impact of well pumping on senior surface water rights holders" in 1968).

¹²⁸ Dellapenna, *supra* note 125 ("[T]oday we have the means for obtaining sufficient information about groundwater to allow conjunctive and integrated management, if we are willing to bear the expense.").

for holistic management of surface and underground water, the full promise of conjunctive management has not yet been realized.¹²⁹

3. *The Rationales*

Perhaps the most common rationale for the law's unique treatment of groundwater is that we simply do not—and cannot—know enough about it to craft meaningful regulation.¹³⁰ In the 1850 decision *Roath v. Driscoll*, the Connecticut Supreme Court declined to protect an existing well owner from interference by a neighbor whose subsequently constructed well cut off the supply of the first well.¹³¹ In often-cited language, the court asserted:

Water, whether moving or motionless in the earth, is not, in the eyes of the law, distinct from the earth. The laws of its existence and progress, while there, are not uniform, and cannot be known or regulated. . . . These influences are so secret, changeable, and [uncontrollable], we cannot subject them to the regulations of law, nor build upon them a system of rules, as has been done with streams upon the surface.¹³²

The rationale has also justified judicial failures to protect surface riparians from depletions caused by neighboring groundwater pumpers.¹³³ In the 1861 decision *Frazier v. Brown*, for example, the Ohio Supreme Court declined to intervene in a dispute between neighbors relying on surface water and groundwater, respectively.¹³⁴ In support of its holding, the court asserted that attempts to regulate groundwater “would be involved in hopeless uncertainty, and would be, therefore, practically impossible.”¹³⁵

As a second justification for weak groundwater regulation, some jurisdictions forthrightly favor specific policy goals, even at the expense of

¹²⁹ See Thompson, Jr., *supra* note 14, at 305–06.

¹³⁰ See generally Joseph W. Dellapenna, *The Mid-Nineteenth Century Choices and the Knowledge Underlying Them*, in 2 WATER AND WATER RIGHTS § 19.02 (Amy K. Kelley ed., 3d ed. 2020) (discussing prominent usage of “one dramatic word—‘occult’” to describe groundwater knowledge in the mid-nineteenth century).

¹³¹ *Roath v. Driscoll*, 20 Conn. 533, 541, 543–44 (1850).

¹³² *Id.* at 541.

¹³³ See, e.g., *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861) (holding in favor of defendant whose pumping of percolating groundwater interfered with plaintiff's use of surface spring and rivulet), *overruled by* *Cline v. Am. Aggregates Corp.*, 474 N.E.2d 324 (Ohio 1984).

¹³⁴ *Id.* at 295–96, 312.

¹³⁵ *Id.* at 311.

hydrological accuracy. Both eastern¹³⁶ and western¹³⁷ jurisdictions routinely promote the “[m]aximum utilization” of water resources, at times buttressed by the myth that groundwater is plentiful.¹³⁸ In other cases, some jurisdictions regulate groundwater leniently to avoid the administrative difficulties of determining the precise impact of well pumping on complaining surface water users.¹³⁹ As one writer noted, the law “did not divide surface waters and groundwater into different regimes because we did not know about the interconnection; the law divided them because we lacked the wherewithal to determine the nature of the interconnection in specific cases.”¹⁴⁰

Under a third rationale, courts countenance lenient groundwater regulation to promote particular outcomes or parties. Early judges were loath to stifle water uses they saw as critical to technological advancement and social progress, an approach that tended to favor large industrial users over smaller groundwater pumpers. In 1850, for example, the Connecticut Supreme Court expressed its reluctance to allow the owners of “comparatively unimportant” wells to prevent pumping by other wells supporting important developing industries.¹⁴¹ Sometimes, courts refuse to regulate groundwater pumping because of a desire to promote the interests of one party over another by placing an unacknowledged judicial thumb on the scales of justice. In the wryly-titled article *We Don’t Do Groundwater: A Morsel of California Legal History*, Professor Joseph Sax chronicled how the California Supreme Court as far back as 1899 engaged in

¹³⁶ See, e.g., RESTATEMENT (SECOND) OF TORTS § 858 cmt. b (AM. L. INST. 1977) (discussing a policy of encouraging groundwater use and allowing “more or less unrestricted development”).

¹³⁷ See, e.g., *Fellhauer v. People*, 447 P.2d 986, 994 (Colo. 1968) (declining to protect surface water rights dating back as far as 1887 from withdrawals by well drilled in 1935, in part to promote the “[m]aximum utilization” of the waters of the state).

¹³⁸ See *id.*; RESTATEMENT (SECOND) OF TORTS § 858 cmt. b (AM. L. INST. 1977) (justifying intensive use of groundwater by “the fact that since most ground water basins are very large and contain vast quantities of water, it is usually impossible for a single water user to capture the entire supply and leave no water for others”).

¹³⁹ See, e.g., Robert E. Beck, *The Regulated Riparian Model Water Code: Blueprint for Twenty First Century Water Management*, 25 WM. & MARY ENV’T L. & POL’Y REV. 113, 118–19 (2000) (discussing how the model code encompasses the entire hydrologic cycle of both surface water and groundwater).

¹⁴⁰ *Id.* at 118; see also ANTHONY DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 6:9 (2021) (“In theory, a groundwater permit [in a prior appropriation jurisdiction] should not be issued if it interferes with existing rights,” but there is “little traditional enforcement of priorities” of one well versus another because “there is seldom an absolute shortage” and it can be difficult to determine exactly which well is causing injury to the plaintiff).

¹⁴¹ *Roath v. Driscoll*, 20 Conn. 533, 541–42 (1850) (declining to regulate wells where such regulation would prevent “the improvement of the neighbourhood, by draining marshes . . . and even the opening of mines of metal or coal”); see also *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861) (refusing to curtail well pumping where such efforts would “interfere, to the material detriment of the common wealth, with drainage and agriculture, mining, the construction of highways and railroads, with sanitary regulations, building and the general progress of improvement in works of embellishment and utility”), *overruled by* *Cline v. Am. Aggregates Corp.*, 474 N.E.2d 324 (Ohio 1984).

what Sax called “doctrinal gymnastics” to recognize a meaningless distinction between percolating groundwater and subterranean streams—all with the unacknowledged goal of protecting the surface water rights of the growing city of Los Angeles.¹⁴² As a consequence, Sax argued, for well over a century California continued to follow a body of water law at odds with scientific reality, leaving most groundwater virtually unregulated except under the nonsensical label of subterranean streams.¹⁴³

Under yet a fourth rationale for groundwater nonregulation, some courts express constitutional discomfort, suggesting that regulation of groundwater users could rise to the level of a regulatory taking. Reliance on such a rationale can be an unsatisfying excuse for inaction if judicial misgivings fall short of rigorous analysis, fail to determine whether a taking would actually occur under the facts of the case, or stop short of drawing a supportable hydrologic line between regulable and non-regulable sources of water.¹⁴⁴

4. *The Consequences*

Groundwater exceptionalism adds a considerable degree of complexity to water management. Well over a century ago, states began to develop common law doctrine for surface water use, falling roughly into the categories of riparianism, prior appropriation, or a dual approach.¹⁴⁵ Multiple decades later, states turned their attention to groundwater doctrine, developing a different menu of options that often employed a different group of managers, sometimes

¹⁴² Sax, *supra* note 32, at 272, 278–82 (discussing, inter alia, *City of Los Angeles v. Pomeroy*, 57 P. 585 (Cal. 1899) and concluding “[t]he plain fact is that while the outcome in *Pomeroy*, in favor of Los Angeles, made good sense, the decision’s legal effort to define a part of the groundwater continuum as a ‘subterranean stream’ was both a hydrogeological and public policy fiasco”).

¹⁴³ *Id.* at 270; see also Burke W. Griggs, *Reaching Consensus About Conservation: High Plains Lessons for California’s Sustainable Groundwater Management Act*, 52 U. PAC. L. REV. 495, 508 (2021) (explaining “California long resisted the regulation of groundwater under a permit system, largely because of opposition from irrigation interests in the San Joaquin Valley” until it passed a comprehensive regulatory plan for groundwater, effective 2015); Jennifer L. Harder, *Cognitive Dissonance or Harmonic Convergence? California’s Groundwater Law and the Public Trust Doctrine*, 65 ROCKY MTN. MIN. L. FOUND. ANN. INST. 24-1, 24-2 (2019) (describing how California did not begin to protect surface water from the effects of groundwater pumping until 2014 and continues to follow an approach toward groundwater of “decentralization and non-regulation”).

¹⁴⁴ See, e.g., *Wisconsin v. Michels Pipeline Constr., Inc.*, 217 N.W.2d 339, 347, 351 (Wis. 1974) (in a case of first impression, selecting lenient groundwater doctrine, in part to avoid regulatory taking liability, and concluding “the proposed change is not confiscatory in nature”); *State ex rel. Bliss v. Dority*, 255 P.2d 1007, 1009, 1018 (N.M. 1950) (holding constitutional a state statute subjecting artesian and shallow ground water to regulation under principles of prior appropriation).

¹⁴⁵ See *supra* Part II.A.

at different levels of state government.¹⁴⁶ As one commentator observed, “since large-scale groundwater development lagged behind surface water development by nearly a century or so, states struggled for decades with the question of whether and how to incorporate groundwater within their existing legal regimes.”¹⁴⁷ Even in states that purport to apply similarly named doctrines to both surface water and groundwater—such as “reasonable use” or “prior appropriation”—doctrinal differences persist between the surface and underground versions of the same doctrine.¹⁴⁸ In modern times, this bifurcation has left states scrambling to harmonize management through “conjunctive use” or integrated management regimes—labels which according to one textbook “though universally praised, [may] lack[] precise meaning.”¹⁴⁹

The exception of groundwater from surface water management also has profound implications for the political economy of water allocation—at times tipping the balance between the “haves” and “have nots” in the world of water rights. As Professor Burke Griggs notes in a series of articles, the law’s separate treatment of surface water and groundwater gave rise to two distinct political cultures in the West, both of which predominately used their water rights for irrigated agriculture.¹⁵⁰ Those who came before the “groundwater revolution”¹⁵¹ generally acquired their water rights under the prior appropriation doctrine’s rule of “first in time, first in right.”¹⁵² This surface-water irrigation community formed a distinct political culture, according to Griggs, displaying a number of characteristics. Among other things, it tends to be “legally conservative” and to support the basic tenets of the traditional prior appropriation doctrine.¹⁵³ Later, in the post-World War II period, modern technology made possible high-capacity wells that could pump thousands of gallons per minute from underlying

¹⁴⁶ See Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 299 (observing “appropriation rules for groundwater came almost eight decades after they had been developed for streams” and noting differences between surface and underground application).

¹⁴⁷ Griggs, *Water: Practical Challenges*, *supra* note 90, at 10–11.

¹⁴⁸ See Lawrence J. MacDonnell, *Prior Appropriation: A Reassessment*, 18 WATER L. REV. 228, 305–09 (2015).

¹⁴⁹ WEBER ET AL., *supra* note 67, at 439; *see also* THOMPSON ET AL., *supra* note 9, at 537 (discussing conjunctive use of surface water and groundwater as a management tool); MacDonnell, *supra* note 148, at 305 (identifying integration of tributary aquifers with surface water uses as “[p]erhaps the most pressing legal problem related to groundwater in most states”).

¹⁵⁰ Burke W. Griggs, *The Political Cultures of Irrigation and the Proxy Battles of Interstate Water Litigation*, 57 NAT. RES. J. 1, 2–4, 7 (2017) [hereinafter Griggs, *Political Cultures*]; Griggs, *Water: Practical Challenges*, *supra* note 90, at 10–7–8, 10–10.

¹⁵¹ *See supra* note 11 and accompanying text.

¹⁵² *See supra* note 90 and accompanying text.

¹⁵³ Griggs, *Political Cultures*, *supra* note 150, at 26.

aquifers.¹⁵⁴ Farmers who rely on groundwater formed a separate and powerful political culture, one hostile to government regulation in general, and to classic prior appropriation doctrine in particular.¹⁵⁵ Exempt from surface water regulation in most cases, well owners could jump to the head of the prior appropriation line and pump their wells even if they interfered with hydrologically-connected surface water long ago allocated to senior surface water users.¹⁵⁶ Because of forces such as these, some have noted the vastly diminished importance of “priority” in the groundwater version of the prior appropriation doctrine.¹⁵⁷

Finally, and perhaps most importantly, groundwater exceptionalism encourages overuse of water supplies at a rate that far outpaces natural replenishment through precipitation and recharge.¹⁵⁸ Aquifer overuse is a serious problem. For example, significant portions of the Ogallala Aquifer—which underlies eight High Plains states—have seen water levels drop by 25 to more than 150 feet from the period before the aquifer was tapped.¹⁵⁹

B. Federal Reserved Water Rights

The reserved rights doctrine offers a hopeful example of where the courts have increasingly rebuffed groundwater exceptionalists. It offers valuable lessons about how the law can move from exceptionalism to integrity,¹⁶⁰ despite more than a century of challenges from the doctrine’s inception in 1908.¹⁶¹ The

¹⁵⁴ *Id.* at 26–27.

¹⁵⁵ *Id.* at 36.

¹⁵⁶ *See id.* at 28–31 (explaining how lenient regulation of certain types of groundwater compromised the doctrine of prior appropriation).

¹⁵⁷ *See, e.g.,* Reed D. Benson, *Alive but Irrelevant: The Prior Appropriation Doctrine in Today’s Western Water Law*, 83 U. COLO. L. REV. 675, 710–11 (2012); Tarlock, *supra* note 140 (“[T]here is little traditional enforcement of priorities in prior appropriation jurisdictions . . .”).

¹⁵⁸ *See, e.g.,* Griggs, *Political Cultures*, *supra* note 150, at 30–31 (describing “massive . . . overappropriation” of the portion of the Ogallala Aquifer underlying Kansas); *see* Dellapenna, *A Primer on Groundwater Law*, *supra* note 64, at 316 (asserting the failure to manage underground water has led to “waste and abuse” of groundwater); Wargia M. Bowman, *Dustbowl Waters: Doctrinal and Legislative Solutions to Save the Ogallala Aquifer Before Both Time and Water Run Out*, 91 U. COLO. L. REV. 1081, 1085–89 (2020) (describing various American aquifers at risk of depletion).

¹⁵⁹ Michon Scott, *National Climate Assessment: Great Plains’ Ogallala Aquifer Drying Out*, NOAA (Feb. 19, 2019), <https://www.climate.gov/news-features/featured-images/national-climate-assessment-great-plains'-ogallala-aquifer-drying-out>.

¹⁶⁰ *See infra* Part III.B (discussing the reversal of under-regulation to restore the integrity of water law doctrines).

¹⁶¹ *See Federal Reserved Water Rights and State Law Claims*, U.S. DEP’T OF JUST., <https://www.justice.gov/enrd/federal-reserved-water-rights-and-state-law-claims> (May 12, 2015) (discussing the 1908 origin of the reserved rights doctrine); Michael C. Blumm, *Reserved Water Rights: Introduction*, in 2 WATERS AND WATER RIGHTS § 37.01(a.01) (Amy K. Kelley ed., 3d ed. 2021) (noting that “numerous uncertainties [remain] . . .

example also contributes to the pattern highlighted in the introduction to this Part.¹⁶² The U.S. Supreme Court has upheld regulation of groundwater that threatens to deplete reserved *surface* waters since 1976, but the lower courts did not begin to support the reservation of *groundwater* in its own right until 1999—a step forward that has still not been squarely addressed by the Supreme Court.¹⁶³

1. *The Law*

The federal government holds title to about twenty-eight percent of the land within the United States, concentrated primarily in the western states.¹⁶⁴ Under the judicially-created federal reserved water rights doctrine, when the federal government reserves its lands for a particular federal purpose, it impliedly reserves appurtenant water sufficient to accomplish that purpose.¹⁶⁵ The doctrine was articulated in 1908 in connection with lands reserved for Native American tribes,¹⁶⁶ but was subsequently extended to lands reserved for national forests, wildlife refuges, recreation areas, and other federal purposes.¹⁶⁷

Reserved water rights date back to the time the land was reserved (often as early as the nineteenth century), even if the government does not begin to exercise its right until years or decades later. Thus, long dormant reserved rights have the potential to take state water users by surprise and disrupt the expectations established under state law, potentially calling for a “gallon-for-gallon” reduction of state rights to fulfill federal reserved rights.¹⁶⁸ To soften the tension between federal and state water rights, courts have limited reserved rights to the volume of water “necessary” to accomplish only the primary

regarding the nature and scope of reserved rights”).

¹⁶² See *supra* note 56 and accompanying text.

¹⁶³ Compare *infra* note 178 and accompanying text (discussing *Cappaert v. United States* and its injunction of groundwater pumping that threatens reserved rights), with *infra* note 185 and accompanying text (discussing *In re Gila River Sys.* and its approval of reserved rights in groundwater) & *infra* note 187 and accompanying text (discussing *Agua Caliente Band of Cahuilla Indians* and its approval of reserved rights in groundwater).

¹⁶⁴ KLEIN ET AL., *supra* note 59, at 38.

¹⁶⁵ Blumm, *supra* note 161. In public lands law, “reservation” refers to the dedication of lands held in federal ownership for specified purposes. KLEIN ET AL., *supra* note 59, at 70 n.2.

¹⁶⁶ NATHAN BROOKS, CONG. RSCH. SERV., RL32198, INDIAN RESERVED WATER RIGHTS: AN OVERVIEW 2 (2005), https://www.everycrsreport.com/files/20050124_RL32198_51c82953d38e001132c5bf621cd0304cee757349.pdf.

¹⁶⁷ Blumm, *supra* note 161, § 37.01(b)(3); see also *Federal Reserved Water Rights and State Law Claims*, *supra* note 161 (chronicling Supreme Court cases since 1908 extending federal reserved water rights).

