Beyond Drought: Water Rights in the Age of Permanent Depletion

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INTRODUCTION

Drought affects more North Americans than any other natural hazard.[1] Over the past two decades, it has returned to the American West with historic intensity. The long drought of 2000–06 across the Great Plains resulted in record low stream flows and record low reservoir levels; in Kansas, it compelled a record number of surface water rights curtailments.[2] The Colorado River Basin is caught in the throes of a fifteen-year drought that has reduced water levels in the two largest reservoirs in the United States, Lake Mead and Lake Powell, to unprecedented lows.[3] California is experiencing its worst drought since 1976–77, and possibly since 1580.[4] Chronic water shortages have driven at least ten states to litigation presently before the Supreme Court of the United States, and most of these cases involve western waters.[5] Unlike the Dust Bowl era, when Farm Security Administration photographs of dry streambeds and drought-stricken fields

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1. *Kansas Drought Watch*, U.S.GEOLOGICAL SURVEY, http://ks.water.usgs.gov/ks-drought (last visited May 13, 2014).

2. *Id.*

3. Michael Wines, *Colorado River Drought Forces a Painful Reckoning for States*, N.Y. TIMES, Jan. 5, 2014, at A1; Felicity Barringer, *Lake Mead Hits Record Low Level*, N.Y. TIMES, (Oct. 18, 2010, 2:05 PM), http://green.blogs.nytimes.com/2010/10/18/lake-mead-hits-record-low-level.

4. Bettina Boxall, *Severe Drought? California Has Been Here Before*, L.A. TIMES, (Feb. 23, 2013), http://articles.latimes.com/2014/feb/23/local/la-me-drought-weakness-20140223.

5. Kansas v. Nebraska, 538 U.S. 720 (2003) (interstate litigation over the Republican River Compact); Montana v. Wyoming, 129 S. Ct. 480 (2008) (interstate litigation over the Yellowstone River Compact); Texas v. New Mexico, 134 S. Ct 1050 (2014) (pending) (interstate litigation over the Rio Grande Compact); Florida v. Georgia, No. 152 Orig. (interstate litigation over the Apalachicola-Chattahoochee-Flint River Basin). The Apalachicola-Chattahoochee-Flint River Basin includes parts of Alabama as well, but Alabama is not included in the last lawsuit, which, unlike the others here noted, is an equitable apportionment case rather than a case enforcing an interstate compact.

provoked outraged skepticism from opponents of the New Deal,[6] no one doubts the current drought. It can be seen from space.[7]

This drought is an economic and environmental problem of the highest order, but does it necessarily pose a legal problem? After all, western water law is built for aridity in general and for drought in particular. The typical western water right is a practical thing, a property right that balances two different aspects of time: the annual variability of precipitation in the arid West, and the legal permanence of the right itself. It entitles its owner to use a specific amount of water every year from a stream, river, or lake, subject to that water being available, and within a permanent priority system encompassing all other such rights.[8] To protect investments in the surface irrigation systems that primarily watered the West between the 1860s and the 1950s, these rights usually enjoy the status of permanent, real property rights.[9] Interstate water compacts, which protect water rights within each state, are likewise perpetual.[10] Even the worst droughts eventually end, and the western water right survives them.

The more serious drought, in terms of both scale and time, is underground, especially across the High Plains-Ogallala Aquifer.[11] The United States has depleted more than 804 million acre-feet of groundwater since 1900; and over a third of that total (about 276 million acre-feet) has been withdrawn from the Ogallala. That figure is nearly twice as much as all of the groundwater withdrawn from the West's alluvial groundwater basins combined (approximately 144 million acre-feet).[12] And the rate of

6. ERROL MORRIS, BELIEVING IS SEEING: OBSERVATIONS ON THE MYSTERIES OF PHOTOGRAPHY 125 (2011).

7. Deborah Netburn, *The California Drought as Seen from the Edge of Space [Photos]*, L.A. TIMES (Jan. 17, 2014), http://www.latimes.com/science/sciencenow/la-sci-sn-california-drought-edge-of-space-20140116,0,1603595.story#axzz2vrYeIZTW.

8. *See, e.g.*, KAN. STAT. ANN. § 82a-701(g) (2009).

9. *Id.*; NEB. REV. STAT. § 46-510 (2013).

10. Perpetuity is the rule. *See, e.g.*, Colorado River Compact, 45 Stat. 1057, at art. III(a) (1922) (apportioning the waters of the Colorado River system "in perpetuity"); Republican River Compact at art. I, Act of May 26, 1943, ch. 104, 57 Stat. 86 (equitably dividing the waters of the Republican River Basin so as to remove "all causes, present and future, which might lead to controversies . . ."). However, some compacts are temporary. *See, e.g.*, Apalachicola-Chattahoochee-Flint River Basin Compact, Pub L. No. 105–104, 111 Stat. 2219 (1997) (lapsed 2003).

11. In deference to common usage, this article will refer to the High Plains-Ogallala Aquifer simply as the "Ogallala Aquifer" or the "Ogallala." A highly variable formation in terms of water supply, depth, and hydrological connection to surface water systems, the Ogallala extends across southwestern South Dakota, much of Nebraska, western Kansas, southeastern Wyoming, eastern Colorado, the Texas and Oklahoma panhandles, and northeastern New Mexico.

12. LEONARD F. KONIKOW, GROUNDWATER DEPLETION IN THE UNITED STATES (1900–2008), at 4–5, 22, U.S. GEOLOGICAL SURVEY (2013), *available at* http://pubs.usgs.gov/sir/2013/5079. I

depletion is accelerating: between 2000 and 2008, the Ogallala lost more than 8.3 million acre-feet per year, a rate twice that of the previous decade.[13] At that rate, groundwater pumping depletes the Ogallala every two years by a volume greater than the annual flow of the waters of the Colorado River Basin.[14] This drought is also more serious because the Ogallala depletion is permanent. Unlike the flows of the Colorado and other western rivers, which vary according to mountain snowpack and summer storms, the Ogallala is not coming back: across most of its range, it is effectively non-rechargeable.[15] Water levels across the Ogallala in eastern Colorado fell by as much as forty feet between 1980 and 1997.[16] Across western Kansas, the saturated thickness of the Ogallala has fallen in some places by over 150 feet,[17] a sixty percent decline from its original thickness.[18] The Ogallala falls in wet years, and it falls in drought years.

This depletion is the product of the groundwater revolution. Between the territorial era and World War II, almost all of the irrigated farms across the Great Plains were clustered near surface water bodies. The advent of groundwater irrigation technology in the 1950s transformed the region and its inhabitants' relationship with water, allowing irrigation wherever they could access the Ogallala. In Nebraska, for example, surface irrigation acreage has remained relatively constant since 1970, at roughly one million acres; but groundwater irrigation expanded from about 500,000 acres in

have converted the report's metric figures to acre-feet, the standard volumetric unit in western water law (1 cubic kilometer = 810,713.194 acre-feet). An acre-foot of water is 325,850 gallons.

13. *Id.* at 7.

14. The Colorado River Compact apportioned 15 million acre-feet (maf) annually. Colorado River Compact, 45 Stat. 1057, at art. III(a) (1922) (apportioning 7.5 maf to the Upper Basin and the Lower Basin states respectively). Yet the average flow of the Colorado River between 1930 and 1996 was 13.9 maf/year, and is "generally treated as a reasonable estimate of the reliable supply." JOSEPH L. SAX, BARTON H. THOMPSON, JR., JOHN D. LESHY, & ROBERT H. ABRAMS, LEGAL CONTROL OF WATER RESOURCES 701 (3d ed. 2000) (citing Dale Pontius, Colorado River Basin Study, app. B, at 6 (Report to the Western Water Policy Review Advisory Commission, 1998).

15. KONIKOW, *supra* note 12, at 22.

16. Ralf Topper, Karen L. Spray, William H. Bellis, Judith L. Hamilton, & Peter E. Barkmann, *Ground Water Atlas of Colorado*, COLO. GEOLOGICAL SURVEY (2003), http://geosurvey.state.co.us/water/GroundwaterAtlas/Pages/GroundwaterAtlasofColorado.aspx.

17. *Change in Saturated Thickness, Predevelopment to Average 2011-2013*, KAN. GEOLOGICAL SURVEY (2013), http://www.kgs.ku.edu/HighPlains/HPA_Atlas/Water%20Levels/index.html#Saturated%2520Thickness%2520Change%2520-%2520Predevelopment%2520to%25202013.jpg.

18. *Percent Change in Saturated Thickness, Predevelopment to Average 2010-2012, Kansas High Plains Aquifer*, KAN. GEOLOGICAL SURVEY (2013), http://www.kgs.ku.edu/HighPlains/HPA_Atlas/Water%20Levels/index.html#Saturated%2520Thickness%2520-%2520Percent%2520Change%2520Predevelopment%2520to%25202013-11.jpg.

1950 to seven million acres in 1990.[19] By the end of the twentieth century, as much as ninety percent of the water used for irrigation in Kansas was drawn from the Ogallala.[20]

The groundwater revolution has disturbed the balance of western water in two ways. First, it has disturbed the balance between annual and permanent time. Unlike the surface waters of the West, its groundwater systems are insulated from annual variability, easily accessible for irrigation, and vast. Irrigators eagerly developed these large groundwater supplies, and western legislatures accommodated that expansion in various ways. The concern about variability dissipated, but belief in the need for legal permanence remained. As a result, the western water right, applied and adapted to groundwater, became something less practical and more abstract, because the chances and the consequences of an underground water shortage seemed remote compared to the droughts that regularly shorted surface water systems. That underground shortage is now all too real, as communities above the Ogallala face the dark side of the groundwater revolution. Second, that revolution has also disturbed the balance of the Ogallala as a hydrological system. Decades of excessive groundwater pumping have distorted its hydrology, putting it into the condition of quasi-permanent if not permanent drought, drought that is the product not of climatic patterns, but of human activity.

This imbalance is a serious legal problem. Six decades of intensive groundwater irrigation across the West have made the depletion of the Ogallala permanent, and four decades of legislative initiatives intended to staunch that depletion have largely failed. The problem of depletion and the failure to address it by regulation have exposed the shortcomings of a legal regime largely beholden to the inherited assumption that the water supply is annually variable but nonetheless permanent. The permanence of the Ogallala is altogether different—it is a permanence of decline. Water rights that assume legal permanence must fail when the supply upon which they depend declines permanently.