¹⁶⁸ See Blumm, *supra* note 161, § 37.01(c)(1) (explaining that because reserved rights are not lost by nonuse, “state water rights holders arguably had little notice of the superior federal rights”); *United States v. New Mexico*, 438 U.S. 696, 705 (1978).

purpose of the reservation¹⁶⁹ and have often quantified that volume stingingly.¹⁷⁰ Nevertheless, reserved rights remain highly controversial and have been challenged on a number of grounds.¹⁷¹

Congressional intent is the touchstone of the doctrine, which pits the purposes of federal reservations against the plight of those whose state water rights are subject to curtailment. The doctrine was first recognized in 1908 in *Winters v. United States*.¹⁷² There, the federal government had reserved the Fort Belknap Reservation as “an Indian reservation and . . . a permanent home and abiding place” for certain tribes in Montana.¹⁷³ When non-tribal water users began to divert water upstream for irrigation, the federal government sought to enjoin such interference with the tribes’ own irrigation needs downstream.¹⁷⁴ The state water users contended that their lands would be “ruined” and they would be forced to “abandon their homes” if the federal reserved rights were sustained, while the United States similarly argued that the arid lands reserved for the Fort Belknap Reservation would be “practically valueless” without a concomitant reservation of water.¹⁷⁵ The U.S. Supreme Court sided with the federal government and upheld the tribes’ reserved water right, noting that the congressional purpose of converting the tribes into a “pastoral and civilized people” would be thwarted without sufficient water for irrigation.¹⁷⁶

2. *The Exceptions*

Opponents of the doctrine have pursued two lines of attack that focus particularly on groundwater. Following the pattern observed previously, the first line of attack argues that groundwater should not be regulated, even when it poses a *threat* to protected surface resources, whereas the second argues that groundwater should not be reserved as a *protected resource* in its own right.¹⁷⁷ Both arguments have been almost uniformly unsuccessful, but progress has been slow.

¹⁶⁹ *New Mexico*, 438 U.S. at 700, 702 (implying reserved rights only where the primary purpose of the reservation would be “entirely defeated” without the rights).

¹⁷⁰ *See* Blumm, *supra* note 161, § 37.01(b)(3) (asserting the Supreme Court has “strictly construed the scope of non-Indian reserved rights” and “state courts have recognized them and quantified them”).

¹⁷¹ *Id.* § 37.01(a.01) (describing reserved rights as “one of the most controversial aspects of water law, especially in the arid West where federal lands predominate”).

¹⁷² *Winters v. United States*, 207 U.S. 564 (1908); *see also* *United States v. Winans*, 198 U.S. 371 (1905) (recognizing reserved tribal fishing rights based on express language of treaty).

¹⁷³ *Winters*, 207 U.S. at 565.

¹⁷⁴ *Id.* at 566–67.

¹⁷⁵ *Id.* at 570, 576.

¹⁷⁶ *Id.* at 576.

¹⁷⁷ *See supra* note 163 and accompanying text.

a. *Groundwater as Threat*

First, in the 1976 litigation *Cappaert v. United States*, state groundwater users argued that even if the federal government could enjoin surface diversions that negatively impacted federal reserved water rights, it had no such recourse against harmful groundwater pumping.¹⁷⁸ In response, the United States grounded its defense in hydrologic reality and congressional intent, arguing that “[g]round water and surface water are interlocking resources . . . and should be treated similarly by the law” and that “it should not matter whether the water reserved for a federal use is interfered with by a surface diversion or by a well. The effect on the reserved land (no water available for its use) and the diverter (obtaining the use of water previously spoken for) is the same.”¹⁷⁹ The Supreme Court agreed with the United States, concluding “since the implied-reservation-of-water-rights doctrine is based on the necessity of water for the purpose of the federal reservation, we hold that the United States can protect its waters from subsequent diversion, whether the diversion is of surface or groundwater.”¹⁸⁰ Thus, the U.S. Supreme Court explicitly clarified that groundwater can be regulated under the doctrine if its use threatens a protected surface supply.¹⁸¹

b. *Groundwater as Protected Resource*

As a second groundwater exclusion strategy, state water users have claimed that federal reserved rights cannot attach to groundwater itself. This argument has found purchase before only the Wyoming Supreme Court, but with little analysis.¹⁸² The Wyoming court acknowledged that “[t]he logic which supports a reservation of surface water to fulfill the purpose of the reservation also supports reservation of groundwater,” but declined to do so in that case because the litigants had not cited a single precedent applying the doctrine to

¹⁷⁸ *Cappaert v. United States*, 426 U.S. 128 (1976). The federal government reserved water rights in a pool deep within a limestone cavern to protect the habitat of the rare desert pupfish, then believed to exist nowhere else in the world. *Id.* at 131, 133–34. The Court classified the pool as surface water rather than groundwater (although not entirely free from ambiguity) and enjoined groundwater pumpers some two and a half miles away who lowered water levels in the pool. *Id.* at 133, 142–43; Brief of Amici Curiae in Support of Petitioners at 12, 20, 22–24, *Cappaert*, 426 U.S. 128 (Nos. 74-1107, 74-1304) (arguing against regulation of groundwater pumping); *id.* at 45 (arguing that “[e]ven if the government were held to have sufficient reserved rights to protect the pupfish, it should not follow that they are entitled to completely preempt all other uses in the underground aquifer which jeopardize the designated water level in the Hole”).

¹⁷⁹ Brief for the United States at 31, *Cappaert*, 426 U.S. 128 (Nos. 74-1107, 74-1304).

¹⁸⁰ *Cappaert*, 426 U.S. at 143.

¹⁸¹ *Id.*

¹⁸² *In re Gen. Adjudication of the Big Horn River Sys.*, 753 P.2d 76 (Wyo. 1988), *aff’d by an equally divided court sub nom. Wyoming v. United States*, 492 U.S. 406 (1989), *abrogated by Vaughn v. State*, 962 P.2d 149 (Wyo. 1998).

groundwater.¹⁸³ Despite the thin analysis, in 1989 the U.S. Supreme Court accepted certiorari and affirmed by an equally divided court without opinion.¹⁸⁴

Every other lower court to subsequently address the issue has held to the contrary, including the Arizona Supreme Court¹⁸⁵ and the Montana Supreme Court.¹⁸⁶ Most recently, in 2017 the Ninth Circuit Court of Appeals agreed that groundwater can be the basis of a reserved right. In *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water District*, the Ninth Circuit squarely held that the reserved water rights doctrine applies to groundwater.¹⁸⁷ Reconciling the on-the-ground reality that surface water is “virtually nonexistent” on the reserved lands with the congressional intent to secure permanent homes for tribal members with “land and water enough,” the Court determined that the tribe’s survival “is conditioned on access to water” and “a reservation without an adequate source of surface water must be able to access groundwater.”¹⁸⁸ Building on *Cappaert*, the Ninth Circuit concluded that “[i]f the United States can protect against groundwater diversions, it follows that it can protect the groundwater itself.”¹⁸⁹ The U.S. Supreme Court denied certiorari, leaving intact the Agua Caliente tribe’s rights to the groundwater beneath its reservation land,¹⁹⁰ despite the high court’s previous affirmance of a decision to

¹⁸³ *Id.* at 99–100 (holding that “the reserved water rights doctrine does not extend to groundwater” and declining to review the district court’s determination that Wyoming “owns” the groundwater beneath its territory).

¹⁸⁴ *Wyoming*, 492 U.S. 406 (per curiam).

¹⁸⁵ *In re Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source*, 989 P.2d 739, 747–50 (Ariz. 1999) (holding that “[t]he significant question for the purpose of the reserved rights doctrine is not whether the water runs above or below the ground but whether it is necessary to accomplish the purpose of the reservation”), *cert. denied*, 530 U.S. 1250 (2000).

¹⁸⁶ *Confederated Salish & Kootenai Tribes of the Flathead Rsr. v. Stults*, 59 P.3d 1093, 1099, 1101 (Mont. 2002) (finding “no reason to limit the scope of our prior holdings by excluding groundwater from the Tribes’ federally reserved water rights in this case” and enjoining state agency from issuing competing water use permits until tribes’ reserved rights have been quantified); *see also* *Tweedy v. Tex. Co.*, 286 F. Supp. 383, 385 (D. Mont. 1968) (opining that “whether the waters were found on the surface of land or under it should make no difference” to the reservation of water rights to make arid lands useful, but finding insufficient evidence that surface landowners within Indian reservation had been deprived of valid reserved rights by defendants’ water use in that case).

¹⁸⁷ *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist.*, 849 F.3d 1262, 1267, 1270 (9th Cir. 2017) (resolving only the first phase of trifurcated litigation and stating “while we are unable to find controlling federal appellate authority explicitly holding that the *Winters* doctrine applies to groundwater, we now expressly hold that it does”), *cert. denied sub nom. Coachella Valley Water Dist. v. Agua Caliente Band of Cahuilla Indians*, 138 S. Ct. 468 (2017).

¹⁸⁸ *Id.* at 1265–66, 1271.

¹⁸⁹ *Id.* at 1271.

¹⁹⁰ *Coachella Valley Water Dist.*, 138 S. Ct. 468.

the contrary by the Wyoming Supreme Court.¹⁹¹ These opinions have potential ramifications for hundreds of other tribes across the country.¹⁹²

3. *The Rationales*

In their attempts to exclude groundwater from the reserved rights doctrine, states and their water users relied on largely discredited assertions imported from intrastate water rights litigation.¹⁹³ Well pumpers own the groundwater beneath their land;¹⁹⁴ the movement of groundwater is too unknown to be regulated;¹⁹⁵ groundwater moves too slowly to affect surface use;¹⁹⁶ “percolating” groundwater is not connected to surface waters;¹⁹⁷ the federal government should bear the burden of proving that the groundwater pumping impacts surface reserved rights;¹⁹⁸ and the use of water for federal purposes interferes with the policy of promoting the maximum utilization of waters within the state.¹⁹⁹ In contrast to such arguments, the Supreme Court has relied on the functional connectivity of surface water and groundwater, as well as on doctrinal purpose,²⁰⁰ in support of the regulation of groundwater that affects protected surface reserved rights. These rationales highlight the path forward toward the integration of surface water and groundwater.

¹⁹¹ See *supra* notes 182–84 and accompanying text.

¹⁹² See *infra* Part II.B.4.

¹⁹³ See *supra* Part II.A.3.

¹⁹⁴ See *United States v. Cappaert*, 508 F.2d 313, 318 (9th Cir. 1974) (summarizing and rejecting defendants’ argument that they held ownership rights to underground water that could only be taken from them by eminent domain), *aff’d*, 426 U.S. 128 (1976); *Petition for Writ of Certiorari* at 12–13, 24–31, *Desert Water Agency v. Agua Caliente of Cahulla Indians*, 138 S. Ct. 469 (2017) (No. 17-42) (arguing that the priority rule does not apply to groundwater); *In re Gen. Adjudication of the Big Horn River Sys.*, 753 P.2d 76, 99–100 (Wyo. 1988) (holding that “the reserved water rights doctrine does not extend to groundwater” and declining to review the district court’s determination that Wyoming “owns” the groundwater beneath its territory), *aff’d by an equally divided court sub nom. Wyoming v. United States*, 492 U.S. 406 (1989), *abrogated by Vaughn v. State*, 962 P.2d 149 (Wyo. 1998).

¹⁹⁵ Brief of Amici Curiae in Support of Petitioners at 5, *Cappaert*, 426 U.S. 128 (Nos. 74-1107, 74-1304) (arguing “[t]he existence of feasible groundwater supplies, especially in the early days, was not known” and therefore the United States could not have formed the intent to reserve such groundwater).

¹⁹⁶ Brief for Intervenor-Appellant State of Nevada at 27–29, *Cappaert*, 426 U.S. 128 (Nos. 74-1107, 74-1304).

¹⁹⁷ See Brief of Amici Curiae in Support of Petitioners, *supra* note 195, at 24.

¹⁹⁸ *Id.* at 6.

¹⁹⁹ *Id.* at 8.

²⁰⁰ See *supra* notes 179–80 and accompanying text.

4. *The Consequences*

Groundwater exceptionalism impacts *who* can use water. It favors well pumpers over surface diverters under state water rights law²⁰¹ and potentially benefits water users in one state over another in interstate disputes.²⁰² In the context of reserved water rights, unchecked exceptionalism could impede water use by yet another group—Native Americans, almost half of whom lack sufficient access to drinking water on tribal reservations.²⁰³ Currently, more than two hundred western tribes occupy lands with groundwater rights that have not yet been quantified by courts or through negotiated agreements.²⁰⁴ Because many of those tribes occupy arid lands with relatively little surface water, deprivation of groundwater access would threaten the tribes' very existence.²⁰⁵ Forestalling just such a consequence, courts have broadly resisted the exception of groundwater from federal reserved rights.

Excluding groundwater from the reserved rights doctrine would impact not only who can use water, but also the purposes for which scarce resources should be allocated. Federal lands are concentrated disproportionately in the arid West,²⁰⁶ where groundwater is often more available than surface supplies. Depriving federal reservations of reserved rights in groundwater could make significantly less water available for federal purposes, which focus heavily on preservation as a counterweight to the development uses often favored by state water users.²⁰⁷

C. *Interstate Water Allocation*

Just as individual water users compete on an *intrastate* basis, so also do states battle with one another for the right to use *interstate* water resources. Historically, most of these disputes focused on surface water, and the law has

²⁰¹ See *supra* Part II.A.2.

²⁰² See *infra* Part II.C.2.

²⁰³ Josie Garthwaite, *Stanford Study Reveals the Changing Scope of Native American Groundwater Rights—And Opportunities for Better Freshwater Management*, STAN. NEWS, <https://news.stanford.edu/2018/08/03/who-owns-the-aquifer/> (Aug. 3, 2018) (observing “[a]lmost half of all homes on Native American land lack adequate access to drinking water or waste disposal facilities, compared to less than 1 percent for U.S. homes overall”).

²⁰⁴ To supply water needs in the absence of settled water rights, some tribes have purchased water from local water supply agencies, which depend upon state water rights rather than federal reserved rights. *Id.*

²⁰⁵ See *supra* notes 175–76 and accompanying text.

²⁰⁶ The federal government owns approximately fifty percent of the land in the western states. Candace H. Stowell, *Federal Lands in the West: A Few Facts and Figures*, W. PLANNER (Apr./May 2016), <https://www.westernplanner.org/201604issue/2017/8/9/federal-lands-in-the-west-a-few-facts-and-figures>.

²⁰⁷ See KLEIN ET AL., *supra* note 59, at 954–55.

made steady progress toward integrating some hydrologically connected groundwater into such surface allocations.²⁰⁸ However, the law has been slower to allocate interstate groundwater independently of any impacts it might have on surface rivers and streams: It was not until the 2021 decision in *Mississippi v. Tennessee* that the U.S. Supreme Court held that the equitable apportionment doctrine could be applied to qualifying groundwater aquifers, although it did not do so under the facts of that particular case.²⁰⁹ As one treatise notes, there are “scores of productive aquifers” that span state lines or form state boundaries, giving rise to “immense” potential for “enormous controversy.”²¹⁰ Overall, these developments fit the pattern observed in the context of federal reserved water rights, under which the law regulates groundwater that threatens protected surface rights long before it protects or regulates the groundwater supply itself.²¹¹

I. The Law

There are three primary mechanisms for the resolution of disagreements over transboundary waters. First, the states can come to an agreement through so-called “interstate compacts,” which must be ratified by Congress.²¹² Alternatively, the U.S. Supreme Court has original jurisdiction over disputes between the states involving water.²¹³ To resolve such disputes, the Court has developed a body of federal common law known as “equitable apportionment,” which calls for awarding each rival an “equality of right,” but not necessarily an equal volume of water.²¹⁴ The Court has been stinting in its willingness to apportion disputed waters.²¹⁵ As of 2021, it has decreed an apportionment of only three interstate rivers (although one additional case arguably might be interpreted as an apportionment).²¹⁶ In seven other cases, the Court has

²⁰⁸ See *infra* Part II.C.2.a.

²⁰⁹ See *infra* notes 239–47 and accompanying text.

²¹⁰ Douglas L. Grant & Bret C. Birdsong, *Introduction to Interstate Allocation Problems*, in 3 WATERS AND WATER RIGHTS § 43.01 n.1 (Amy K. Kelley ed., 3d. ed. 2021).

²¹¹ See *supra* note 163 and accompanying text.

²¹² Grant & Birdsong, *supra* note 210, § 43.02. Less directly, differences can also be resolved through private suits between individual water users in different states, state regulation of interstate water exports, and perhaps through state agreements that fall short of interstate compact status. *Id.*

²¹³ *Id.* §§ 45.01, 45.02.

²¹⁴ *Id.* § 45.01 (citing *Kansas v. Colorado*, 206 U.S. 46, 97 (1907)).

²¹⁵ Burke W. Griggs, *Interstate Litigation, State Reaction, and Federalism in the Age of Groundwater*, in 65 ROCKY MTN. MIN. L. INST. PROC. 26-1, 26-2–26-3 (2019) [hereinafter Griggs, *Interstate Litigation*] (explaining that judicial equitable apportionment is a less common method of allocating interstate water supplies).

²¹⁶ Douglas L. Grant & Bret C. Birdsong, *Equitable Apportionment Suits Between States*, in 3 WATERS AND WATER RIGHTS § 45.07 nn.356–58 & 359–82 (Amy K. Kelley ed., 3d. ed. 2021). Those rivers include the

dismissed apportionment petitions on a variety of grounds.²¹⁷ As a third and final dispute resolution method, Congress can also apportion interstate waters directly, but it has exercised that authority so rarely as to be of negligible importance to the analysis that follows.²¹⁸

2. *The Exceptions*

a. *Interstate Compacts*

Most often, states settle disputes by negotiating interstate compacts, which

following: (1) the Laramie River: Wyoming v. Colorado, 259 U.S. 419 (1922) (apportionment); Wyoming v. Colorado, 353 U.S. 953 (1957) (replacing previous decree); (2) the Delaware River: New Jersey v. New York, 283 U.S. 336 (1931) (apportionment); New Jersey v. New York, 347 U.S. 995 (1954) (modified decree); and (3) the North Platte River: Nebraska v. Wyoming, 325 U.S. 589 (1945) (apportionment); Nebraska v. Wyoming, 534 U.S. 40 (2001) (modified decree); Nebraska v. Wyoming, 515 U.S. 1, 14 (1995) (allowing Nebraska to proceed on a claim that Wyoming's upstream groundwater withdrawals substantially deplete apportioned surface waters). One might also consider the Court's treatment of yet a fourth river—the Gila River (a tributary of the Colorado River)—as a type of apportionment between Arizona and New Mexico. *See Arizona v. California*, 373 U.S. 546, 594–95 (1963). The Court explained the following:

Arizona and New Mexico presented the Master with conflicting claims to water in the Gila River, the tributary that rises in New Mexico and flows through Arizona. Having determined that tributaries are not within the regulatory provisions of the Project Act[,] the Master held that this interstate dispute should be decided under the principles of equitable apportionment . . . [and accepted a compromise settlement agreed upon by these states]. No exceptions have been filed to these recommendations by any of the parties and they are accordingly accepted by us.

Id.