Like many revolutions, the groundwater revolution made the past obsolete—temporarily. But in this post-revolutionary age of permanent depletion, the past has become more relevant than ever. This article attempts to bring some of the more important lessons of western water law,

19. Vincent H. Dreeszen, *Water Availability and Use*, *in* ROBERT D. KUZELKA & CHARLES FLOWERDAY, FLAT WATER: A HISTORY OF NEBRASKA AND ITS WATER 84 (1993).

20. CHARLES A. PERRY, U.S. GEOLOGICAL SURVEY, EFFECTS OF IRRIGATION PRACTICES ON WATER USE IN THE GROUNDWATER MANAGEMENT DISTRICTS WITHIN THE KANSAS HIGH PLAINS, 1991-2003, 1 (U.S. Dep't of the Interior, U.S. Geological Survey eds., 2006).

especially Kansas water law, to bear upon the crisis of the Ogallala. Part I places the modern property right in Ogallala groundwater within its ancestral contexts: the context in which the western water right was first generated as a property right in the nineteenth century, and the context in which that right came to be regulated by the middle of the twentieth century. Part II surveys how three Ogallala states (Colorado, Nebraska, and especially Kansas) made legal adjustments to accommodate the groundwater revolution. Within their respective legal regimes, these states produced a practically expanded property right in Ogallala groundwater, and they succeeded wildly in granting new Ogallala rights; but they largely failed to produce a regulatory regime that could effectively account for and protect such a right. Consequently, there has emerged a growing disparity between legal fiction and hydrological reality. Part III attempts to explain how Kansas has responded to this disparity. Both irrigators and regulators have largely avoided the principal legal tools to protect Ogallala water rights, preferring instead to employ alternative contractual and regulatory mechanisms.

This practice of avoidance raises troubling similarities with the legal situation of the early West itself, where received eastern water law was so foreign both to hydrological reality and to prevailing customs that it quickly and justifiably lost its cultural and political legitimacy. But in this age of permanent depletion and post-natural drought, we cannot afford to lose the legitimacy of our legal regime for water, a regime that was generated by western conditions of permanent scarcity. Such a loss would be legally unjustifiable, profoundly regrettable, and relentlessly litigious. To allay such a possible threat, Part IV concludes this article with four historical observations that recommend certain legal and policy reforms to address the permanent depletion of the Ogallala. As Kansas issues a "call to action for a vision for the future of water in Kansas,"[21] it would be wise to keep the past and its lessons prominently in view.

I. THE BASES OF THE PROPERTY RIGHT IN WESTERN GROUNDWATER

Western water law is a peculiar genre of American property law that evolved into doctrinal maturity during the rough and exceptional half-century between the California Gold Rush of 1848–49 and the Reclamation Act of 1902.[22] The first appropriated western water supplies were drawn

21. *Vision for the Future of Water in Kansas*, KAN. WATER OFFICE, http://www.kwo.org/50_Year_Vision/50_Year_Vision.htm (last visited Mar. 4, 2014).

22. *See, e.g.*, SAMUEL C. WIEL, WATER RIGHTS IN THE WESTERN STATES 46–306 (1905) (discussing the application of water rights in the western United States in 1905).

from the rivers flowing down from mountains—the Sangre de Cristo Range in New Mexico and Colorado, the Wasatch Front in Utah, the western slopes of the Sierra Nevada in California, and the Front Range of the Rocky Mountains of Colorado. While early commentators noted that alluvial groundwater, artesian springs, and shallow groundwater formations such as the Dakota Aquifer in Kansas could provide for irrigation,[23] technological limitations limited early groundwater development to shallow wells that irrigated small acreages.[24] Surface water development dominated this seminal and most formative period of western water law, and so many of the assumptions, principles, and attributes of the surface water right, for better and for worse, were generally translated to the various classifications of early groundwater rights.[25] As western water codes adapted to the groundwater revolution starting in the 1950s, the surface water right inevitably exerted a most important influence—as a template which, depending upon the code and the situation, was to be closely copied, followed but modified, or rejected altogether.[26] A generalized survey of this influential antecedent, termed here the "classical western water right," is therefore appropriate.

The classical western water right begins with the "imperative necessity" of western conditions,[27] and it rests on three supporting imperatives: the need to accommodate the West's physical situation, the need to provide a defensible private property interest in the use of water, and the need to regulate and administer that private interest in balance with public interests.

The first imperative concerns the physical situation of most of the West—its climate, hydrology, and topography. West of the 98th Meridian, the climate is generally too arid to raise crops without irrigation.[28] This

23. ERASMUS HAWORTH, UNDERGROUND WATERS OF SOUTHWESTERN KANSAS 37–42, 48–56 (U.S. Dep't of the Interior, U.S. Geological Survey eds., 1897).

24. *See* GEORGE S. KNAPP ET AL., THE APPROPRIATION OF WATER FOR BENEFICIAL PURPOSES: A REPORT TO THE GOVERNOR ON HISTORIC, PHYSICAL AND LEGAL ASPECTS OF THE PROBLEM IN KANSAS 13–14 (1944) [hereinafter 1944 REPORT] (noting the increase in well drilling in the 1930s).

25. WIEL, *supra* note 22, at 124–36.

26. *See infra* Part II.

27. Coffin v. Left Hand Ditch Co., 6 Colo. 443, 447 (1882).

28. John Wesley Powell chose the 100th Meridian because it roughly corresponded to the twenty-inch isohyet—the cartographic line connecting points receiving twenty inches of annual precipitation. JOHN WESLEY POWELL, REPORT ON THE LANDS OF THE ARID REGION OF THE UNITED STATES: WITH A MORE DETAILED ACCOUNT OF THE LANDS OF UTAH 12–13 (Wallace Stegner ed., 2d ed. 1879). *See also* DONALD WORSTER, A RIVER RUNNING WEST: THE LIFE OF JOHN WESLEY POWELL 355, 348–49 (2001). Later geographers and legislation moved that line one to two degrees east. *See, e.g.*, KAN. STAT. ANN. 42-301 to -311 (relating to the use of water for industrial purposes west of the 99th Meridian). The Flood Control Act of 1944, 33 U.S.C. §§ 701–709 (1996), drew the line between western irrigation use and eastern navigation use at the 98th Meridian. 33 U.S.C. §

aridity meant that most early western farms were dry-land farms, wholly dependent upon excessive and anomalous amounts of precipitation, unless water could be obtained from off the farm. Where available, that water was found in the West's sparse and irregular rivers. The flows of rivers originating in western mountains vary mostly according to annual snowpack at the higher altitudes of their tributary streams. By contrast, the rivers that gather water across the High Plains, such as the Smoky Hill, Cimarron, or Republican Rivers, depend mostly on rain falling during the growing season.[29] In either case, the flows of western rivers vary substantially from month to month and from year to year, much more so than that of eastern rivers;[30] but until the advent of large-scale groundwater irrigation, they flowed every year, even when their flows went underground.[31] Many of them still do, because their supplies mostly derive from the hydrologic cycle, which is an annual cycle.[32]

Farmers who sought to access these annually variable but perpetual water supplies faced the challenge of western topography, whose mountain ranges, high parks and basins, and deep valleys and canyons placed formidable obstacles between water supplies and arable land. Early irrigated farms diverted small amounts of water from nearby or adjacent streams.[33] As demand for water increased, irrigators and irrigation entities found it necessary to move water across longer distances, from alpine and subalpine basins with little arable land to more temperate and arable ones, and from water-rich basins to water-short ones.[34] The physical situation of the West made irrigation necessary; it forced irrigators to confront highly variable but

701-1(b) (1996).

29. H.A. RICE & ROGER C. RICE, THE RELATION OF THE KANSAS WATER COMMISSION TO THE FLOOD PROBLEM OF KANSAS 9 (U.S. Geological Survey ed., 1918) (precipitation over Kansas is of the "plains type," where seventy-one to seventy-eight percent of the annual total falls during the crop-growing season); HAWORTH, *supra* note 23, at 62–63 (discussing irrigation development in the Kansas portion of the Cimarron River).

30. DOUGLAS L. GRANT & GREGORY S. WEBER, CASES AND MATERIALS ON WATER LAW 3, n.3 (8th ed. 2010).

31. 1944 REPORT, *supra* note 24, at 14 (discussing the variations of flow of the Cimarron River according to natural hydrological conditions).

32. THOMAS C. WINTER, JUDSON W. HARVEY, O. LEHN FRANKE, & WILLIAM M. ALLEY, GROUNDWATER AND SURFACE WATER: A SINGLE RESOURCE 2–5 (U.S. Geological Survey ed., 1998).

33. ELWOOD MEAD, IRRIGATION INSTITUTIONS: A DISCUSSION OF THE ECONOMIC AND LEGAL QUESTIONS CREATED BY THE GROWTH OF IRRIGATED AGRICULTURE IN THE WEST 42–43 (Richard T. Ely ed., 1903) (discussing Mormon pioneers diverting water from [Salt Lake] City Creek in 1847); *id.* at 143–44 (discussing early irrigation from the South Platte and Cache la Poudre Rivers in Colorado).

34. *See, e.g.*, Wyoming v. Colorado, 259 U.S. 419, 456 (1922) (discussing Colorado's trans-basin diversions of the Laramie River).

generally permanent water supplies; and it provided incentives to move water from where it was less valuable to where it was more valuable. Early diversion works for mining in California could extend more than sixty miles and cost millions.[35] Early irrigation canals near Garden City, Kansas cost over a million dollars as well.[36]

This physical and financial situation produced the second imperative of the classical western water right: the need to recognize and then protect the private property interest in the diversion, transportation, and use of water. The process of recognition began through custom and by analogy, mostly by applying established mining principles to water. In the wake of the Mexican War and the Treaty of Guadalupe Hidalgo, which granted "Alta California" to the United States, most mining camps originally lay within the public domain, and the federal government neither asserted title to nor granted away its land, its mineral rights, or its water rights. In that legal vacuum, the miners' customs asserted themselves.[37] These customary rules governed the acquisition, holding, and forfeiture of individual mining claims, based upon priority of discovery and diligence in working them. Because water was a necessary incident to placer (and later, hydraulic) mining, miners applied a fundamental principle of claiming mineral rights to claiming water rights: the first to divert and to use the water had the exclusive right to it. In the absence of specific state or federal laws, these and other customary rules of the mining camps became locally recognized as valid claims to water.[38]

Recognition of such a right under state law, however, posed obstacles potentially as formidable as the western mountains. Miners were neither judges nor lawyers, and when they entered the wilderness to stake their claims, they committed a breach of precedent, leaving "behind them much of the established law of real property."[39] Their assertion of water rights defied the law. Western legislatures had adopted the English common law as the rule of decision, and California initially refused to recognize mining customs when they conflicted with state law.[40] The California Supreme Court

35. *See, e.g.*, WILLIAM H. BREWER, UP AND DOWN CALIFORNIA IN 1860-1864: THE JOURNAL OF WILLIAM H. BREWER 400–01 (Francis P. Farquhar ed., 1930) (describing diversion works from the Stanislaus River to the mining town of Sonora, constructed at a cost of $1.5 million in the 1850s, and destroyed by flood in 1862–63).