²¹⁷ To date, the Court has accepted, but later dismissed or failed to resolve, actions to apportion the following seven rivers: (1) the Arkansas River: *Kansas v. Colorado*, 206 U.S. 46, 114–15, 117–18 (1907) (dismissing complaint without prejudice and rejecting Kansas's contention that "underflow" should be treated as a separate river with the same course as the surface Arkansas River); (2) the Connecticut River: *Connecticut v. Massachusetts*, 282 U.S. 660 (1931) (dismissing complaint because Connecticut failed to satisfy its burden of proof); *Connecticut v. Massachusetts*, 283 U.S. 789 (1931) (dismissing complaint); (3) the Walla Walla River: *Washington v. Oregon*, 297 U.S. 517 (1936) (confirming special master's recommendation to dismiss Washington's request for apportionment of the Walla Walla River and finding Oregon's groundwater use reasonable under the facts of the case); (4) the Colorado River: *Arizona v. California*, 298 U.S. 558 (1936) (denying petition for leave to file complaint for failure to join United States as indispensable party); (5) the Vermejo River: *Colorado v. New Mexico*, 467 U.S. 310 (1984) (dismissing the case); (6) the Catawba River: *South Carolina v. North Carolina*: 552 U.S. 804 (2007) (granting motion for leave to file complaint; the case was later settled); and (7) the Apalachicola, Chattahoochee, and Flint Rivers Basin: *Florida v. Georgia*, 141 S. Ct. 1175 (2021) (dismissing the case for Florida's failure to prove serious injury by clear and convincing evidence). In yet an eighth case, the Court held that equitable apportionment applied to a disputed underground aquifer, but dismissed the complaint without reaching an apportionment because plaintiff Mississippi had never specifically requested such remedy. *See Mississippi v. Tennessee*, 595 U.S. ___, slip op. at 6, 11–12 (Nov. 22, 2021) (dismissing complaint and declining to decide whether Mississippi should be granted leave to amend its complaint to request an equitable apportionment); *see also infra* notes 239–47 and accompanying text (discussing *Mississippi v. Tennessee*).

²¹⁸ *Grant & Birdsong, supra* note 210, § 47.01 (noting the Supreme Court has recognized only two congressional apportionments, both of which "grew out of unusual circumstances").

become federal law upon receiving congressional consent.²¹⁹ As of the end of 2020, there were twenty-three water apportionment compacts, only four of which specifically mention groundwater.²²⁰ One of those four compacts references groundwater only to explicitly exclude it from the apportionment.²²¹ The remaining three compacts also exclude groundwater from apportionment, unless it is tributary or causes a measurable depletion to surface flows.²²² This widespread failure to apportion groundwater is perhaps unsurprising: Many interstate compacts had been negotiated by the mid-twentieth century, before the advent of the groundwater revolution.²²³

By the mid-twentieth century, a dramatic increase of groundwater pumping threatened to upset carefully crafted compact allocations of surface waters.²²⁴ The stakes were quite high, involving thousands of post-compact wells that potentially depleted surface rivers in defiance of a state's compact obligations.²²⁵ States turned to the U.S. Supreme Court to determine whether compact restrictions encompassed both surface and underground water, even if the original agreements failed to specifically mention "groundwater." To date, the Court has interpreted five compacts silent on groundwater to determine whether

²¹⁹ *Id.* §§ 46.01–.02; see U.S. CONST. art. I, § 10, cl. 3 ("No State shall, without the Consent of Congress, . . . enter into any Agreement or Compact with another State . . ."). The Supreme Court has expressed its preference for this method of interstate allocation. See, e.g., *Colorado v. Kansas*, 320 U.S. 383, 392 (1943) (calling for "judicial caution in adjudicating the relative rights of States" and asserting that "mutual accommodation and agreement [through compact] should, if possible, be the medium of settlement, instead of invocation of [the Court's] adjudicatory power").

²²⁰ Grant & Birdsong, *supra* note 210, §§ 46.01, 46.03. In addition to those twenty-three compacts, several others interstate agreements involve partial apportionments or indirectly affect water allocation. *Id.*

²²¹ *Id.* § 46.03; see Klamath River Basin Compact of 1957, art. II (defining "water" or "waters" as water "on the surface of the ground in streams, lakes or otherwise, regardless of whether such waters at any time were or will become ground water, but shall not include water extracted from underground sources until after such water is used and becomes surface return flow or waste water").

²²² Amended Bear River Compact arts. V(A), VI(B), 94 Stat. 4, 10–11 (1980) (regulating the withdrawal of groundwater "tributary" to the Bear River, as measured by the resultant "annual depletion" to the River); Kansas-Nebraska Big Blue River Compact art. V(5.2), 86 Stat. 193, 196–97 (1972) (limiting groundwater regulation to withdrawals from wells drilled after November 1, 1968 into the "alluvium and valley side terrace deposits within one mile" from the river, provided such regulation yields "measurable increases" in surface flow at the state line); Upper Niobrara River Compact art. IV(A), 83 Stat. 86, 87, 89 (1969) (providing for potential future regulation of wells that deplete surface river flows, where apportionment of groundwater is determined to be desirable or necessary).

²²³ See *supra* note 11 and accompanying text.

²²⁴ Griggs, *Interstate Litigation*, *supra* note 215, at 26–9 (noting "the groundwater revolution started to undermine the compact administration of many interstate basins"); Lesby, *supra* note 2, at 1475 (documenting the increase of groundwater pumping from thirty-eight to almost ninety-four million acre-feet between 1950 and 2000).

²²⁵ Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 171–72 (describing Kansas's allegations that Nebraska countenanced the drilling of thousands of wells in the Republican River Basin, which depleted surface flows previously allocated by compact to downstream Kansas).

they nevertheless authorize the restriction of well pumping that threatens rivers previously allocated: (1) the Rio Grande Compact of 1938; (2) the Republican River Compact of 1943; (3) the Arkansas River Compact of 1949; (4) the Pecos River Compact of 1949; and (5) the Yellowstone River Compact of 1951.²²⁶

In revisiting these mid-twentieth century agreements, the Court held that each of the five challenged compacts constrains groundwater use, at least to the extent that it causes depletions to surface streams the compacts were designed to apportion—a functional approach that advances the compacts’ goals of dividing up surface waters.²²⁷ Further, the Court devised stringent new remedies in an effort to deter future compact breaches.²²⁸ At times, the Court and the special masters that assisted it sometimes fell back on old terminology from state water rights law, interpreting the compacts broadly enough to regulate groundwater that qualified as “tributary” or “subflow,” or that formed “underground streams.”²²⁹ But more importantly, the rulings consistently recognized the interconnectedness of surface and underground supplies,²³⁰

²²⁶ Douglas L. Grant & Bret C. Birdsong, *Interpretation and Enforcement*, in 3 WATERS AND WATER RIGHTS § 46.05 (Amy K. Kelley ed., 3d ed. 2021) (identifying compacts interpreted by the Court on a range of issues, including some considering the extent of authority over groundwater).

²²⁷ See Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 179–80 (summarizing results of compact interpretation litigation as “firmly incorporat[ing] groundwater into compacts that had been negotiated and enacted decades before large-scale groundwater pumping greatly expanded water usage across their respective basins”).

²²⁸ See, e.g., Chad O. Dorr, “*Unless and Until It Proves to be Necessary*”: *Applying Water Interest to Prevent Unjust Enrichment in Interstate Water Disputes*, 101 CALIF. L. REV. 1763, 1766–67, 1788–91 (2013) (discussing groundbreaking remedies imposed by special master against New Mexico for likely deliberate circumvention of its compact obligations to Texas, including placing the burden of proof on New Mexico to prove its groundwater pumping had *not* violated the compact; awarding damages with post-judgment interest; and requiring in-kind damage payments of water, not money; but noting that the Supreme Court gave New Mexico the option of paying either water damages or monetary damages); Joshua Mann, *Saving Water in the Pecos: One Coin, Two Sides, Many Overdrafts (and No Bail Outs?)*, 47 IDAHO L. REV. 341, 355–56 (2011) (describing *Texas v. New Mexico*, 462 U.S. 554 (1983) as “the first major interstate lawsuit . . . involving the legal relationship between groundwater and surface water”).

²²⁹ See, e.g., First Interim Report of the Special Master at 43, 44, 47, *Montana v. Wyoming & North Dakota*, No. 137, Orig. (Feb. 10, 2010) (finding compact restricted the pumping of “at least some groundwater withdrawals,” potentially including such categories as “underground streams,” the “subflow of a stream,” and “percolations tributary to watercourses”); *Montana v. Wyoming*, 563 U.S. 368, 373–74 (2011) (citing special master’s uncontested finding that the compact protects certain existing appropriations in Montana from “new surface and groundwater diversions in Wyoming . . . that prevent adequate water from reaching Montana to satisfy those [protected levels of] appropriations”); see also Griggs, *supra* note 215, at 26–18 (discussing special master’s conclusion that Yellowstone River Compact protected Montana’s surface share from the pumping of hydrologically connected groundwater).

²³⁰ Griggs, *Interstate Litigation*, *supra* note 215, at 26-10 (describing how the Court “consistently ruled” that hydrologically connected groundwater falls within the scope of interstate compacts and equitable apportionments, even if compacts fail to specifically address groundwater).

marking a sharp departure from many states' exclusion of groundwater from intrastate water rights regulated under state law.²³¹

b. Equitable Apportionment

To date, the Supreme Court has engaged in three equitable apportionments.²³² As with interstate compacts, those efforts focused primarily on the allocation of competing states' shares of surface rivers, but tangentially included some tributary groundwater that impacted the flow of those rivers.²³³ One recent case went further to potentially integrate groundwater into the allocation, but stopped short of decreeing an equitable apportionment: In *Florida v. Georgia*, Florida sought an equitable apportionment of all waters "hydrologically" connected to two named surface rivers, "including, without limitation, *groundwater*, rivers, streams, creeks, draws, and drainages."²³⁴ Florida complained broadly about its neighbor's groundwater pumping—potentially sweeping the water used to irrigate hundreds of thousands of acres of Georgia farmland into its requested apportionment.²³⁵ The Court was unconvinced that Florida had demonstrated sufficient harm to justify an apportionment and dismissed the litigation.²³⁶ However, it accepted without criticism the broad scope of groundwater analysis contained in the special master's first report,²³⁷ which could serve as a template for future equitable apportionment litigation.

²³¹ See *supra* Part II.A.2.

²³² See *supra* note 216 and accompanying text.

²³³ Grant & Birdsong, *supra* note 210, § 45.01 (noting "[a]lthough groundwater was, or perhaps was, involved in a few of these [apportionment] cases, the Court has not explicitly extended the equitable apportionment doctrine to interstate groundwater, though it might do so on proper facts").

²³⁴ Complaint for Equitable Apportionment and Injunctive Relief at 6, *Florida v. Georgia*, No. 142, Orig. (Nov. 3, 2014), <https://www.ca10.uscourts.gov/special-master-142> (emphasis added).

²³⁵ *Id.* at 8–9 (referring to the Flint River Basin as "the source of water for hundreds of thousands of acres of irrigated land in southern Georgia, most of which is served by irrigation wells"); *id.* at 16 (complaining about Georgia's irrigation of up to 843,000 acres of farmland, an area described as "larger than the State of Rhode Island").

²³⁶ *Florida v. Georgia*, 141 S. Ct. 1175, 1183 (2021) (holding that Florida failed to sustain the burden of proving serious harm caused by Georgia's alleged water overconsumption).

²³⁷ Report of Special Master Ralph Lancaster, Jr., at 31–34, *Florida v. Georgia*, No. 142, Orig. (Feb. 14, 2017) (noting "largely unrestrained" agricultural irrigation in Georgia); *Florida v. Georgia*, 138 S. Ct. 2502, 2509, 2525 (2018) (remanding to special master to determine whether a cap on Georgia's agricultural water consumption in the Flint River basin would produce enough extra water reaching the Apalachicola River to significantly redress the economic and ecological harm that Florida had suffered). On remand, the special master recommended dismissing Florida's complaint, but raised no doubts that groundwater use had appropriately figured in his weighing of the potential benefits and harms of an apportionment. Report of Special Master Paul J. Kelly, Jr., at 25, 80, *Florida v. Georgia*, No. 142, Orig. (Dec. 11, 2019).

Beyond this expanding regulation of groundwater usage that threatens allocated surface waters, in 2021 the Supreme Court unanimously held, as a matter of first impression, that interstate aquifers can be protected resources worthy of allocation in their own right.²³⁸ In *Mississippi v. Tennessee*, Mississippi filed a sweeping claim in 2014: that it “owns” all the groundwater that had been beneath its territory at the time it entered the Union in 1817.²³⁹ To bolster its claim, Mississippi argued that in some portions of the aquifer the groundwater moves as slowly as one inch per day and therefore is “part of the earth” that would never under natural conditions be available beneath Tennessee.²⁴⁰ Further, Mississippi complained that Tennessee had wrongfully siphoned off its water through a well field just across the state line.²⁴¹ Mississippi adamantly resisted sharing the groundwater through an equitable apportionment;²⁴² instead, it sought more than a half billion dollars in damages for the alleged theft of its groundwater.²⁴³

In an earlier phase of the litigation, the Fifth Circuit had held that the dispute fell “squarely within the original development and application of the equitable apportionment doctrine” and explained that “[t]he fact that this particular water source is located underground . . . is of no analytical significance. The Aquifer flows, if slowly, under several states, and it is indistinguishable from a lake bordered by multiple states or from a river bordering several states depending upon it for water.”²⁴⁴ Citing the Fifth Circuit’s statement with approval, the U.S. Supreme Court held that equitable apportionment of the disputed aquifer would be “‘sufficiently similar’ to past applications of the doctrine [to surface rivers

²³⁸ See *supra* note 56 (revealing inconsistent treatment of groundwater as threat vs. groundwater as protected resource).

²³⁹ Mississippi’s Motion for Leave to File Bill of Complaint at 3–6, 8–10 [hereinafter Mississippi Complaint] (complaining disputed groundwater pumped in Tennessee “is a valuable natural resource belonging to Mississippi which would have never, under natural conditions, resided or been available within Tennessee’s boundaries”), *Mississippi v. Tennessee*, No. 143, Orig., 2014 WL 5319728 (June 6, 2014). See generally Klein, *Owning Groundwater*, *supra* note 3, at 474 (discussing litigation history between Mississippi and Tennessee).

²⁴⁰ Mississippi Complaint, *supra* note 239; see also Transcript of Closing Argument at 9–10, Mississippi v. Tennessee, No. 143, Orig. (Feb. 25, 2020), https://www.ca6.uscourts.gov/sites/ca6/files/documents/special_master/No.%20131%20Transcript%20of%20Closing%20Arguments.pdf (Mississippi arguing that extremely slow-moving groundwater “is part of the earth” and owned by Mississippi).

²⁴¹ Mississippi Complaint, *supra* note 239, at 5.

²⁴² *Id.* at 17–19 (arguing “Mississippi should not be . . . forced to ‘share’ its natural resources . . . under a claim by Tennessee to a right of equitable apportionment”).

²⁴³ *Id.* at 21 (estimating “the value of the Mississippi groundwater . . . wrongfully taken,” combined with prejudgment interest, as at least \$615 million).

²⁴⁴ *Hood ex. rel. Mississippi v. Memphis*, 570 F.3d 625, 630 (5th Cir. 2009) (concluding the disputed aquifer “is an interstate water source, and the amount of water to which each state is entitled from a disputed interstate water source must be allocated before one state may sue an entity for invading its share”).

and streams] to warrant the same treatment.”²⁴⁵ Taking care to “resist general propositions” in a matter of first impression, the Court narrowly held that the particular groundwater at issue was subject to equitable apportionment because, as the special master had found, the aquifer and its water had the hallmarks of an interstate resource, even though it flowed extremely slowly.²⁴⁶ The Court forcefully rejected Mississippi’s contention that it had “sovereign ownership of all groundwater beneath its surface,” observing that such an approach would defeat doctrinal purpose by “allow[ing] an upstream State to completely cut off flow to a downstream one, a result contrary to our equitable apportionment jurisprudence.”²⁴⁷

3. *The Rationales*

In support of their right to use groundwater unfettered by compact or apportionment, some states have resurrected the same exceptionalism arguments advanced by well pumpers in the context of intrastate water rights:²⁴⁸ Groundwater is part of the soil and owned by the overlying landowner;²⁴⁹ groundwater use is too complicated to be regulated;²⁵⁰ and states should encourage the maximum beneficial use of water.²⁵¹

But courts have been less tolerant of such arguments in the interstate context and have swept them away with a variety of explanations that can point the way forward to integrated water use throughout the hydrologic cycle.²⁵² First, courts have been impatient with feigned hydrologic ignorance, noting that scientists have understood the connection between surface water and groundwater since well before the mid-twentieth century.²⁵³ In addition, courts have resisted

²⁴⁵ *Mississippi v. Tennessee*, 595 U.S. ___, slip op. at 4, 7–8 (Nov. 22, 2021).

²⁴⁶ *Id.* at 9–10. Among the hallmarks making the disputed water susceptible to apportionment, the Court noted that the aquifer’s geologic formation was a “transboundary resource,” that it contained water that “flows naturally between the states,” and that the challenged pumping within Tennessee had interstate effects. *Id.* at 8–9. Further, the Court rejected Mississippi’s argument that the slow speed of the flow precluded apportionment, observing that “we have long applied equitable apportionment even to streams that run dry from time to time.” *Id.* at 8 (noting that even though the subject groundwater flowed at a rate of only one or two inches daily, that amounted to “over 10 billion gallons per year” flowing across the state line).

²⁴⁷ *Id.* at 9–10.

²⁴⁸ *See infra* Part II.A.3.

²⁴⁹ *See, e.g., supra* note 240 (argument of Mississippi against neighboring Tennessee).

²⁵⁰ *See, e.g.,* Report of Special Master Vincent L. McKuisick at 41–43, *Kansas v. Nebraska & Colorado*, No. 126, Orig. (Jan. 28, 2000) (disapprovingly recounting Colorado’s argument that compact drafters intended to exclude certain groundwater pumping from compact’s allocation restrictions because of “the complexity of quantifying the hydraulic connection” between groundwater pumping and streamflow depletion).

²⁵¹ *See supra* notes 137–38 and accompanying text.

²⁵² *See infra* Part III.C.