36. MEAD, *supra* note 33, at 336.

37. WIEL, *supra* note 22, at 2.

38. WELLS A. HUTCHINS, WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES 166 (3d ed. 2009).

39. WIEL, *supra* note 22, at 4.

40. *Id.* at 6. After the Kansas-Nebraska Act of 1854 established the territories of Kansas and Nebraska, both territories adopted the common law of England. 1855 Kan. Sess. Laws 469; 1855

followed these statutes, at least as far as it could apply them "to the novel question growing out of the peculiar enterprises in which many of the people of this State are embarked."[41] Stuck between a statutory dictate to obey the common law, citizens who ignored that law, and natural conditions that discredited that law, the California courts understandably looked for an escape. In 1855, they found it, in the landmark case of *Irwin v. Phillips*.[42] The controversy in *Irwin* took place on public land, so the court did not consider itself constrained by statutes nullifying the miners' customs.[43] That opening allowed the court to find that the customary right of a prior appropriator to divert water from a stream, convey it to another site, and use it there conferred rights superior to the claimant whose land bordered the stream, and who would have otherwise prevailed (as a riparian possessor) at common law. "Courts are bound to take notice of the political and social condition of the country, which they judicially rule," wrote the court.[44] In accepting the custom of prior appropriation, the courts based their decisions on "the peculiar condition of things" in California, which had no precedent in the English common law.[45] Less than a decade after the Gold Rush had begun, mining customs as applied to water had become securely established in California.[46] By 1857, the California Supreme Court confidently stated "the right to appropriate the waters of the streams of this State, for mining and other purposes, has been too long settled to admit of any doubt or discussion at this time."[47] Congress subsequently enacted statutes expressly protecting water rights so obtained.[48] In construing these statutes and the

Neb. Laws 328. By 1855 that doctrine had evolved in response to the water-power demands of the industrial revolution. *See* JOSHUA GETZLER, A HISTORY OF WATER RIGHTS AT COMMON LAW 271–79 (2004).

41. Eddy v. Simpson, 3 Cal. 249, 252–53 (1853).

42. 5 Cal. 140 (1855).

43. This finding drew the accusation of judicial activism; and the Court, in a subsequent decision, defended itself by explaining that taking judicial notice of local customs was an established precept of the common law the legislature had statutorily adopted. *See* Conger v. Weaver, 6 Cal. 548, 555–56 (1856) ("That new conditions and new facts may produce the novel application of a rule which has not been before applied, in like manner, does not make it any less the common law; for the latter is a system of grand principles, founded upon the mature and perfected reason of centuries.").

44. *Irwin*, 5 Cal. at 146.

45. Hoffman v. Stone, 7 Cal. 46, 48 (1857).

46. Advocates for common law riparianism vigorously contested the holding in *Irwin*, and received support from Chief Justice Murray in this effort. *See, e.g.*, *Conger*, 6 Cal. at 559 (Murray, J., dissenting). However, in *Crandall v. Woods*, Chief Justice Murray relented. 8 Cal. 136 (1857). Later cases failed to overturn *Irwin*. *See, e.g.*, McDonald v. Bear River & Auburn Water & Mining Co., 13 Cal. 220 (1859); Logan v. Driscoll, 19 Cal. 623 (1862).

47. Hill v. King, 8 Cal. 336, 338 (1857).

48. *See, e.g.*, Mining Act of 1866, Act July 26, 1866, c. 262, § 9, 14 Stat. 253 (codified at 30

California cases, the Supreme Court of the United States repeatedly ruled for the miners, "who were emphatically the law-makers, as respects mining, upon the public lands in the State."[49]

Elevated from custom to law, the doctrine of prior appropriation spread eastward to Colorado in the Gold Rush of 1859. Aside from the usual western problem with the English common law, Colorado also faced a conflict between prior appropriation and other earlier customs. The first settlers of European descent in Colorado were the Spanish and Spanish–American farmers who settled near the Rio Grande in the San Luis Valley.[50] Spanish water law featured a communitarian approach to the allocation of water during times of drought—one that took place according to need, rather than priority.[51] Due to the Mexican War and to differences in ethnicity, religion, and language, Anglo-American westerners did not recognize Hispanic water law as legitimate.[52] Other customary water law came from Mormon pioneers who were among the first Anglo settlers in Colorado. Mormon water law also held that the right to use water belonged to the group, and not to its individual members.[53] Across the San Luis Valley, some of the earliest fights over water in Colorado engaged not only competing water users, but competing doctrines as well.[54] The potential for further conflict continued after the Colorado Territory became established separately from the Kansas Territory in 1861. Its territorial legislature enacted water laws that were largely in accordance with the equitable principles of Spanish and Mormon doctrines.[55]

The seniority of these rival doctrines posed a potential problem for the

U.S.C. § 51); Act July 9, 1870, c. 235, § 17, 16 Stat. 218 (codified at 30 U.S.C. § 52); Desert Lands Act of 1877, c. 107, 19 Stat. 377 (codified at 43 U.S.C. §§ 641–48).