²⁵³ *See, e.g.,* Report of Special Master at 23, *Kansas v. Nebraska & Colorado*, *supra* note 250 (observing

attempts to treat groundwater as part of the surface estate, even if the water's movement is so slow as to be nearly imperceptible.²⁵⁴ Likewise, they have rejected the notion that administrative difficulty excuses groundwater regulation under interstate compacts.²⁵⁵ Overall, the courts have taken a pragmatic, functional approach that is faithful to doctrinal purpose, opining that early negotiators surely intended to restrict groundwater use that interfered with allocations of surface streams, even if the relevant documents lack explicit references to "groundwater."²⁵⁶

4. *The Consequences*

In the intrastate context, exceptionalism has insulated groundwater pumpers from regulation to such an extent that they have developed a distinct political subculture that threatens the very foundations of the prior appropriation doctrine.²⁵⁷ State courts have had little appetite for reining in groundwater use and impeding what they view as the maximum beneficial use of the states' water resources.²⁵⁸ But when the federal courts have been called on to mediate between the states, they have been much more willing to restrict groundwater use, particularly when states hide behind the cloak of exceptionalism while using more than their share of apportioned watercourses. In the interstate context, the seemingly laudatory mantra of "maximum use" potentially furnishes a license to evade a state's solemn responsibilities imposed by a congressionally-approved compact or a Court-crafted equitable apportionment.

the "connection between groundwater discharge and stream flow was a widely known scientific fact well before the [Republican River] Compact was drafted" in 1943).

²⁵⁴ See *supra* note 246 and accompanying text (Supreme Court's rejection of claim that slow movement of groundwater can preclude application of equitable apportionment doctrine); see also Report of Special Master at 24–26, *Mississippi v. Tennessee*, *supra* note 246 and accompanying text (concluding that disputed groundwater is an interstate resource subject to apportionment because of at least some interstate natural flow, no matter how slowly it moves); Transcript of Closing Argument at 65, 70–71, *Hood ex. rel. Mississippi v. Tennessee*, *supra* note 240 (City of Memphis arguing that the Supreme Court has never used a "speed limit or residence time" to decide whether a resource is interstate and subject to apportionment).

²⁵⁵ See *supra* note 250 and accompanying text.

²⁵⁶ See, e.g., Report of Special Master, *Kansas v. Nebraska & Colorado*, *supra* note 250, at 21–23 (explaining the language of the compact is clearly broad enough to include the effects of groundwater pumping, despite the absence of the term "groundwater," and concluding the broad purposes of the compact indicated that the parties could not have intended that one state could "unilaterally enlarge" its allocation by taking hydraulically connected groundwater before it reached the stream flow); see also Special Master's Report, *supra* note 229, at 19–20 (interpreting compact's purpose to "remove all causes of present and future controversy" as broad enough to protect established water rights from later initiated surface and groundwater uses); *supra* note 247 and accompanying text (the Supreme Court's rejection of an attempt to thwart the purpose of equitable apportionment in *Mississippi v. Tennessee*).

²⁵⁷ See Griggs, *Water: Practical Challenges*, *supra* note 90 and accompanying text.

²⁵⁸ See *supra* notes 136 & 138 and accompanying text.

Several practical consequences have followed from this judicial pushback, particularly in cases of willful breach. Courts have expanded the scope of remedies that can be imposed to deter such water brinkmanship by one state at the expense of another, including retroactive liability, in-kind payments through water “disgorgements,” and the charging of monetary interest for the period of noncompliance.²⁵⁹ Relatedly, courts have assigned the noncomplying state with the burden of proving that its groundwater use will not violate a previously negotiated compact.²⁶⁰ Tougher judicial remedies, in turn, have given states the motivation and political cover necessary to regulate some groundwater usage on their own—an effort that could amount to “political suicide” in the absence of an external compulsive force such as judicial oversight, but one that may prove increasingly necessary in the face of climate change.²⁶¹ In addition, judicial recognition of the interconnectedness of surface and underground water has created an incentive for the development of sophisticated hydrogeologic computer models that shed light on the impacts of well pumping on other water users, even though distant in time or geography.²⁶² Although powerful, such consequences have not brought about the coordinated treatment of surface water and groundwater at the interstate level.²⁶³ Some states continue to make the strategic, political calculation that the benefits of exceeding their allocated share exceed the costs and potential penalties, a hydrologic version of contract law’s “efficient breach” calculation.²⁶⁴

²⁵⁹ See Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 190–94 (discussing the deterrent effect of imposing damages for breach of compact).

²⁶⁰ See *supra* note 228 and accompanying text.

²⁶¹ See Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 166, 214–16 (discussing the fundamental reform of Kansas water law integrating surface and groundwater use prompted by Court’s previous apportionment decisions). See generally Ellen M. Gilmer & Jennifer Kay, *Water Wars at the Supreme Court: “It’s Only Going to Get Worse,”* BLOOMBERG L. (Sept. 17, 2020, 1:16 PM), <https://news.bloomberglaw.com/environment-and-energy/water-wars-at-the-supreme-court-its-only-going-to-get-worse> (“As climate change increases droughts and makes surface water increasingly scarce, . . . groundwater is where cities and states are increasingly turning for their water resources.” (quoting Professor Robert Percival)).

²⁶² See Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 180–81.

²⁶³ See *id.* at 181.

²⁶⁴ As Professor Griggs explains, “Time and again, the economic benefits of groundwater pumping have led states to disobey their compact obligations rather than to make the politically unpopular decision to reduce pumping.” Because the wronged state will have to spend considerable time and money in protecting its allocation through enforcement litigation, the disobeying state’s overpumping can represent “sound cost-benefit analysis” because even if “a plaintiff state eventually prevails, the defendant state has almost certainly reaped the economic benefits obtained from water over-consumption prior to the lawsuit and even during its pendency.” *Id.* at 168–70, 190; see *id.* at 169 n.116 (citing *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1057 (2015), for the Court’s awareness that “the economic incentives for Nebraska to withhold water owed to Kansas, pay resulting damages, and still come out ahead are a ‘recipe for breach’”).

D. *The Clean Water Act*

In contrast to the allocation of water rights under state law, the regulation of water pollution is controlled primarily by the federal Clean Water Act of 1972 (CWA).²⁶⁵ The CWA calls for hydrologic “integrity” by declaring the sweeping purpose “to restore and maintain the chemical, physical, and biological *integrity* of the Nation’s waters.”²⁶⁶ The statute assigns primary regulatory responsibility to federal agencies and authorizes them to oversee various permit programs established by the statute.²⁶⁷ The CWA includes a savings clause that preserves to the states primary responsibility to “prevent, reduce, and eliminate pollution” and to engage in land and water planning.²⁶⁸ Commentators disagree as to the impact of this clause: groundwater exceptionalists hail it as a core component of the CWA that constrains federal regulation,²⁶⁹ whereas critics, such as Professor Oliver Houck, describe it as a “beguiling” and “misleading” relic from past approaches to water pollution long since abandoned by Congress.²⁷⁰

History aside, state programs often are “nonregulatory” in the sense that they rely on voluntary compliance rather than strict enforcement mechanisms.²⁷¹ Thus, the invocation of federalism principles can serve as a proxy for the goal of minimizing regulation.²⁷² Much has been written about the regulatory divide between “point source” pollution (subject to federal control) and “nonpoint source” pollution (left to state oversight).²⁷³ But, as relevant to this Article, some have drawn a line between surface water and groundwater that purportedly

²⁶⁵ Federal Water Pollution Control Act, as amended by the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act), 33 U.S.C. §§ 1251–1387.

²⁶⁶ *Id.* § 1251(a) (emphasis added).

²⁶⁷ See *infra* note 280 and accompanying text.

²⁶⁸ Clean Water Act, 33 U.S.C. § 1251(b).

²⁶⁹ See, e.g., Damien Schiff, *Keeping the Clean Water Act Cooperatively Federal—Or, Why the Clean Water Act Does Not Directly Regulate Groundwater Pollution*, 42 WM. & MARY ENV'T L. & POL'Y REV. 447, 455 (2019) (article by senior attorney for the Pacific Legal Foundation arguing that Congress left to the states the authority “to regulate (or not to regulate) the addition of any pollutant to things other than ‘navigable waters,’ or the addition of any pollutant from a ‘nonpoint source’”).

²⁷⁰ Oliver A. Houck, *Cooperative Federalism, Nutrients, and the Clean Water Act: Three Cases Revisited*, 44 ENV'T L. REP. 10426, 10427–28 (2014) (concluding the CWA “relegates to the states a highly circumscribed role for those dischargers most on the national mind in 1972” and arguing that “[state] primacy was exactly what Congress rejected” when enacting the CWA).

²⁷¹ See, e.g., Schiff, *supra* note 269, at 454 (noting significant civil and criminal liability under some provisions of the CWA); Nat. Res. Def. Council v. EPA, 915 F.2d 1314, 1318 (9th Cir. 1990) (holding that “Section 319 does not require states to penalize nonpoint source polluters who fail to adopt best management practices; rather it provides for grants to encourage the adoption of such practices”).

²⁷² See Schiff, *supra* note 269 (asserting states have authority to decline to regulate pollution beyond federal jurisdiction).

²⁷³ See, e.g., Daniel R. Mandelker, *Controlling Nonpoint Source Water Pollution: Can It Be Done?*, 65 CHI.-KENT L. REV. 479 (1989).

demarcates the respective roles of federal and state authorities. As this section shows, it has become increasingly untenable to square extra-scientific, bright-line legal rules with the nuanced reality of the hydrologic cycle.

Those seeking to narrow the statute's regulatory reach have identified groundwater as a prime target, with mixed results. Although the law remains in considerable disarray, two opposing patterns have begun to take shape.²⁷⁴ Courts and federal agencies have been reluctant to recognize groundwater as a *protected resource* in its own right under federal law. This reluctance has taken the form of the broad exclusion of groundwater from regulatory definitions of “waters of the United States”—the statutory phrase that describes the jurisdictional scope of the CWA.²⁷⁵ In contrast, courts have been increasingly willing to regulate groundwater that threatens to pollute jurisdictional surface waters. In 2020, the U.S. Supreme Court issued a path-breaking opinion, holding that the CWA regulates discharges of pollutants into groundwater in cases where it poses a sufficient *threat* to jurisdictional surface waters protected under the statute.²⁷⁶ In so doing, the high court rebuffed exceptionalists' attempt to create a glaring loophole for pollution that travels *any* distance—however short—through groundwater before contaminating protected surface water supplies.²⁷⁷

1. *The Law*

Reduced to basics, the CWA protects “navigable waters”²⁷⁸—a term of art that has defied consistent interpretation over the years. To safeguard such protected waters, the statute regulates activities that constitute the “discharge of any pollutant”²⁷⁹—another term of art with an elusive meaning. These jurisdictional limits apply widely to the entire statute, including the Section 402 pollutant discharge permit program, the Section 404 dredge and fill permit program, and provisions regarding water quality standards, oil spill liability and prevention, and enforcement.²⁸⁰

²⁷⁴ A similar pattern has appeared in the context of the federal reserved rights doctrine, *see supra* note 163 and accompanying text, and the allocation of interstate waters, *see supra* note 211 and accompanying text.

²⁷⁵ *See infra* Part II.D.2.

²⁷⁶ *See infra* Part II.D.2.b.

²⁷⁷ *See infra* note 335 and accompanying text.

²⁷⁸ *See* Clean Water Act, 33 U.S.C. § 1311(a) (except pursuant to permit “the discharge of any pollutant by any person shall be unlawful”); *id.* § 1362(12) (defining “discharge of a pollutant” as “any addition of any pollutant to navigable waters from any point source”).

²⁷⁹ *Id.*

²⁸⁰ STEPHEN P. MULLIGAN, CONG. RSCH. SERV., R44585, EVOLUTION OF THE MEANING OF “WATERS OF THE UNITED STATES” IN THE CLEAN WATER ACT 3 (2019) (discussing the broad applicability of the definition of “navigable waters” throughout the CWA).

2. *The Exceptions*

a. *Protected Waters—The Scope of “Navigable Waters”*

The CWA extends federal protection to “navigable waters,” which the statute defines as “the waters of the United States” (WOTUS).²⁸¹ The U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps), agencies entrusted with administration of the CWA, have struggled to define “waters of the United States” through a series of rulemakings.²⁸² These proceedings are politically charged and the outcomes have vacillated widely with changes in presidential administration, often excluding groundwater from their reach.

i. *1980 & 1982 Rules*

The rules developed in three stages, and yet a fourth incarnation is currently underway. First, under parallel definitions promulgated by the Corps and the EPA in 1980 and 1982,²⁸³ the agencies interpreted federal jurisdiction to include three categories of surface waters that roughly tracked the scope of the Commerce Clause: (1) waters related to interstate or foreign commerce; (2) interstate waters and wetlands; and (3) waters whose degradation could affect interstate commerce, including wetlands adjacent to jurisdictional waters.²⁸⁴ Those regulations provided some protection for groundwater, but only tangentially in connection with the definition of wetlands as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support” wetland vegetation.²⁸⁵ But even that stinting protection of groundwater was challenged as overbroad in a pair of U.S. Supreme Court cases.²⁸⁶ Both cases arose under Section 404 of the CWA—known as the dredge

²⁸¹ Clean Water Act, 33 U.S.C. § 1362(7).

²⁸² See KLEIN ET AL., *supra* note 59, at 993–95; MULLIGAN, *supra* note 280.

²⁸³ After a decade of inconsistency, the Corps and the EPA harmonized their regulatory definitions in the 1980–82 period. See EPA, Final Rule Defining “Waters of the United States,” 45 Fed. Reg. 33,290 (May 19, 1980); Army Corps of Engineers, Interim Final Rule for Regulatory Programs, 47 Fed. Reg. 31,794, 31,810 (July 22, 1982). See generally MULLIGAN, *supra* note 280, at 12–13, App (explaining how Corps and EPA “streamlined and harmonized” their regulatory definitions by 1982).

²⁸⁴ Army Corps of Engineers, 47 Fed. Reg. at 31,810–31,811 (codified at 33 C.F.R. § 323.2(a)).

²⁸⁵ *Id.* (codified at 33 C.F.R. § 323.2(c) (1982)). The Corps had recognized that otherwise protected wetlands could be fed by groundwater as early as 1977. See 42 Fed. Reg. 37,122 (July 19, 1977).

²⁸⁶ *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121 (1985); *Rapanos v. United States*, 547 U.S. 715 (2006) (plurality opinion). A related third Supreme Court case challenged the jurisdictional reach of “waters of the United States,” but did not focus directly on groundwater. See *Solid Waste Agency of N. Cook Cnty. v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001).

and fill program—which regulates the discharge of rock, sand, dirt, and other fill material into protected waterways and wetlands.²⁸⁷

First, the Supreme Court sustained the 1980 & 1982 rules in *United States v. Riverside Bayview Homes, Inc.* against a challenge by a developer who wanted to fill wetlands on its property for a housing development without first obtaining a CWA permit.²⁸⁸ Although the developer did not challenge the regulation of wetlands hydrologically connected to *surface* water bodies, it claimed federal agencies had no jurisdiction over wetlands supported by *groundwater*—areas it dismissively referred to as lands with “poor drainage.”²⁸⁹ The developer asserted that regulating such groundwater-fed wetlands would give the government unwarranted jurisdiction over millions of acres of land throughout the nation.²⁹⁰ Exercise of such broad jurisdiction, it claimed, would amount to a regulatory taking of private property without just compensation.²⁹¹ Further, it continued, a broad construction of jurisdiction would allow federal agencies to usurp the states’ traditional role as land use planners because such interpretation would impede the conversion of wetlands to state-sanctioned uses including residential construction and agriculture.²⁹² The Court rejected such rationales, focusing instead on the statutory purpose of promoting hydrologic “integrity.”²⁹³ Adopting a functional approach informed by science, the Court embraced the Corps’ determination that the regulation of pollution cannot rely on “artificial lines” but must acknowledge that water moves in “hydrologic cycles.”²⁹⁴ The Court concluded that wetlands—whether fed by groundwater or surface water—play an integral role of protecting water quality and upheld the definition of wetlands in the 1980s rules.²⁹⁵

²⁸⁷ 33 U.S.C. § 1344(a). See *generally Obtain a Permit*, U.S. ARMY CORPS OF ENG’RS, <https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Obtain-a-Permit/> (last visited Dec. 16, 2021) (setting forth procedures for obtaining a dredge and fill permit); *Section 404 of the Clean Water Act*, U.S. ARMY CORPS OF ENG’RS, <https://www.spl.usace.army.mil/Missions/Regulatory/Jurisdictional-Determination/Section-404-of-the-Clean-Water-Act/> (last visited Dec. 16, 2021) (explaining § 404 permit and exceptions).

²⁸⁸ *Riverside Bayview Homes*, 474 U.S. at 139.

²⁸⁹ Respondent’s Brief at 2–3, *Riverside Bayview Homes*, 474 U.S. 121 (No. 84-701) (claiming federal agencies lacked jurisdiction over wetlands supported by a high groundwater table or by precipitation).

²⁹⁰ *Id.* at 2–3, 43 (arguing the regulation of lands with “poor drainage” would interfere with the lands’ ability to produce approximately twenty-five percent of the major crops grown in the United States).

²⁹¹ Respondent’s Brief, *supra* note 289, at 46–50 (claiming the Riverside property “presently is totally unproductive, lying vacant and unused” and filling in the land “is a necessary element of the development of the property for any economically productive purpose”).

²⁹² *Id.* at 43.

²⁹³ *Riverside Bayview Homes*, 474 U.S. at 132–35.

²⁹⁴ *Id.* (approving Corps’ conclusion that wetlands adjacent to protected waters “may function as integral parts of the aquatic environment even when the moisture creating the wetlands does not find its source in the adjacent [surface] bodies of water”).

²⁹⁵ *Id.* The Corps had urged the Court to root its decision in science, asserting “the Corps’ definition of

Second, more than twenty years later in *Rapanos v. United States*, the Court veered from science to textualism in a badly-fractured decision that yielded no majority opinion.²⁹⁶ Justice Scalia, writing for the plurality, concluded that the Corps' regulatory definition was an overly expansive, impermissible construction of the CWA that went beyond the intent of Congress.²⁹⁷ His conclusion turned on a hyper-technical linguistic distinction: the CWA designates as protected “*the waters*” (rather than simply “waters”) of the United States.²⁹⁸ Relying on the 1954 second edition of *Webster's New International Dictionary*, Justice Scalia determined that CWA protection was confined to surface features—including “only those relatively permanent, standing or continuously flowing bodies of water ‘forming geographic features’ that are described in ordinary parlance as ‘streams[,] . . . oceans, rivers, [and] lakes.’”²⁹⁹ Continuing this focus on surface waters, Justice Scalia restricted statutory protection of adjacent wetlands to only those with a “continuous surface connection” to other jurisdictional waters.³⁰⁰ Justice Scalia's opinion evidenced a concern for private property and a disdain for regulation that cast the landowner as a victim, who “for backfilling his own wet fields . . . faced 63 months in prison and hundreds of thousands of dollars in criminal and civil fines.”³⁰¹ As a further supporting rationale, he expressed solicitude for the states and a desire to avoid what he characterized as bringing virtually all land and water resource planning under federal control.³⁰² So strong was this concern that

wetlands, which attaches no significance to the source of water inundating or saturating an area characterized by wetlands vegetation, is fully consistent with both congressional and scientific understanding of the many valuable services performed by wetlands.” Reply Brief for the United States at 8, *Riverside Bayview Homes*, 474 U.S. 121 (No. 84-701)

²⁹⁶ *Rapanos v. United States*, 547 U.S. 715 (2006) (plurality opinion). Justice Scalia wrote for the plurality (joined by Justices Roberts, Thomas, and Alito); Justices Roberts and Kennedy wrote separate concurring opinions; and Justice Stevens wrote a dissent (joined by Justices Souter, Ginsburg, and Breyer).

²⁹⁷ *Id.* at 739 (plurality opinion).

²⁹⁸ *Id.* at 732 (emphasis added). As Justice Scalia explained:

The Corps' expansive approach might be arguable if the CWA defined “navigable waters” as “water of the United States.” But “the waters of the United States” is something else. The use of the definite article (“the”) and the plural number (“waters”) show plainly that § 1362(7) does not refer to water in general. In this form, “the waters” refers more narrowly to [a dictionary definition focusing on surface geographic features].

Id.

²⁹⁹ *Id.* at 739.

³⁰⁰ *Id.* at 741–42 (interpreting the CWA as protecting “only those wetlands with a continuous surface connection to bodies that are ‘waters of the United States’ in their own right, so that there is no clear demarcation between ‘waters’ and wetlands that are ‘adjacent to’ such waters and covered by the Act”).

³⁰¹ *Id.* at 721. In concurrence, Justice Kennedy took the plurality to task for what he criticized as its “unduly dismissive” tone that gave little weight to the “[i]mportant public interests” served by the CWA and by the protection of wetlands. *Id.* at 777 (Kennedy, J., concurring in judgment).

³⁰² *Id.* at 737 (plurality opinion) (citing to the statutory savings clause in § 1251(b)).

Justice Scalia brushed aside the position of a brief filed by thirty-three states and the District of Columbia in support of the Corps' regulation, opining that the statute did not permit states to "unburden themselves" and shift "controversial decisions" to federal regulators.³⁰³ In contrast, in what proved to be a highly influential concurrence,³⁰⁴ Justice Kennedy articulated a "significant nexus" test, under which CWA jurisdiction extends to those waters and wetlands that "significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" ³⁰⁵ Justice Kennedy rooted his concurrence in the statutory purpose of promoting hydrologic integrity and in wetland science, taking particular note of the valuable ecological services provided by wetlands.³⁰⁶

ii. The Obama Administration's Rule

A second stage of rulemaking followed the 1980s rules and inconclusive Supreme Court decisions.³⁰⁷ In 2015, the Obama administration promulgated its "Clean Water Rule" to amend the definition of the statutory phrase "waters of the United States."³⁰⁸ The rule cited to the CWA's purpose of restoring and maintaining hydrologic integrity.³⁰⁹ Of critical importance, the rule was rooted firmly in science and recognized the hydrologic connection between surface water and groundwater. It claimed faithfulness to the "best available peer-reviewed science," including more than 1,200 peer-reviewed publications collected in a report entitled *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence*.³¹⁰

In most aspects, the rule expanded the scope of federally protected waters. It listed six categories of surface waters that are jurisdictional by rule in all

³⁰³ *Id.* at 737 n.8.

³⁰⁴ MULLIGAN, *supra* note 280.

³⁰⁵ *Rapanos*, 547 U.S. at 778–81 (Kennedy, J., concurring in judgment).

³⁰⁶ *Id.* at 759–62, 765–66.

³⁰⁷ Chief Justice Roberts lamented that "no opinion [in *Rapanos*] commands a majority of the Court on precisely how to read Congress's limits on the reach of the Clean Water Act" and encouraged the agencies to refine their views of the scope of their power under the statute. *Id.* at 758 (Roberts, C.J., concurring).

³⁰⁸ Army Corps of Engineers & EPA, Clean Water Rule: Definition of "Waters of the United States," 80 Fed. Reg. 37,054 (June 29, 2015) (to be codified at 33 C.F.R. pt. 328 and 40 C.F.R. pts. 110, 112, 116).

³⁰⁹ *Id.* at 37,056–37,057.

³¹⁰ *Id.* (citing to science report prepared by the EPA's Office of Research and Development and subjected to a comprehensive technical review by the EPA's Science Advisory Board); see also James R. Mihelcic & Mark Rains, *Where's the Science? Recent Changes to Clean Water Act Threaten Wetlands and Thousands of Miles of Our Nation's Rivers and Streams*, 37 ENV'T ENG'G SCI. 173, 175–76 (2020) (describing the role of science in the promulgation of the Obama-era rule).

instances, including “adjacent wetlands.”³¹¹ Following Justice Kennedy’s concurring opinion in *Rapanos*, the rule also included numerous additional categories of surface waters deemed to be jurisdictional if a case-specific analysis shows them to have a “significant nexus” to other jurisdictional waters.³¹² The rule also carried forward the previous definition of wetlands, which made no distinction between those supported by surface runoff and those supported by groundwater.³¹³ But despite these broad protections, the 2015 rule added new categorical exclusions from jurisdictional protection, downplaying them as a simple codification of longstanding agency practice.³¹⁴ Most notable for purposes of this Article, those categorical exclusions listed “groundwater” and “groundwater recharge basins.”³¹⁵

Reflecting the controversial nature of the topic, the rule received its share of harsh criticism from all sides. Some pro-development forces denounced it as “a raw and tyrannical power grab that will crush jobs . . . and place landowners, small businesses, farmers, and manufacturers on the road to a regulatory and economic hell.”³¹⁶ Critics from the environmental community, for their part, argued that the new categorical exclusions ignored the advice of the agencies’ own scientific advisory board.³¹⁷ Further, they argued that the rule relied impermissibly on the rationale of administrative convenience, rather than on scientific principles.³¹⁸

³¹¹ Clean Water Rule, 80 Fed. Reg. at 37,057–37,059, 37,104 (to be codified at 33 C.F.R. § 328.3(a)(1–6)).

³¹² *Id.* at 37,058 & 37,106 (to be codified at 33 C.F.R. § 328.3(a)(7–8)).

³¹³ *Id.* at 37,106 (to be codified at 33 C.F.R. § 328.3(c)(4)).

³¹⁴ *Id.* at 37,059 (referring to the addition of “several exclusions reflecting longstanding agency practice[s]”).

³¹⁵ *Id.* at 37,105 (excluding “groundwater drained through subsurface drainage systems” and all groundwater generally) (to be codified at 33 C.F.R. § 328.3(b)(5) & (b)(7)). Despite such exclusions of groundwater from protection in its own right, the rule required a CWA permit for discharges into groundwater that migrated to hydrologically connected surface jurisdictional waters. See Michael C. Blumm & Steven M. Thiel, *(Ground)Waters of the United States: Unlawfully Excluding Tributary Groundwater from Clean Water Act Jurisdiction*, 46 ENV’T L. 333, 371–74 (2016).

³¹⁶ Dave Owen, *Little Streams and Legal Transformations*, 2017 UTAH L. REV. 1, 2 (2017) [hereinafter Owen, *Little Streams*] (quoting former Congressman John Boehner and collecting other condemnations). Owen highlights an underappreciated environmentally protective trend of CWA regulations that protect “little streams.” *Id.*

³¹⁷ See, e.g., Blumm & Thiel, *supra* note 315, at 368–70 (arguing the 2015 rule is underinclusive because it categorically exempts all groundwater from CWA regulation in contravention of the purposes, terms, and judicial interpretations of the CWA, and calling for the inclusion of tributary groundwater as a jurisdictional water).

³¹⁸ See *id.* at 368–69.

iii. *The Trump Administration's Rule*

Reflecting the political volatility of CWA jurisdiction, the Trump administration repealed the Obama rule just four years later.³¹⁹ Then in 2020, it published a final replacement rule—the “Navigable Waters Protection Rule.” In contrast to the Obama administration’s rule, the Trump administration’s rule did not purport to rely on science. The EPA’s Scientific Advisory Board concluded that “the proposed rule lacks a scientific justification, while potentially introducing new risks to human and environmental health.”³²⁰ The EPA itself expressly disavowed reliance on science, asserting “science cannot dictate where to draw the line between Federal and State waters.”³²¹

The Trump replacement rule closely tracked Justice Scalia’s plurality opinion in *Rapanos*.³²² In fact, President Trump’s executive order explicitly instructed the Corps and the EPA to “consider interpreting the term ‘navigable waters’ . . . in a manner consistent with the opinion of Justice Antonin Scalia in *Rapanos v. United States*.”³²³ With respect to groundwater, the Trump rule retained the Obama-era exclusions of groundwater.³²⁴ But going even further to exclude groundwater from regulation, the rule constricted jurisdiction over “adjacent wetlands” to only those wetlands that abut or have a “direct hydrologic *surface* connection” to other protected waters.³²⁵ Environmental groups challenged the rule as interpreting CWA jurisdiction too narrowly, whereas cattlemen and ranchers claimed the rule asserted jurisdiction over some intermittent streams and adjoining wetlands that should have been left unregulated.³²⁶

³¹⁹ Army Corps of Engineers & EPA, Definition of “Waters of the United States”—Recodification of Pre-Existing Rules, 84 Fed. Reg. 56,626 (Oct. 22, 2019) (repealing 2015 rule and restoring the pre-2015 regulatory rule).

³²⁰ Mihelcic & Rains, *supra* note 310, at 176 (discussing Scientific Advisory Board’s conclusions).

³²¹ *Id.*

³²² Navigable Waters Protection Rule: Definition of “Waters of the United States,” 85 Fed. Reg. 22,250 (Apr. 21, 2020) (to be codified at 33 C.F.R. Part 328 and various sections of Title 40 of the Code of Federal Regulations).

³²³ Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the “Waters of the United States” Rule, 82 Fed. Reg. 12,497 (Feb. 28, 2017).

³²⁴ *Navigable Waters Protection Rule*, Definition of “Waters of the United States,” 85 Fed. Reg. 22,251, 22,252 (Apr. 21, 2020) (to be codified at 33 C.F.R. §§ 328.3(b)(2) & 328.3(b)(11)).

³²⁵ *Id.* at 22,338 (to be codified at 33 C.F.R. §§ 328.3(a)(4) & 328.3(c)(1)) (emphasis added).

³²⁶ See generally Amena H. Saiyid, *Farmers, Ranchers Dispute Legal Limits of Revamped Water Rule*, BLOOMBERG L. (May 11, 2020, 6:00 AM), <https://news.bloomberglaw.com/environment-and-energy/farmers-ranchers-dispute-legal-limits-of-revamped-water-rule?context=article-related> (summarizing arguments of those opposing expanded jurisdiction).

iv. *The Biden Administration's Rule*

Early in his administration, President Biden announced his intent to revise the Trump-era definition of “waters of the United States” in accordance with, among other things, “[t]he latest science and the effect of climate change on our waters.”³²⁷ The proposed rule recodifies the pre-Obama-era rule, with additional protections for waters that would meet either of the Scalia or Kennedy tests from *Rapanos*.³²⁸

b. *Regulated Actions—The “Discharge of Pollutants”*

The Clean Water Act limits jurisdiction to activities that constitute the “discharge of pollutants,” defined as “any addition of any pollutant to navigable waters from any point source.”³²⁹ Under this provision, polluting activities fall within the regulatory net if they threaten to pollute or destroy protected waters. Concerning groundwater, one controversial issue has been whether the statute regulates point source discharges that migrate *through* groundwater before reaching navigable surface waters, resulting in an indirect discharge to navigable waters.³³⁰ The Supreme Court addressed this question just two days after publication of the Trump administration’s WOTUS rule.³³¹ In *Maui v. Hawaii Wildlife Fund*, the Court reaffirmed groundwater’s integral role in the hydrologic cycle.³³² The County of Maui had been discharging about four million gallons of treated sewage daily down four wells without a CWA

³²⁷ *Army Announces Intent to Revise Definition of WOTUS*, U.S. ENV’T PROT. AGENCY (June 9, 2021), <http://www.epa.gov/newsreleases/epa-army-announce-intent-revise-definition-wotus> (EPA news release).

³²⁸ *Revising the Definition of “Waters of the United States,”* U.S. ENV’T PROT. AGENCY, <https://www.epa.gov/wotus/revising-definition-waters-united-states> (last visited Dec. 16, 2021) (announcing an intention to “put back into place the pre-2015 definition of ‘waters of the United States,’ updated to reflect consideration of Supreme Court decisions”); see also *supra* notes 299–300 and accompanying text (Justice Scalia’s test from *Rapanos*), & notes 305–06 and accompanying text (Justice Kennedy’s test from *Rapanos*).

³²⁹ Clean Water Act, 33 U.S.C. § 1362(12) (emphasis added) (defining “discharge of a pollutant” and “discharge of pollutants” as “any addition of any pollutant to navigable waters from any point source”); *id.* § 1311(a) (except pursuant to permit “the discharge of any pollutant by any person shall be unlawful”).

³³⁰ This argument was presaged by *Rapanos*, as discussed *supra* Part II.D.2.a. Justice Scalia expressly disavowed fears that a narrow interpretation of “navigable waters” would allow polluters to evade the permitting requirements of other sections of the statute, including the Section 402 “national pollutant discharge elimination system” (NPDES). He opined, but did not decide, that the Act forbade the “addition of any pollutant to navigable waters” and not merely the “addition of any pollutant *directly* to navigable waters” from any point source. However, he focused on intermittent streams, through which pollutants naturally wash downstream, rather than groundwater as a conduit of pollutants. *Rapanos v. United States*, 547 U.S. 715, 742–44 (2006) (plurality opinion) (emphasis added); see also LINDA TSANG, CONG. RSCH. SERV., LSB10528, UNCHARTED WATERS: NAVIGATING THE SUPREME COURT’S NEW CLEAN WATER ACT PERMITTING TEST (2020), <https://crsreports.congress.gov/product/pdf/LSB/LSB10528> (summarizing the Supreme Court’s *Maui* decision).

³³¹ See *supra* note 322 and accompanying text (indicating the rule was published on April 21, 2020).

³³² *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462, 1467–68 (2020) (opinion dated April 23, 2020).

permit.³³³ The County did not dispute that the pollutants were dumped into the Pacific Ocean after traveling a brief distance (approximately one-half mile) through groundwater. Instead, the County argued for a sweeping exception for groundwater pollution, claiming that the CWA's permitting requirement does not apply if there is "any amount of groundwater between the end of the pipe and the edge of the navigable water," such as the Pacific Ocean.³³⁴

In a 6-3 decision, the Court, led by Justice Breyer's majority opinion, rejected the County of Maui's proffered "bright-line test" as a nonscientific interpretation that would create a regulatory "loophole" allowing "easy evasion" of the CWA's basic purpose of restoring and maintaining hydrologic integrity.³³⁵ The Court held that the CWA requires a permit "if the addition of pollutants through groundwater is the *functional equivalent* of a direct discharge from the point source into navigable waters."³³⁶ The opinion was rooted in pragmatism and adopted a middle ground that the majority viewed as "administratively workable."³³⁷ Justice Breyer rejected the Ninth Circuit's opinion below,³³⁸ which called for broad regulation of any pollution "fairly traceable" from a point source to a navigable water.³³⁹ At the same time, he rejected the narrow scope of jurisdiction recognized by the Fourth³⁴⁰ and Sixth Circuits,³⁴¹ both of which would have limited federal jurisdiction to direct discharges into surface waters that did not first travel through groundwater.

Justice Breyer grounded his opinion in science. Citing to the Brief for Aquatic Scientists included in the record and a scientific encyclopedia, he stated that "[v]irtually all water, polluted or not, eventually makes its way to navigable

³³³ *Id.* at 1469.

³³⁴ *Id.* at 1469, 1473.

³³⁵ *Id.* at 1470, 1473–75.

³³⁶ *Id.* at 1468, 1476 (emphasis added) (noting that in applying the test, "[t]ime and distance are obviously important"). Justice Breyer was joined by Chief Justice Roberts and Justices Ginsburg, Sotomayor, Kagan, and Kavanaugh. Justice Kavanaugh filed a concurring opinion. Justice Thomas filed a dissent, joined by Justice Gorsuch. Justice Alito filed a separate dissent.

³³⁷ *Id.* at 1473.

³³⁸ *Haw. Wildlife Fund v. County of Maui*, 886 F.3d 737, 749 (9th Cir. 2018) (holding that the CWA applies to discharges from point sources that are "fairly traceable from the point source to a navigable water such that the discharge is the functional equivalent of a discharge into the navigable water").

³³⁹ *Maui*, 140 S. Ct. at 1473.

³⁴⁰ *Id.* at 1469–70, *abrogating* *Upstate Forever v. Kinder Morgan Energy Partners, L.P.*, 887 F.3d 637, 651 (4th Cir. 2018) (limiting CWA regulation over groundwater discharges to cases where there is a "direct hydrological connection" between the groundwater and navigable surface waters).

³⁴¹ *Maui*, 140 S. Ct. at 1469–70, *abrogating* *Ky. Waterways All. v. Ky. Utils. Co.*, 905 F.3d 925 (6th Cir. 2018). *Kentucky Waterways Alliance v. Kentucky Utilities Co.* held that "[t]he CWA does not extend liability to pollution that reaches surface waters via groundwater." *Ky. Waterways All.*, 905 F.3d at 928.

water. This is just as true of groundwater.”³⁴² Engaging in a textual analysis, he concluded there was no linguistic basis for categorically denying federal authority over discharges that travel through groundwater before reaching protected waters.³⁴³ Employing a folksy metaphor, Justice Breyer refused to limit the word “to” as meaning “*directly* to” a protected water body: “A recipe might instruct to ‘add the drippings from the meat to the gravy’; that instruction does not become incomprehensible . . . simply because the drippings will have first collected in a pan or on a cutting board.”³⁴⁴ Likewise, the CWA did not relinquish jurisdiction over pollutants traveling some distance through groundwater before reaching the Pacific Ocean.³⁴⁵

3. *The Rationales*

Groundwater exceptionalists rely on a number of rationales, both familiar and unfamiliar from this Article’s previous discussion of state water rights, the reserved rights doctrine, and interstate allocation. First, they regard groundwater as an integral part of the land rather than a component of the hydrologic cycle—an argument that harkens back to the largely-discredited absolute dominion rule of state water rights law.³⁴⁶ As a corollary, they suggest that restrictions on the use of privately-owned lands constitute a regulatory taking requiring compensation under the Fifth Amendment. In *Riverside Bayview Homes*, for example, the landowner/developer characterized the wetlands it sought to fill as simply lands with “poor drainage,” the regulation of which would give rise to a takings claim.³⁴⁷ Likewise, Justice Scalia’s plurality opinion in *Rapanos* characterized wetlands as simply “wet fields” and chastised federal regulators for impeding the landowner’s desire to “backfill” those fields.³⁴⁸

As a second rationale, exceptionalists argue that regulation of groundwater under the CWA constitutes a federal power grab because modern knowledge of surface/groundwater connections could render everyday activities vulnerable to federal overreach. No longer hiding behind a veil of hydrologic ignorance, some exceptionalists now acknowledge quite freely—perhaps surprisingly so—that their fundamental goal is to evade regulation. For example, in an amicus brief

³⁴² *Maui*, 140 S. Ct. at 1470.