49. Jennison v. Kirk, 98 U.S. 453, 457–58 (1878). *See also* Atchison v. Peterson, 87 U.S. 507 (1874); Basey v. Gallagher, 87 U.S. 670 (1874).

50. MEAD, *supra* note 33, at 143. Mead committed an error still common among Anglos, referring to the original settlers as "Mexicans." *Id.*

51. MICHAEL C. MEYER, WATER IN THE HISPANIC SOUTHWEST: A SOCIAL AND LEGAL HISTORY, 1550–1850, at 147–64 (1984). *See generally* JOHN O. BAXTER, DIVIDING NEW MEXICO'S WATERS, 1700–1912 (1997).

52. *See* MALCOLM EBRIGHT, LAND GRANTS & LAWSUITS IN NORTHERN NEW MEXICO 11–54 (1994).

53. MEAD, *supra* note 33, at 42–44, 233.

54. *See* VIRGINIA MCCONNELL SIMMONS, THE SAN LUIS VALLEY: LAND OF THE SIX-ARMED CROSS 219–24 (2d ed. 1999) (recounting how, in 1879, earlier settlers built dams to keep Mormons from withdrawing irrigation water from the Conejos River, and Mormon settlers responded by tearing down the dams).

55. *See, e.g.*, 1861 Colo. Sess. Laws 67, §§ 1, 4 (adopting the doctrines of riparian rights and equitable apportionment respectively); 1862 Colo. Sess. Laws 48, § 13. Mead took note of the 1861 laws that required permanent appurtenance; these were largely adopted in Wyoming in 1876. MEAD, *supra* note 33, at 83.

advocates of prior appropriation.[56] Colorado fundamentally resolved the problem in 1876, when it enshrined the doctrine in its constitution at statehood.[57] So authorized, the Colorado Supreme Court, in its seminal water law decision six years later, dismissed these earlier doctrines.[58] The law of prior appropriation had entered Kansas statutes, also in 1876.[59] Nebraska followed suit, first by statute in 1889, and then by amending its constitution in 1920.[60] Across the West, these enactments acknowledged the cultural authority of prior appropriation and the political imperative to protect these property rights. For the next half-century, surface water irrigation developed from the foothills of the Rockies downstream to the High Plains. By 1884, Colorado had developed over a million acres of irrigated land.[61] By 1889, canals in the Colorado portion of the San Luis Valley extended for almost 1,200 miles, "and were capable of supplying water to a million and half acres—had there been enough water to do so."[62] In western Kansas, the main canals on the Arkansas River had been developed by the 1880s, irrigating around 65,000 acres and entirely diverting whatever flows escaped from Colorado.[63] These developments were aided substantially by statutes allowing for the incorporation of irrigation companies and granting them valuable legal rights and protections.[64] Surface irrigation also spread to the valleys of more remote

56. *See, e.g.*, Yunker v. Nichols, 1 Colo. 551, 570 (1872).

57. COLO. CONST. art. XVI, §§ 5, 6.

58. Coffin v. Left Hand Ditch Co., 6 Colo. 443, 447 (1882). Such dismissal appears to have contradicted both the 1861 and 1862 session laws, which allowed for equitable apportionment. 1861 Colo. Sess. Laws 67, § 4; 1862 Colo. Sess. Laws 48, § 13. For a fuller discussion of this apparent contradiction, see Gregory A. Hicks & Devon G. Peña, *Community Acequias in Colorado's Rio Culebra Watershed: A Customary Commons in the Domain of Prior Appropriation*, 74 U. COLO. L. REV. 387, 399–400 (2003). The late Professor Joseph Sax recognized the contradiction in 1990. *See* Joseph L. Sax, *The Constitution, Property Rights and the Future of Water Law*, 61 U. COLO. L. REV. 257, 268 & n.34 (1990) (criticizing *Coffin* as the foundational example of "judicial revisionism in reading the Territorial legislature's riparian statutes" of 1861, 1862, and 1864—statutes that the Colorado Supreme Court "blatantly misinterpreted").

59. 1876 Kan. Sess. Laws 153–55.

60. 1889 Neb. Laws 503–04; NEB. CONST. art. XV, § 6 ("The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied except when such denial is demanded by the public interest.").

61. MEAD, *supra* note 33, at 144.

62. DOUGLAS R. LITTLEFIELD, CONFLICT ON THE RIO GRANDE: WATER AND THE LAW, 1879-1939, at 35–36 (2008).

63. JAMES EARL SHEROW, WATERING THE VALLEY: DEVELOPMENT ALONG THE HIGH PLAINS ARKANSAS RIVER, 1870-1950 79–92 (1991). In a telling example of the cultural power of prior appropriation, no riparian owner on the Arkansas River between the Colorado and Oklahoma state lines ever challenged an irrigator's right to divert from the Arkansas River. 1944 REPORT, *supra* note 24, at 45.

64. *See, e.g.*, 1866 Kan. Sess. Laws 124–38; 1923 Kan. Sess. Laws 205 (preserving the

basins of the Great Plains, such as the Pioneer Ditch on the North Fork Republican River in northeastern Colorado and northwestern Nebraska,[65] and even to the Cimarron River Valley of southwestern Kansas, where it had progressed "to a considerable extent" by the end of the nineteenth century.[66]

Less than a generation after the Gold Rush era, prior appropriation had obtained constitutional and statutory authority across much of the West, based on its twofold claim to accommodate the West's physical realities and to secure property rights in water. Yet by the turn of the twentieth century, irrigation experts such as Elwood Mead had assayed that claim and found it wanting. In his opinion, the doctrine was a comprehensive mess that rendered impossible any accurate understanding of how westerners had actually allocated their water supplies. Most appropriators did not know how much water they were diverting, how much they had even claimed, or how much their lands needed. Thus, they had no regard whatsoever for future water needs, and made grossly excessive claims. They posted different claims of water to the same tract of land, either in competition with one another or by mistake. These errors produced a problem as old as prior appropriation itself: that of over-appropriation, where the quantities set forth in decreed water rights vastly exceeded the supply the stream could give, even in wet years.[67] Lawyers and litigation contributed to the myth that prior appropriation was well-suited to settle western waters for irrigation. "It is a fairly satisfactory law for the miner," concluded Mead, "but a poor law for the irrigator."[68] For experts who shared Mead's opinion, prior

common law). In 1886, the Kansas legislature passed a notice-posting statute, making clear that "[a]s between appropriators, the one first in time is the first in right." 1886 Kan. Sess. Laws 154. Nebraska passed its first irrigation law in 1877, classifying canals as internal improvements and granting irrigation corporations the power to condemn rights of way. 1877 Neb. Laws 168; MEAD, *supra* note 33, at 291. As with Kansas, a later statute clarified the rights of prior appropriators. *See* 1889 Neb. Laws. 503–06.

65. The Republican River Compact explicitly recognized the right of the Pioneer Canal to divert fifty cubic feet per second (cfs) of water from the North Fork Republican River in Colorado to irrigate lands in both Colorado and Nebraska. Republican River Compact, ch. 104, 57 Stat. 86, 89 (1943). This right was settled, and its 1890 priority blessed, by *Weiland v. Pioneer Irrigation Co.*, 259 U.S. 498, syl. ¶ 2 (1922).

66. HAWORTH, *supra* note 23, at 62.

67. MEAD, *supra* note 33, at 145–59 (describing over-appropriation in Colorado). *See id.* at 150–51 (calculating the total appropriations for the Cache La Poudre River in Colorado at 4,632 cubic feet per second, as compared to an August average flow in the river of between 141 and 162 cubic feet per second).

68. *Id.* at 299 (regarding irrigation code of Montana). Mead quoted one "Professor S. Fortier, of Bozeman, Montana," who wryly described one water fight as "the old familiar story of heroic efforts to subdue a desert and at the same time maintain an action in court over a contested water right." *Id.* at 307. Powell acknowledged the success of mining districts in managing the regulation of mining lands and water use, but his insistence on statutory remedies was based on a mistrust of

appropriation even threatened justice, sound planning, and the general welfare.[69] But by 1900, the doctrine was deeply anchored in state law, and millions of acres of irrigated land across the West relied upon it. Indeed, the most comprehensive attempt to respond to its deleterious effects—the Reclamation Act of 1902—expressly deferred to state law.[70] The Reclamation Act's blessing of state water law in general and of prior appropriation in particular has survived a century of amendments.[71]

If the prior appropriation system were to realize its claim to "promote[] investment by giving security of use,"[72] then it would have to be regulated in a secure fashion, and at the state law level. Therein lay the third imperative behind the classical western water right: the need to regulate it as a reliable property right, and in accordance with the public interest. The evolution and maturation of Kansas water law in the first half of the twentieth century reveals how one western state achieved such a form of regulation.

From statehood through World War II, the doctrines of riparianism and prior appropriation coexisted in Kansas, at first without much controversy.[73] After 1917, the Kansas legislature gradually developed an administrative system for water rights, including the formation of the Division of Water

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the courts: "it hardly seems wise to imperil interests so great by intrusting them to the possibility of some future court made law." POWELL, *supra* note 28, at 41, 43.

69. Robert A. Manley, *The Desert Shall Rejoice and Blossom as the Rose!*, *in* FLAT WATER: A HISTORY OF NEBRASKA AND ITS WATER, *supra* note 19, at 30 (citing the opinion of Frederick Newell, the first director of the Reclamation Service, in 1902).

70. Reclamation Act of 1902, ch. 1093, § 8 (codified as amended at 43 U.S.C. §§ 372, 383 (2006)).

71. The Reclamation Reform Act of 1982, Pub. L. No. 97-293, tit. II, 96 Stat. 1261 (codified as amended at 43 U.S.C. §§ 390aa to 390zz-1 (2006)); *see generally* Amy K. Kelley & Reed D. Benson, *Federal Reclamation Law*, *in* ROBERT E. BECK & AMY K. KELLEY, 2 WATERS AND WATER RIGHTS §§ 41.03(c) to 41.04(b) (3d ed. 2008) (Supp. 2012) (tracing history of the reclamation program from "[w]hen the reclamation program was born in 1902" to its modern form).