³⁴³ *Id.* at 1475 (concluding the CWA does not limit its scope to pollutant discharges “directly” or “immediately” from point sources).

³⁴⁴ *Id.* (emphasis added).

³⁴⁵ *Maui*, 140 S. Ct. at 1477 (concluding the CWA applies to pollutant discharges reaching navigable waters through groundwater in cases where such a discharge is the functional equivalent of a direct discharge).

³⁴⁶ *See supra* notes 98–100 and accompanying text.

³⁴⁷ *See supra* note 289 and accompanying text.

³⁴⁸ *See supra* note 301 and accompanying text.

filed in *Maui v. Hawaii Wildlife Fund*, the Pacific Legal Foundation acknowledged that “[n]early all groundwater is hydrologically connected to surface water.”³⁴⁹ But the regulation of groundwater pollution, the brief claimed, would impose “intolerable burdens” on landowners, farmers, and others who “unwitting[ly]” pollute through their land-use practices, such as homeowners who rely on septic tanks or agriculturalists who employ “regular farming practices, like fertilizing crops.”³⁵⁰ Likewise, the landowner in *Riverside Bayview Homes*³⁵¹ and Justice Scalia’s plurality opinion in *Rapanos*³⁵² assailed the imposition of federal regulation, fines, and imprisonment for statutory violations, arguing that federal intervention impeded such activities as farming and filling in wetlands for residential development.³⁵³ Similarly, after the Obama administration promulgated its definition of regulated waters, critics responded in what one commentator described as “apocalyptic” rhetoric, claiming the rule placed “landowners, small businesses, farmers, and manufacturers on the road to a regulatory and economic hell.”³⁵⁴ Comparably, the Trump administration expressly disavowed science as a proper basis upon which to base the appropriate scope of federal regulation.³⁵⁵

As a third rationale, exceptionalists employ textualism to interpret the scope of federal authority under the CWA, purportedly emphasizing plain meaning over hydrologic understanding and statutory purpose. Justice Scalia, for example, famously relied on *Webster’s New International Dictionary* to define words such as “waters,” eschewing reliance on more technical or scientific sources.³⁵⁶ In *Rapanos*, this allowed him to conflate the distinction between

³⁴⁹ See, e.g., *supra* note 332 and accompanying text (discussing the Supreme Court’s discussion of the water cycle in *Maui*); Brief Amicus Curiae of Pacific Legal Foundation in Support of Petitioner at 11, *Maui*, 140 S. Ct. 1462 (No. 18–260).

³⁵⁰ Brief Amicus Curiae of Pacific Legal Foundation in Support of Petitioner at 3, 13–14, 13 n.3, *Maui*, 140 S. Ct. 1462 (No. 18–260).

³⁵¹ See *supra* note 288 and accompanying text.

³⁵² See *supra* note 296 and accompanying text.

³⁵³ See *supra* note 302 and accompanying text (indicating landowner should not be penalized for backfilling his own wet fields).

³⁵⁴ Owen, *supra* note 316, at 2 (citing Congressman John Boehner and other critics employing “apocalyptic” language); see also *What They Are Saying: EPA, U.S. Army Repeal 2015 Rule Defining “Waters of the United States,”* U.S. ENV’T PROT. AGENCY (Sept. 13, 2019), <https://www.epa.gov/newsreleases/what-they-are-saying-epa-us-army-repeal-2015-rule-defining-waters-united-states> (federal news release collecting sources critical of the Obama-era rule); Mulligan, *supra* note 280, at 2 n.8 (“[O]pponents condemn [the Clean Water Rule] as a massive power grab by Washington, saying it will give bureaucrats carte blanche to swoop in and penalize landowners every time a cow walks through a ditch.” (quoting Jenny Hopkinson, *Obama’s Water War*, POLITICO (May 27, 2015, 10:41 AM), <https://www.politico.com/story/2015/05/epa-waterways-wetlands-rule-118319>)).

³⁵⁵ See *supra* note 321 and accompanying text.

³⁵⁶ See *supra* notes 298–99 and accompanying text; see also *Rapanos v. United States*, 547 U.S. 715, 732–

“wetlands” and other waters such that the CWA would regulate only those wetlands with a “continuous surface connection” to jurisdictional waters, “making it difficult to determine where the ‘water’ ends and the ‘wetland’ begins.”³⁵⁷ Justices Thomas and Gorsuch took up the mantle of plain meaning in their dissenting opinion in *Maui v. Hawaii Wildlife Fund*, relying on the *American Heritage Dictionary* and *Webster’s New International Dictionary* to conclude that statutory jurisdiction over the “addition” of pollutants to jurisdictional waters excluded pollutants released to groundwater a short distance from the Pacific Ocean.³⁵⁸

Such exclusionary rationales have been defeated, in some cases, by a judicial emphasis on the CWA’s primary goal of promoting hydrologic integrity, undergirded by science. In *Riverside Bayview Homes*, the Supreme Court rejected reliance on “artificial lines” and instead focused on the hydrologic function of wetlands.³⁵⁹ Justice Kennedy’s concurrence in *Rapanos* followed a similar approach, considering statutory purpose, the ecosystem services performed by wetlands, and the “significant nexus” that can exist between surface waters and groundwater.³⁶⁰ Likewise, the Court in *Maui v. Hawaii Wildlife Fund* relied on science, explicitly citing to a brief submitted by aquatic scientists and a scientific encyclopedia.³⁶¹

4. *The Consequences*

As a general pattern, the scope of protected “waters of the United States” has narrowed over time, increasingly excluding groundwater and associated wetlands—culminating in the Trump administration’s 2020 jurisdictional rule, but with likely reversal by the Biden administration.³⁶² Conversely, the scope of regulated activities that threaten protected surface waters has expanded over time, as evidenced by the 2020 opinion in *Maui v. Hawaii Wildlife Fund*.³⁶³ There, the Supreme Court held that the Clean Water Act regulates some discharges into groundwater, provided they are the “functional equivalent” of

33 n.5 (2006) (plurality opinion) (acknowledging “scientifically precise distinctions between ‘perennial’ and ‘intermittent’ flows are no doubt available,” but relying on *Webster’s Second Dictionary* over a technical report by the U.S. Geological Survey).

³⁵⁷ *Rapanos*, 547 U.S. at 742.

³⁵⁸ *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462, 1479–80 (2020) (Thomas, J., dissenting).

³⁵⁹ See *supra* note 294 and accompanying text.

³⁶⁰ See *supra* notes 305–06 and accompanying text.

³⁶¹ See *supra* note 342 and accompanying text.

³⁶² See *supra* notes 327–28 and accompanying text.

³⁶³ See *supra* notes 335–41 and accompanying text.

discharges into protected surface waters.³⁶⁴ This acceptance of groundwater regulation is quite modest. The Court was careful to narrowly circumscribe groundwater regulation, observing that “Congress left general groundwater regulatory authority to the States; its failure to include groundwater in the general EPA permitting provisions was deliberate.”³⁶⁵ Nevertheless, *Maui* represents an important move toward hydrologic integrity.

These opposing patterns have defied scientific understanding. The scope of the Clean Water Act is clearly a matter of law and politics. But by purporting to draw a bright line between groundwater (federally *unregulated*) and surface water (federally *regulated*), lawmakers have imbued the analysis with a quasi-scientific aura that often fails to reflect the hydrologic reality of the water cycle.³⁶⁶ As one prominent environmental journalist observed, cases involving Clean Water Act jurisdiction over groundwater “address distinctions in the law that are not always present in nature.”³⁶⁷

The CWA cases and rules have also generated analytical confusion. The EPA and the Corps have promulgated inconsistent and fluctuating rules to interpret their jurisdiction under the CWA, seemingly based on little more than the preferred politics of the current occupant of the White House.³⁶⁸ Chief Justice Roberts bemoaned the lack of clear guidance in his *Rapanos* concurrence, complaining that in the absence of clarity “[l]ower courts and regulated entities will now have to feel their way on a case-by-case basis.”³⁶⁹

Beyond scientific defiance and analytical confusion, the extent to which the CWA excludes groundwater has important on-the-ground consequences that could frustrate the statute’s purpose to promote the “integrity” of the nation’s waters.³⁷⁰ For example, the narrow Trump-era rule potentially removed federal protection from millions of acres of wetlands and streams.³⁷¹ Although estimates

³⁶⁴ See *supra* note 336 and accompanying text.

³⁶⁵ *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462, 1472 (2020).

³⁶⁶ See generally Brett Walton, *U.S. Courts Issue Contradictory Rulings on Groundwater and the Clean Water Act*, CIRCLE OF BLUE (Feb. 7, 2018), <https://www.circleofblue.org/2018/world/u-s-courts-issue-contradictory-rulings-groundwater-clean-water-act/> (noting arguments that “address distinctions in the law that are not always present in nature”).

³⁶⁷ *Id.*

³⁶⁸ See *supra* Part I.LD.2.a (describing rule changes corresponding to changes in presidential administrations).

³⁶⁹ *Rapanos v. United States*, 547 U.S. 715, 758 (Roberts, C.J., concurring).

³⁷⁰ See *supra* note 266 and accompanying text.

³⁷¹ See Hannah Northey, *Exclusive: Trump Rule Imperils More than 40,000 Waterways*, E&E NEWS (Mar. 19, 2021, 1:44 PM), <https://subscriber.politicopro.com/article/eenews/1063727993> (analyzing the consequence of all changes implemented by the subject rule, not solely those relating to groundwater).

vary significantly, by some counts, the Trump-era rule eliminated federal protection of seventy percent of waterways and ninety-one percent of wetlands previously protected under the Obama-era rule.³⁷²

III. THE WAY FORWARD: FROM EXCEPTIONALISM TO INTEGRITY

Part II revealed groundwater exceptionalism's firm grasp on the law, but also uncovered promising areas where the law is moving toward integrity both in the hydrologic sense (by recognizing groundwater's integral role in the water cycle) and in the legal sense (by grounding decisionmaking in a coherent and transparent set of analytical principles). This Part compiles those positive signs into a roadmap useful for fostering further progress and hydrologic sustainability. Section A builds on the relationships first depicted in Figure 1.³⁷³ It adds nuance to the horizontal axis of the figure by taking a closer look at the propertization of groundwater and suggesting a better conceptualization that harmonizes underground and surface water. Next, section B fills in detail on the vertical axis by gathering the encouraging decisions identified in Part II that reject groundwater under-regulation. Finally, section C culls key analytical techniques that have supported the movement toward integrity, adding them to the tool kit for continued progress toward sustainable water use.

A. *Rejecting Over-Propertization*

Water defies easy and consistent legal classification as it moves through the hydrologic cycle from surface to underground and back, becomes contaminated with pollution, or is allocated by officials pursuant to "water rights." Indeed, some have articulated a "fluid" view of property rights in water that depends on context.³⁷⁴ Broadly, scholars recognize three categories of property, albeit with some blurring at the margins and some inconsistency of terminology: (1) private property, (2) public property (sometimes called "state property"), and (3) commons property.³⁷⁵ The traditional bundle of sticks metaphor has been

³⁷² *Id.* (summarizing results of Army Corps of Engineers database revealing that 40,000 out of 55,519 waters under study did not qualify for federal protection); *see also EPA News Release, supra* note 327 (concluding under the Trump rule there was a twenty-five percent reduction in the determination of the scope of protected waters and that the reduction is "particularly significant in arid states, like New Mexico and Arizona, where nearly every one of over 1,500 streams assessed has been found to be non-jurisdictional").

³⁷³ *See supra* Part II, fig.1.

³⁷⁴ Shelley Ross Sager, *The Fluid Nature of Property Rights in Water*, 21 DUKE ENV'T L. & POL'Y F. 49, 50 (2010); Carol M. Rose, *Property as the Keystone Right?*, 71 NOTRE DAME L. REV. 329, 351 (1996).

³⁷⁵ *See, e.g.,* Michael Heller, *Three Faces of Private Property*, 79 OR. L. REV. 417, 418–21 (2000); CHRISTINE A. KLEIN, *PROPERTY: CASES, PROBLEMS, AND SKILLS* 344 (2d ed. 2020); Joseph W. Dellapenna, *Introduction to Riparian Rights*, in 1 WATERS AND WATER RIGHTS § 6.01(b)(1.01) (discussing private property,

pressed into service to clarify distinctions among these categories. First, private property features strong rights of exclusion and transferability.³⁷⁶ Second, public property, which is owned by federal, state, or local governments, also enjoys strong rights of exclusion, but such rights are exercised by the governmental owner or manager.³⁷⁷ Third, commons property incorporates no exclusionary rights, but it allows for broad use rights.³⁷⁸

Prior to extraction from streams, lakes, or other natural features, *in situ* water fits fairly comfortably within the category of public property—neither pure private property³⁷⁹ nor a true commons,³⁸⁰ as suggested in Figure 2. Perhaps unsurprisingly, this characterization developed first with respect to surface water. In a landmark nineteenth century opinion, *Illinois Central Railroad Co. v. Illinois*, the U.S. Supreme Court held that the states hold the title to lands under navigable waters, which “necessarily carries with it *control* over the waters above them.”³⁸¹ As the Court explained, the states hold title to qualifying submerged lands “in trust for the people of the state,” so that they can enjoy such activities as commerce, navigation, and fishing in the overlying waters “free from the obstruction or interference of private parties.”³⁸² Many states claim

public property, and common property in the context of water).

³⁷⁶ See Heller, *supra* note 375, at 418–19.

³⁷⁷ See *id.* at 420–21. Heller explains that a state property regime “is similar to commons property in that no individual stands in a specially privileged position with regard to any resource, but is distinguished from commons property because the state has a special status or distinct interest—that of owner of all resources able to include or exclude all individuals.” *Id.* This Article uses “public property” in the same sense that Heller uses “state property”—each phrase indicates ownership by some governmental entity at the federal, state, or local level.

³⁷⁸ See *id.* at 419–20.

³⁷⁹ See Dellapenna, *Adapting Riparian Rights*, *supra* note 84, at 545–54 (describing water as a “public good” as distinguished from “private goods,” based on its qualities of indivisibility and publicness); see also GETCHES, *supra* note 21, at 85 (asserting that private persons generally “do not ‘own’ water in its natural state”).

³⁸⁰ See KLEIN, *supra* note 375, at 378 (explaining that international law recognizes only four global commons: the high seas, the atmosphere, Antarctica, and outer space). Although commentators sometimes describe *in situ* water as a “commons” or “common pool resource,” they often use such labels interchangeably with “public” property. See, e.g., Saxer, *supra* note 374, at 50 (firmly locating water as a resource that “belongs to the public and is held in trust for us by the government,” but also referring to water as a “unique common resource . . . entrusted to the government for the public good”). Compare Dellapenna, *Adapting Riparian Rights*, *supra* note 84, at 550 (describing water as “public good”), with Joseph W. Dellapenna, *Is There a Role for Markets?*, in 2 WATERS & WATER RIGHTS § 18.08 (Amy K. Kelley ed., 3d ed. 2021) (describing water, including groundwater, as “common pool resources”).

³⁸¹ *Ill. Cent. R.R. Co. v. Illinois*, 146 U.S. 387, 452 (1892) (emphasis added). In this context, “navigable waters” is a term of art that identifies which waterways are open to public use. See KLEIN, *supra* note 375, at 690–91 (explaining the concept of “navigability for title purposes” and distinguishing it from other navigability tests).

³⁸² *Ill. Cent.*, 146 U.S. at 452 (assigning the role of trustee to the states in the context of water bodies determined to be “navigable” as a term of art).

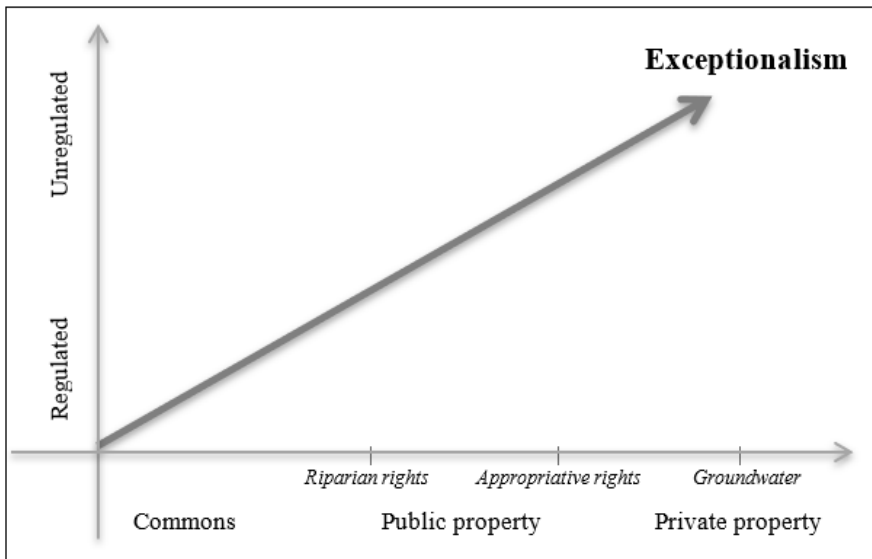
through constitution or statute to “own” the waters within their territory.³⁸³ But such claims are better described as a *trusteeship* that authorizes states to “control” (in the words of *Illinois Central*) water use for the benefit of their citizens, rather than ownership of the corpus of water itself.³⁸⁴ This distinction is particularly critical in the context of interstate disputes, where the idea of state ownership of molecules that reside for some period of time within one state could easily thwart the claims of neighboring states to use a portion of the shared resource when the molecules migrate or are siphoned across state lines.³⁸⁵ Because water is a fugitive resource that moves through the water cycle, *in situ* water should logically retain its public character, whether found below ground in an aquifer or above ground in a river, lake, or ocean. Nevertheless, as described previously, the law has been slow to accept this connection.³⁸⁶

³⁸³ Klein, *supra* note 3, at 510–11.

³⁸⁴ See Klein, *supra* note 3, at 510–13 (collecting sources describing state ownership as “a fiction” for the power to regulate); see also Barton H. Thompson, Jr., *Water as a Public Commodity*, 95 MARQ. L. REV. 17 (2011) (describing water as a public trust).

³⁸⁵ See *Mississippi v. Tennessee*, 595 U.S. ___, slip op. 9–10 (Nov. 22, 2021) (asserting “we have ‘consistently denied’ the proposition that a State may exercise exclusive ownership or control of interstate ‘waters flowing within her boundaries’” (quoting *Hinderlider v. LaPlata River & Cherry Creek Ditch Co.*, 304 U.S. 92, 102 (1938))); see also *supra* note 239 and accompanying text (discussing Mississippi’s claim of groundwater ownership asserted against neighboring Tennessee in an attempt to control the use of water within an aquifer underlying multiple states).

³⁸⁶ See, e.g., *supra* Part II.A.1.c (describing the minority “absolute dominion” groundwater doctrine that purports to recognize landowners’ ownership of water molecules that lie beneath their surface estate). *But see* *Env’t L. Found. v. State Water Res. Control Bd.*, 26 Cal. App. 5th 844, 859–60 (Cal. Ct. App. 2018) (holding that the public trust doctrine applies to groundwater extractions that threaten surface waters protected by the doctrine, but clarifying the “dispositive issue is not the source of the activity, or whether the water that is diverted or extracted is itself the subject of the public trust, but whether the challenged activity harms a navigable waterway”).

Figure 2. Property Rights in Water

The classification of state issued “water rights” adds an additional layer of complexity to the analysis.³⁸⁷ Water rights convey legal authority to use water diverted from its natural source,³⁸⁸ but do not displace the states’ trusteeship and control over all water within their borders.³⁸⁹ As such, water rights are a subspecies of property that coexists with state trusteeship,³⁹⁰ as suggested in Figure 2. In water law parlance, water rights are generally described as “usufructuary,”³⁹¹

³⁸⁷ Professor Jane Maslow Cohen has observed that water rights are exceptional among property rights because of “the publicness of water,” and that “public debate, even among lawmakers, may suffer from a lack of awareness of water rights exceptionalism that may be the direct result of the near-total obsession that introductory property law courses have with ‘real’ property.” Jane Maslow Cohen, *Of Waterbanks, Piggybanks, and Bankruptcy: Changing Directions in Water Law*, 83 TEX. L. REV. 1809, 1846–47 (2005).

³⁸⁸ See *supra* Part II.A.

³⁸⁹ See Owen, *supra* note 31, at 275 (concluding “water use always remains subject to governmental oversight and control”).

³⁹⁰ See *id.* at 274–75 (describing “the most prevalent view” under which “private [water] use rights must coexist with, and often remain subordinate to, overriding public interests in waterways” and concluding under this view “to an even greater extent than land use rights, water use always remains subject to governmental oversight and control”); see also Sandra B. Zellmer & Jessica Harder, *Unbundling Property in Water*, 59 ALA. L. REV. 679, 684–87 (2007) (suggesting web-of-interests is a better metaphor than bundle-of-rights to describe overlapping interests in water rights and to better assess the nature of “the thing” in question (citing Craig Anthony Arnold, *The Reconstitution of Property: Property as a Web of Interests*, 26 HARV. ENV’T L. REV. 281, 291–95 (2002))).

³⁹¹ DAVID H. GETCHES, *WATER LAW IN A NUTSHELL* 86–87 (4th ed. 2009) (distinguishing appropriative

with little additional explication. But basic principles of property law furnish a ready model for this type of arrangement: two parties can simultaneously hold possessory and nonpossessory rights in the same property, such as a fee simple encumbered by an easement, covenant, license, or profit à prendre.³⁹² Accordingly, water rights convey only a nonpossessory usufructuary property right,³⁹³ subject to state trusteeship and regulatory authority. In the wetter eastern states, riparian water rights edge more toward notions of common ownership.³⁹⁴ Each riparian landowner has broad use rights (the right to make reasonable use of the watercourse) and limited exclusionary rights (the inability to exclude other riparians from likewise making reasonable uses).³⁹⁵ In contrast, water rights under the prior appropriation doctrine veer more toward private property. Water rights holders in those jurisdictions have broad use rights (perpetual as long as the water is put continuously to a beneficial use that stays within the parameters of the original appropriation) and also broad exclusionary rights (“senior” water users can exclude others from diverting until the senior’s full right has been satisfied).³⁹⁶ Of critical importance—but seldom stated explicitly—both riparian and appropriative rights are nonpossessory use rights that remain subject to the states’ overriding trusteeship and regulatory authority, regardless of whether the water rights themselves more closely resemble commons or private property.³⁹⁷

“usufructuary” rights from “possessory” rights).

³⁹² KLEIN, *supra* note 375, at 516–18; *see* Zellmer & Harder, *supra* note 390, at 683 n.21 (citing RESTATEMENT (FIRST) OF PROPERTY: INTRODUCTION & FREEHOLD INTERESTS, ch.1, intro. note, at 3 (1936)); *see also* Saxer, *supra* note 374, at 105 (concluding water rights should best be classified as licenses).

³⁹³ *See, e.g.,* Henry E. Smith, *Governing Water: The Semicommons of Fluid Property Rights*, 50 ARIZ. L. REV. 445, 448–49 (2008) (referring to water rights as usufructuary property interests); GETCHES, *supra* note 391, at 86 (stating water rights are usufructuary rights as opposed to possessory rights).

³⁹⁴ *See supra* Part II.A.1.a (discussion of riparian rights doctrine); *see also supra* note 378 and accompanying text (discussing the bundle of sticks metaphor and commons property). Classification of riparian rights has been difficult. As one water casebook chronicles, riparian rights “have been described as part and parcel of the land itself, corporeal hereditaments, incorporeal hereditaments, easements, appurtenances and tenancies in common in the stream.” WEBER ET AL., *supra* note 67, at 253.

³⁹⁵ As Professor Joseph Dellapenna explained, riparian rights “allow anyone with lawful access to use a common pool resource as long as the use is reasonable”—constituting a rule of “common property rather than a rule of private property, similar to tenants in common using or disputing the use of their jointly held land.” Dellapenna, *Adapting Riparian Rights*, *supra* note 84, at 553–54, 561–65; *see also* Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trades and Ecosystems*, 83 MINN. L. REV. 129, 139–43 (1998) (classifying both eastern and western water rights as “limited common property regimes” that are “commons with respect to the membership, but property with respect to outsiders”).

³⁹⁶ *See supra* Part II.A.1.b (discussing prior appropriation doctrine); *see also* THOMPSON ET AL., *supra* note 9, at 251 (contrasting perpetual water rights with term-limited rights-of-way to use federal lands and navigable waters for ski areas, power plants, and the operation of hydropower dams on rivers).

³⁹⁷ *See, e.g.,* *Kobobel v. Dep’t of Nat. Res.*, 249 P.3d 1127, 1134 (Colo. 2011) (holding that a water right is a “usufructuary right” and that “one does not ‘own’ water but owns the right to use water within the limitations of the prior appropriation doctrine”). Not all courts have observed the nonpossessory nature of water rights. When evaluating claims that environmental and other regulations work a regulatory taking of water rights, a few

In contrast to surface water rights, groundwater rights in some states seemingly take on the attributes of *possessory* property analogous to private property rights in real estate. According to one commentator, states perform this “conceptual shimmy” by aligning groundwater more with land than with surface water,³⁹⁸ which tracks the water-as-land rationale frequently used to bolster groundwater exceptionalism. According to this source, “the folding of groundwater doctrine not into the doctrinal domain of surface water but into the alternate domain of land law, thanks to the rigid logic of the ad infernos doctrine and the casual neglect of the ‘occult,’” is a costly mistake in an era of increasingly scarce water supplies.³⁹⁹ States generally follow one of five common law groundwater doctrines, sometimes with statutory overlays, regardless of whether they fall within a riparian or appropriation jurisdiction for surface rights.⁴⁰⁰ Under those doctrines, landowners often have some type of property right in the groundwater beneath their surface estate.⁴⁰¹ The precise contours of this right vary from state to state, but are often at odds with the well-established usufructuary nature of surface rights. Many states apply some version of a rule of capture under which landowners acquire a relatively unfettered right to pump water from the shared aquifer underlying their property.⁴⁰² As one casebook explains, there is “little doubt once . . . groundwater is brought to the surface[] [that] a personal property ownership interest in those molecules of water has been perfected.”⁴⁰³ At the furthest end of the spectrum, Texas recognizes a landowner’s property right in subsurface groundwater *in situ*, even if it has not been captured and brought to the surface.⁴⁰⁴

courts have analyzed the restrictions as “physical takings” of property, which in turn requires the courts to conceptualize water rights as *possessory* rights in particular molecules of water, rather than nonpossessory rights of use. However, this view has been widely criticized and has not gained much acceptance. See Michael C. Blumm & Rachel G. Wolfard, *Revisiting Background Principles in Takings Litigation*, 71 FLA. L. REV. 1165, 1196–1200 (2019) (noting “withering criticism” of a decision holding water diversion restrictions should be analyzed as physical takings); Owen, *Taking Groundwater*, *supra* note 31, at 273–74 (discussing application of “categorical physical takings analysis” to water rights and concluding “many more cases have rejected [this] analytical methodology than have followed it”).

³⁹⁸ See Cohen, *supra* note 387, at 1853 (noting groundwater law has been folded into land law rather than surface water law).

³⁹⁹ *Id.*

⁴⁰⁰ See *supra* Part II.A.1.c.

⁴⁰¹ *Id.*

⁴⁰² *Id.*

⁴⁰³ THOMPSON ET AL., *supra* note 9, at 502.

⁴⁰⁴ *Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 842 (Tex. 2012); see also Owen, *supra* note 31, at 276–77 (describing the Texas Supreme Court decision holding landowners own water beneath their land, even prior to pumping).

This singling out of groundwater for special property status triggers the adverse micro-consequences previously summarized in Table 1.⁴⁰⁵ First, it defies hydrologic understanding. As the Kansas Supreme Court acknowledged as early as 1962 when upholding the constitutionality of certain groundwater regulations, it would be “the height of inconsistency” to premise surface water rights on demonstrated possession and control of water, but award groundwater rights on the basis of ownership of the overlying land.⁴⁰⁶ The court rooted its statement in a “scientific premise”: “One cannot separate ground water and surface water. What is surface water at one time is ground water the next. What is ground water today becomes surface water tomorrow.”⁴⁰⁷ Further, exceptionalism produces analytical incoherence. For example, the declining English rule of absolute dominion allows landowners to pump as much groundwater as they can from beneath their land, even if such capture causes neighboring wells to go dry.⁴⁰⁸ In practice, the rule’s promise of absolute property rights turns out to be an illusion. Some have called the absolute ownership doctrine “a misnomer if ever there was one” because “[a]s soon as someone with a more powerful pump comes along, existing uses of the aquifer can be diminished or completely eviscerated, with no legal recourse.”⁴⁰⁹ Despite recognition of private property rights in underground water, absolute ownership jurisdictions recognize at most a usufructuary right in surface waters,⁴¹⁰ even though the same water molecules may move between surface and underground locations—a contradiction that makes little hydrologic or analytical sense. Finally, treating groundwater as private property undermines the foundational goals of riparianism and prior appropriation, as applied to surface waters: establishing fair and consistent principles to guide individual use of public waters.⁴¹¹ If a portion of those waters can be used at will as private property, then the surface allocation rules are severely undermined.

B. Reversing Under-Regulation

In many cases, groundwater exceptionalism thwarts regulation, thereby weakening doctrines aimed at the orderly distribution of water use rights or the prevention of pollution. Strategic advocates have systematically sought to “propertize” water and other resources with the clear goal of impeding

⁴⁰⁵ See *supra* Part II (introductory paragraphs).

⁴⁰⁶ *Williams v. Wichita*, 374 P.2d 578, 588–89 (Kan. 1962).

⁴⁰⁷ *Id.* at 590 (quoting *Foley*, *supra* note 1, at 497).

⁴⁰⁸ See *supra* notes 98–100 and accompanying text.

⁴⁰⁹ *Zellmer & Harder*, *supra* note 390, at 694–95.

⁴¹⁰ See *supra* Part II.A.1.c.

⁴¹¹ See *supra* Parts II.A.1.b & II.A.1.c.

regulation. As one scholar explains, “For most property rights advocates, constitutional property rights are a means to anti-regulatory ends.”⁴¹² Such tactics render exceptionalism rationales disingenuous, stifle productive debate, and interfere with the realization of doctrinal goals. This critique is *not* a call for more (or less) regulation of water rights and water pollution. Rather, it argues that drawing a nonscientific line between groundwater and surface water is a distraction that does not meaningfully advance legal policy.

Overall, the law has moved forward incrementally. It has followed a broad pattern under which courts and lawmakers have been increasingly willing to regulate groundwater that threatens to deplete or pollute protected surface waters. Courts and lawmakers, however, are more reluctant to recognize groundwater as worthy of protection in its own right. This pattern emerges in the context of federal reserved water rights, where the law upheld regulation of groundwater that depletes reserved surface supplies almost half a century before holding that groundwater itself can be the protected subject of federal reservations.⁴¹³ It also appears in the context of interstate water allocation, where the U.S. Supreme Court has interpreted five interstate compacts as implicitly authorizing the restriction of groundwater use that threatens to reduce surface allocations, but did not decide that groundwater itself could be the subject of an interstate apportionment until 2021.⁴¹⁴ In addition, the Court has extended CWA jurisdiction over some groundwater pollution that impacts surface supplies, such as the Pacific Ocean, but the statute’s implementing regulations have been subject to political pressure that largely resists protecting groundwater itself.⁴¹⁵

This section summarizes the consequences of groundwater exceptionalism, as discussed on a doctrine-by-doctrine basis in Part II, and shows how each contributes to a broader anti-regulatory whole. The discussion also highlights positive examples of when courts and lawmakers have rejected exceptionalism arguments that undermine doctrinal goals. The landmark positive developments are summarized in Table 2, with supporting analysis provided in the subsections below.

⁴¹² Owen, *Taking Groundwater*, *supra* note 31, at 284 (citing sources explaining how “conservative activists” asserted regulatory takings claims as a “severe brake” on federal and state regulation).

⁴¹³ See *infra* Part II.B (tracing developments from *Cappaert v. United States*, 426 U.S. 128, 138 (1976) to *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist.*, 849 F.3d 1262, 1270 (9th Cir. 2017)).

⁴¹⁴ See *infra* Part II.C.

⁴¹⁵ See *infra* Part II.D.

Table 2. Moving Toward the Regulation of Groundwater

	Groundwater as Regulated Threat	Groundwater as Protected Resource
State Water Rights	Conjunctive management	Conjunctive management
Federal Reserved Rights	<i>Cappaert v. United States</i> (U.S. 1976) ⁴¹⁶	<i>Agua Caliente Band v. Coachella Valley Water Dist.</i> (9th Cir. 2017) ⁴¹⁷
Interstate Allocation	Some regulation of tributary groundwater that impacts state allocations under interstate compacts ⁴¹⁸	<i>Hood ex. rel. Mississippi v. Memphis</i> (5th Cir. 2009) ⁴¹⁹ <i>Mississippi v. Tennessee</i> (U.S. 2021) ⁴²⁰
Clean Water Act	<i>Maui v. Hawaii Wildlife Fund</i> (U.S. 2020) ⁴²¹	No clear regulatory guidance defining extent to which CWA protects groundwater ⁴²²

1. State Water Rights Doctrine

Each state has devised a system for allocating scarce water resources among competing users, addressing such questions as *who* can use water and *where*

⁴¹⁶ *Cappaert*, 426 U.S. at 138 (holding that groundwater can be regulated as threat to reserved surface rights).

⁴¹⁷ Compare *Agua Caliente Band*, 849 F.3d at 1270 (holding that groundwater can be protected as a federal reserved right), with *In re Gen. Adjudication of the Big Horn River Sys.*, 753 P.2d 76 (Wyo. 1988), *aff'd by an equally divided court*, 492 U.S. 406 (1989) (holding that groundwater cannot be protected as a federal reserved right).

⁴¹⁸ See *supra* Part II.C.2.a (discussing five Supreme Court decisions interpreting mid-twentieth century compacts as regulating at least some groundwater).

⁴¹⁹ *Hood ex rel. Mississippi v. Memphis*, 570 F.3d 625, 629–30 (5th Cir. 2009) (suggesting groundwater aquifers are the proper subject of interstate allocation).

⁴²⁰ *Mississippi v. Tennessee*, 595 U.S. ___ (2021); see also Report of Special Master Eugene E. Siler, Jr. at 27–28, 32, *Mississippi v. Tennessee*, No. 143, Orig. (Nov. 5, 2020) (suggesting Mississippi’s sole remedy lies in an equitable apportionment of groundwater).

⁴²¹ *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462, 1467 (2020) (holding the CWA regulates discharges into groundwater that are the “functional equivalent” of direct discharges into navigable waters).

⁴²² See *supra* Part II.D.2.a.

those resources can be applied. Eastern riparianism calls for broad sharing among riparian landowners and also confines water use to the same tract of land or watershed from which the water was diverted.⁴²³ Western appropriation, in contrast, generally allows anyone to use water at any place, but addresses shortages with a system of temporal priority.⁴²⁴ When confronted with increasing scarcity brought on by drought, climate change, population growth, and expanded use, each doctrine has given groundwater users broad latitude to circumvent existing allocation rules as long as they pump water from a hydrologically-meaningless source known as “percolating groundwater.”⁴²⁵ Often, administrators know that groundwater pumping interferes with established surface rights under longstanding doctrine, but decline to regulate it.⁴²⁶ Following groundwater exceptionalism allows decisionmakers to postpone making hard decisions under the guise of pseudoscience. This de facto deregulation leads, in many cases, to the very overuse and conflicts that riparianism and appropriation were designed to address. Increasingly, however, states have begun to implement what they call the “conjunctive management” or “integrated management” of water, which coordinates the regulation of both surface water and groundwater to promote effective management of all the states’ water resources.⁴²⁷ This serves both to protect surface water rights from depletion by well pumping and to protect groundwater rights in their own right from unauthorized interference.

2. Federal Reserved Water Rights

Under the federal reserved rights doctrine, when the government reserves federal land for a federal purpose, it impliedly reserves sufficient unappropriated water necessary to accomplish the purpose of the reservation.⁴²⁸ The doctrine is designed to advance congressional purposes associated with federal lands over

⁴²³ See *supra* Part II.A.1.a.

⁴²⁴ See *supra* Part II.A.1.b.

⁴²⁵ See *supra* Part II.A.1.c.

⁴²⁶ As the Colorado Supreme Court explained, “Although historically there had been little regulation of groundwater well pumping, by the 1960s there was growing conflict between surface and groundwater users because the use of largely [unregulated] wells was greatly increasing the withdrawal of tributary groundwater and thereby depleting the surface flows of rivers.” *Kobobel v. Colo. Dep’t of Nat. Res.*, 249 P.3d 1127, 1135 (Colo. 2011) (explaining how the state adopted legislation to integrate the use of some groundwater known as “tributary” with the use of surface water after the state supreme court “acknowledged the detrimental impact of well pumping on senior surface water rights holders”).

⁴²⁷ See *supra* notes 127–28 and accompanying text (explaining conjunctive management in prior appropriation jurisdictions); see also *supra* note 126 and accompanying text (calling for “conjunctive management of surface and underground waters” consistent with “physical laws” in riparian jurisdictions).

⁴²⁸ See *supra* note 166 and accompanying text.

those of competing state users.⁴²⁹ In an effort to evade regulation, state water users have sought to create groundwater-related loopholes, but those efforts have been rebuffed consistently.⁴³⁰

In 1976, the Court established in *Cappaert v. United States* that groundwater users can be regulated when their wells threaten to deplete reserved rights in surface waters.⁴³¹ Tethering its holding to doctrinal purpose, the Court explained that “since the implied-reservation-of-rights doctrine is based on the necessity of water for the purpose of the federal reservation, we hold that the United States can protect its water from subsequent diversion, whether the diversion is of surface or groundwater.”⁴³² The Ninth Circuit went a step further in 2017, holding in *Agua Caliente Band v. Coachella Valley Water District* that groundwater itself could be protected under a federal reservation.⁴³³ As the court observed, “If the United States can protect against groundwater diversions, it follows that it can protect the groundwater itself.”⁴³⁴ The Supreme Court denied certiorari and no subsequent litigation has provided the Court a chance to articulate its views.

3. Interstate Water Allocation

Justice Holmes memorably extolled interstate water allocations as an alternative to war between the states.⁴³⁵ Such allocations—whether by agreement or by Supreme Court decree—routinely exclude some or all groundwater from their calculations. Many allocations predated the “groundwater revolution”⁴³⁶ and understandably overlooked groundwater at a time when the resource was not widely used. Strategically exploiting this oversight, some states allowed thousands of post-agreement wells to be drilled, thereby circumventing limits on their allocated share of interstate surface rivers.⁴³⁷ This strategy defeats the very purpose of interstate water allocations by triggering water wars—metaphorical wars, if not physical ones.

⁴²⁹ See *supra* note 168 and accompanying text.

⁴³⁰ See *supra* Part II.B.

⁴³¹ *Cappaert v. United States*, 426 U.S. 128, 138 (1976).

⁴³² *Id.* at 143.

⁴³³ 849 F.3d 1262, 1270 (9th Cir. 2017), *cert. denied*, 138 S. Ct. 468, 469 (2017).

⁴³⁴ *Id.* at 1271.

⁴³⁵ *New Jersey v. New York*, 283 U.S. 336, 342–43 (1931) (declaring “[a] river is more than an amenity, it is a treasure” that “offers a necessity of life that must be rationed” among neighboring states according to “an equitable apportionment without quibbling over formulas”).

⁴³⁶ See *supra* note 11 and accompanying text.

⁴³⁷ See *supra* note 225 and accompanying text.

The modern Court has generally rejected such efforts. It has interpreted several old interstate compacts as authorizing the regulation of at least some groundwater pumping that threatens to deplete a state's share of an interstate river.⁴³⁸ Further, the Court has developed new remedies to prod recalcitrant states to stay within their respective water budgets.⁴³⁹ Such efforts to prevent the under-regulation of groundwater have been met with mixed success, as states continue to engage in strategic behavior to maximize the volume of water available to them.⁴⁴⁰

Going further, the U.S. Supreme Court has determined that groundwater itself can be the subject of an equitable apportionment under appropriate facts. In the original action *Mississippi v. Tennessee*, Mississippi claimed that it owns all groundwater that resided beneath its territory at the time it entered the Union in 1817.⁴⁴¹ Complaining that Tennessee wells had siphoned groundwater from beneath its borders, Mississippi adamantly resisted sharing groundwater through an equitable apportionment and instead sought more than a half billion dollars in damages from its neighbor.⁴⁴² In defense, Tennessee argued that the sole remedy available to Mississippi was an equitable apportionment of the disputed groundwater that lies in a common aquifer underlying both states.⁴⁴³ The Supreme Court agreed, holding that application of the doctrine to the disputed aquifer would be “‘sufficiently similar’ to past applications [to surface water] to warrant the same treatment.”⁴⁴⁴

4. *The Clean Water Act*

Of all the doctrines discussed in this Article, the CWA most directly aligns doctrinal purpose with scientific reality through its call “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”⁴⁴⁵ Developers and polluters have argued to exclude groundwater from the statute’s scope, but their arguments differ significantly from exceptionalism arguments

⁴³⁸ See *supra* Part II.C.1.a.

⁴³⁹ See *supra* notes 228, 259–60 and accompanying text.

⁴⁴⁰ See *supra* notes 263–64 and accompanying text.

⁴⁴¹ See *supra* notes 239–40 and accompanying text (discussing *Mississippi v. Tennessee*, No. 143, Orig. (Nov. 5, 2020)).

⁴⁴² See *supra* notes 239–40 and accompanying text.

⁴⁴³ See *supra* notes 246–47 and accompanying text.

⁴⁴⁴ *Mississippi v. Tennessee*, 595 U.S. ___, slip op. at 7 (Nov. 22, 2021); see also *Hood ex rel. Mississippi v. Memphis*, 570 F.3d 625, 629–30 (5th Cir. 2009) (in related litigation, holding that “[t]he fact that this particular water source is located underground, as opposed to resting above ground as a lake, is of no analytical significance”).

⁴⁴⁵ 33 U.S.C. § 1251(a).

advanced in other legal contexts. Rather than feign hydrologic ignorance, they generally concede that nearly all groundwater is hydrologically connected to surface water.⁴⁴⁶ Using that admission as sword rather than shield, they forthrightly admit to a deregulatory agenda and claim that the regulation of surface and groundwater would subject them to “intolerable burdens.”⁴⁴⁷

Exceptionalists have achieved mixed success in these efforts. In the 2020 opinion of *Maui v. Hawaii Wildlife Fund*, the U.S. Supreme Court held that groundwater pollution is not categorically excluded from regulation under the CWA.⁴⁴⁸ Rather, it can be regulated in cases where it is the “functional equivalent” of a direct discharge into protected navigable waters, thereby promoting the statutory goal of fostering hydrologic “integrity.”⁴⁴⁹ Despite that encouraging sign, the law has not yet clearly settled on the degree to which groundwater itself can be protected under the statute. Instead, an inconsistent series of administrative rules and judicial interpretations fail to provide clear guidance.⁴⁵⁰

C. *Restoring Integrity: A Roadmap*

In 1894, attorney Clesson Kinney introduced lawyers to a new water vocabulary—featuring made-up terms such as *percolating groundwater*, *subflow*, and *known channels*.⁴⁵¹ Although superficially impressive, these terms are hydrologically meaningless: they misleadingly suggest that groundwater is not fully a part of the hydrologic cycle.⁴⁵² Since that time, the law has inconsistently embraced and rejected groundwater exceptionalism. This section reviews the lessons emerging from Part II to cull analytical techniques that have enjoyed particular success in restoring integrity to water law, as summarized in Table 3. Although many are simple techniques, they can offer a powerful antidote to exceptionalism, leading toward sustainable use of water resources.

⁴⁴⁶ See *supra* notes 309–12 and accompanying text.

⁴⁴⁷ See *supra* notes 349–50 and accompanying text.

⁴⁴⁸ See *supra* note 336 and accompanying text (analyzing *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462 (2020)).

⁴⁴⁹ See *supra* note 336 and accompanying text.

⁴⁵⁰ See *supra* Part II.D.2.a.

⁴⁵¹ See *supra* note 31 and accompanying text.

⁴⁵² See *supra* note 31 and accompanying text.

Table 3. A Toolkit of Analytical Techniques

Technique	Positive Model
Reliance on scientific references, data, and analysis <ul style="list-style-type: none"> • Dictionaries and encyclopedias • Computer models Burden of proof aligns with water cycle Required record-keeping of groundwater use	<i>Maui v. Hawaii Wildlife Fund</i> (U.S. 2020) ⁴⁵³ Clean Water Rule (2015) ⁴⁵⁴ Conjunctive management ⁴⁵⁵ Presumption that groundwater is tributary and subject to regulation ⁴⁵⁶
Analysis rooted in doctrinal purpose <ul style="list-style-type: none"> • Focus on hydrologic connections 	<i>Cappaert v. United States</i> (U.S. 1908) ⁴⁵⁷ <i>Maui v. Hawaii Wildlife Fund</i> (U.S. 2020) ⁴⁵⁸ <i>Mississippi v. Tennessee</i> (U.S. 2021) ⁴⁵⁹
Analysis freed of unviable Fifth Amendment claims	<i>Riverside Bayview Homes</i> (U.S. 1985) ⁴⁶⁰

⁴⁵³ 140 S. Ct. 1462, 1470–71 (2020) (relying in part on a scientific encyclopedia and brief submitted by aquatic scientists in upholding regulation of groundwater).

⁴⁵⁴ See *supra* notes 308–10 and accompanying text (Obama-era rule defining scope of protected waters under the CWA based in part on the best available peer-reviewed science).

⁴⁵⁵ See *supra* notes 125–29 and accompanying text (discussing state water rights law).

⁴⁵⁶ See *supra* notes 125–29 and accompanying text.

⁴⁵⁷ 426 U.S. 128, 138, 142, 147 (1976) (upholding regulation of groundwater threatening a federal reserved right in surface water to promote doctrinal purpose of supporting tribes).

⁴⁵⁸ *Maui*, 140 S. Ct. at 1477 (referring to underlying statutory objectives to provide guidance and asserting “[d]ecisions should not create serious risks either of undermining state regulation of groundwater or of creating loopholes that undermine the statute’s basic federal regulatory objectives”).

⁴⁵⁹ See *supra* note 247 and accompanying text (rejecting Mississippi’s attempt to circumvent the purposes of equitable apportionment by claiming ownership of the groundwater beneath its territory).

⁴⁶⁰ *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121, 129 (1985) (dismissing as “spurious” the constitutional claim that groundwater regulation requires compensation under the Fifth Amendment).

1. *Analysis Based on Science and Data*

Coherent laws must be rooted in physical reality. As a first step, some decisionmakers have begun to consult scientific sources and data when appropriate. For example, the Obama administration compiled and consulted more than 1,200 peer-reviewed science reports as a basis for its promulgation of a new rule clarifying the jurisdictional scope of the CWA, and the majority opinion in *Maui v. Hawaii Wildlife Fund* asserted jurisdiction over certain pollution discharges into groundwater after consulting sources including a scientific encyclopedia and a brief submitted by aquatic scientists.⁴⁶¹ Likewise, *Mississippi v. Tennessee* determined that equitable apportionment would be appropriate for the disputed groundwater after reviewing the special master's fact-intensive review of the aquifer's hydrogeologic characteristics.⁴⁶² As a second step, jurists can create incentives for the development of hydrologic data in a number of ways, such as by (1) presuming groundwater is part of the hydrologic cycle and placing the burden of proof on those who claim their pumping does not impact surface waters;⁴⁶³ (2) rejecting groundwater exclusions premised on administrative convenience rather than hydrology;⁴⁶⁴ (3) requiring recordkeeping of groundwater use;⁴⁶⁵ and (4) making decisions supported by computer-generated groundwater models.⁴⁶⁶ In addition, lawmakers can call for the "conjunctive management" of surface water and groundwater resources as an overall conceptual framework.⁴⁶⁷

2. *Analysis Rooted in Doctrinal Purpose and Functional Connectivity*

Science- and data-driven analyses are necessary, but not sufficient because laws are based on policy as well as fact. Judges and legislators can advance

⁴⁶¹ See *supra* note 310 and accompanying text (discussing scientific basis of Obama administration's rule); see also *supra* note 342 and accompanying text (discussing scientific basis of *Maui*).

⁴⁶² See *supra* note 246 (discussing special master's findings).

⁴⁶³ See *supra* notes 111 (presuming source is unregulated percolating groundwater), 119 (presuming groundwater is tributary and subject to regulation under Colorado statute), & 228 (in interstate dispute, placing burden on New Mexico to prove its groundwater pumping had not violated existing compact entitlement) and accompanying text.

⁴⁶⁴ See *supra* note 250 and accompanying text (refusing to recognize administrative convenience exception in interstate litigation among Kansas, Nebraska, and Colorado).

⁴⁶⁵ See Griggs, *A Fifty-Year Retrospective*, *supra* note 11, at 189 (explaining the incentive of upstream states to resist keeping records of groundwater use that can hurt them in subsequent litigation over interstate allocations and suggesting courts overcome this incentive by presuming "interstate compacts cover any extraction of groundwater that reduces apportioned stream flow").

⁴⁶⁶ See *supra* note 262 and accompanying text.

⁴⁶⁷ See *supra* notes 126 (describing 1997 call by the *Regulated Riparian Model Water Code* for conjunctive management "consistent with physical laws") & 127–29 (recognizing western state efforts to implement "conjunctive use" or "integrated management" regimes) and accompanying text.

analytical integrity by rejecting the impulse to mask policy decisions in the garb of pseudoscience. This, in turn, occurs when jurists tether their opinions to doctrinal purpose⁴⁶⁸ and to functional hydrologic connections.⁴⁶⁹ Further, judges can recognize groundwater as not only the target of regulation, but also the subject of protection. In the context of federal reserved water rights, the Supreme Court held in *Cappaert v. United States* that the federal government could enjoin water uses that harmed its reserved rights, whether the interference came from surface diversions or from groundwater pumping.⁴⁷⁰ Building on that holding, the Ninth Circuit held in *Agua Caliente* that “[i]f the United States can protect against groundwater diversions, it follows that it can protect the groundwater itself.”⁴⁷¹ The law could benefit from a similar synthesis under the CWA. In that context, courts have moved toward an acceptance that the statute can protect against groundwater pollution that *threatens* navigable waters, at least in some contexts.⁴⁷² But with respect to whether the statute *protects* groundwater itself, the law has fluctuated wildly in tandem with the changing of presidential administrations.⁴⁷³

3. Analysis Freed of Fifth Amendment Distractions

The regulatory takings doctrine has been a distraction from careful water management. Not infrequently and often with little analysis, courts justify a failure to regulate groundwater with unsupported fears that such regulation would violate the Fifth Amendment’s prohibition against uncompensated takings.⁴⁷⁴ As far back as 1985, the Supreme Court recognized such fears as distractions. In *Riverside Bayview Homes*, it upheld the regulation of fill deposited into wetlands, regardless of whether those wetlands were fed by surface water or by groundwater.⁴⁷⁵ Sweeping away vague takings concerns, the

⁴⁶⁸ See *supra* note 247 and accompanying text (rejecting Mississippi’s attempt to circumvent the purposes of equitable apportionment by claiming ownership of the groundwater beneath its territory). See generally Hannah J. Wiseman & Dave Owen, *Federal Laboratories of Democracy*, 52 U.C. DAVIS L. REV. 1119, 1127 (2018) (observing “courts often invoke policy experimentation as a rationale for limiting federal authority” and arguing that rationale is “often misguided”).

⁴⁶⁹ See *supra* notes 115–19 and accompanying text (describing Colorado’s statutory scheme calibrating the extent of groundwater use regulation with a degree of connectivity to surface water sources).

⁴⁷⁰ See *supra* notes 179–81 and accompanying text.

⁴⁷¹ See *supra* notes 187–91 and accompanying text (referencing *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist.*, 849 F.3d 1262, 1271 (9th Cir. 2017) (emphasis added)).

⁴⁷² See *supra* note 336 and accompanying text (discussing *Maui v. Haw. Wildlife Fund*, 140 S. Ct. 1462 (2020)).

⁴⁷³ See *supra* Part II.D.2.a (discussing the evolution of jurisdictional regulatory definition of “waters of the United States”).

⁴⁷⁴ See *supra* note 144 and accompanying text.

⁴⁷⁵ See *supra* notes 294–95 and accompanying text.

Court concluded that the challenged regulation represented a permissible interpretation of the Clean Water Act: “Purged of its spurious constitutional overtones,” the question of the validity of the regulation at issue “is an easy one.”⁴⁷⁶ According to one empirical study of over fifty groundwater cases alleging uncompensated Fifth Amendment takings, courts widely declare groundwater use rights as “constitutional property” that is potentially protected by the takings doctrine.⁴⁷⁷ But despite this judicial willingness to propertize groundwater in theory, landowners rarely succeed in proving their takings claims under the facts of individual cases.⁴⁷⁸

CONCLUSION

Groundwater exceptionalism began, perhaps innocently enough, at a time when both hydrologic understanding and groundwater usage were minimal. But it became a surprisingly sticky catechism that persisted long after its proponents understood that groundwater was not a mysterious substance with no relationship to its surficial counterpart. Exceptionalism provided a useful, pseudoscientific cover for a variety of interests, including those of well pumpers who wanted to jump ahead in the priority line decades after the most durable surface rights had been fully allocated; state groundwater users who feared curtailment to provide water for federal purposes on tribal and federal lands; states that turned a blind eye to their citizens’ groundwater use that potentially exceeded the state’s allocated share of interstate rivers; landowners who wanted to fill in wetlands on their property for agriculture and development; and polluters who wanted to discharge their wastes with minimal federal oversight. Part subterfuge, part wishful thinking, exceptionalism proved a useful tool for these powerful interests and rooted expectations.

But ignoring hydrologic reality is not costless. Over time, it has become apparent that groundwater is not an inexhaustible resource: every drop of groundwater pumped by one water user means there will be potentially one drop less available to others or to sustain the natural environment. Aligning law with physical reality will undoubtedly raise new and perplexing questions about who should have the right to use limited water resources and the degree to which particular water uses and polluting activities should be regulated. It will also afford new opportunities for fresh thinking about our water use in the face of

⁴⁷⁶ United States v. Riverside Bayview Homes, Inc., 474 U.S. 121, 129 (1985).

⁴⁷⁷ Owen, *supra* note 31, at 277, 280–85.

⁴⁷⁸ *Id.* (noting that although groundwater may be generally recognized as constitutional property, landowners and groundwater users rarely win under the facts of each individual case).

climate change and inadequate supplies. Painful or not, the reckoning is long overdue, and the law must move beyond exceptionalism to embrace the reality of the water cycle.