72. CHARLES J. MEYERS, NATIONAL WATER COMMISSION, A HISTORICAL AND FUNCTIONAL ANALYSIS OF THE APPROPRIATION SYSTEM 6 (1971).

73. Eastern Kansas followed the riparian doctrine, by which the reasonable use of water was an inherent common law attribute of riparian property. Such a doctrine suited the wetter climate of eastern Kansas, its many streams and rivers, and the developed industrial uses of water at the riverbank. Early litigation in Kansas water law usually concerned such industrial uses. *See, e.g.*, Shamleffer v. Council Grove Peerless Mill Co., 18 Kan. 24 (1877); Emporia v. Soden, 25 Kan. 588 (1881). As early as 1866, western Kansas followed the prior appropriation doctrine, which formally entered Kansas statutes in 1876. *See* Kan. L. 1876, ch. 58. In 1886, the legislature passed a notice-posting statute, making clear that "as between appropriators, the first in time is the first in right." Clark v. Allaman, 80 P. 571, 572 (Kan. 1905) (discussing 1886 law and subsequent amendments). Subsequent statutes elaborated on the 1886 law. Kan. L. 1889, chs. 95, 165. The 1891 legislature appears to have collected the extant water statutes and placed them in some sort of order. *See generally*, KAN. STAT. ANN. § 42-302 (2013) (citing Kan. L. 1891, ch. 133, art. 1, § 2).

Resources (DWR).[74] Over the same general period, Kansas courts repeatedly denied efforts to adopt prior appropriation exclusively.[75] Starting with the Dust Bowl, however, Kansans began to realize that this hybrid law code was no longer working well as a means to establish and to protect water rights. The severe droughts of the "dirty thirties" and the Republican River flood of 1935 convinced leaders across Kansas, Nebraska, and Colorado that the states would require federal assistance to construct sustainable irrigation projects and flood control works. This shared realization produced a cooperative response among the states, culminating in the Republican River Compact of 1943.[76] However, the compact raised fundamental concerns about the merits of Kansas water law. Those concerns intensified significantly in 1944, when the Kansas Supreme Court ruled that Kansas water law was ineffective in attempting to impose administrative control over the use of groundwater.[77]

In response to these developments at both the interstate and intrastate levels, Governor Andrew F. Schoeppel appointed a select committee to review Kansas water law in a comprehensive way, and to provide recommendations for its proper reformation.[78] As part of its review, the committee engaged outside lawyers, economists, irrigation experts, and

74. Most revisions to pre-1945 Kansas water statutes (Chapter 42) between 1923 and 1945 consist of adjustments made necessary by the Kansas Water Commission Act of 1917 (Kan. L. 1917, ch. 172), the formation of the Division of Water Resources (Kan. L. 1927, ch. 293), and the authorization of the office of the chief engineer (Kan. L. 1933, ch. 271, § 7). In 1941, the Kansas legislature repealed the notice-posting statutes of 1886. Kan. L. 1941, ch. 261, § 1.

75. *See, e.g.*, *Clark*, 80 P. at 573–74 (Kan. 1905) (noting the lack of historical understanding and legislative suggestion to broaden the doctrine); Feldhut v. Brummitt, 150 P. 549, 550 (Kan. 1915) (producing the same result but in the context of denying specific performance). In 1936, the Kansas Supreme Court reconciled riparianism with prior appropriation, holding that any person holding a riparian right or an appropriation right under the 1886 statute does not have priority against a senior riparian owner or a riparian owner holding land patents issued before 1886. *See* Frizell v. Bindley, 58 P.2d 95, 100–02 (Kan. 1936). *Frizell* consequently held that R.S. 42-101 (1923), which had authorized the riparian owner to appropriate water for irrigation purposes, was ineffectual to confer on such an owner priority as against riparian owners under pre-1866 patents. Such a result followed the "California Doctrine," as most notably set forth in *Lux v. Haggin*, 10 P. 674 (Cal. 1886), followed by nine states in its heyday; today, only California, Nebraska, and Oklahoma subscribe to that doctrine, albeit in different ways. The legislature repealed R.S. 42-101 in 1941. Kan. L. 1941, ch. 261. *Smith v. Miller*, 75 P.2d 273, 273–74 (Kan. 1938), reaffirmed the riparian landowner's common law ownership of the water running through the land.

76. Act of May 26, 1943, ch. 104, 57 Stat. 86, 86 (1943) (Kan. L. 1943, ch. 335, § 1) (codified at KAN. STAT. ANN. § 82a-518.

77. *See* State *ex rel*. Peterson, Co. v. Board of Agric., 149 P.2d 604, 607–09 (Kan. 1944) (favoring a broad, common law approach).

78. *See* 1944 REPORT, *supra* note 24, at 7–8 (listing appointment process and committee members).

bankers from Kansas, Nebraska, and the federal government.[79] The committee's work provides a clear summary of the four principal changes which such a reformation required.

The first change concerned power. In response to *State, ex rel. v. Board of Agriculture*,[80] it was imperative that the state, through DWR, be placed in control of all of the state's waters, both surface and groundwater. The prominent water law expert Wells A. Hutchins,[81] then a senior irrigation economist with the U.S. Department of Agriculture, stressed that groundwater must be placed within the same legal regime as surface water, so that they could be regulated together as one system. Otherwise, excessive groundwater pumping would be allowed to intercept baseflows to the river, extinguishing rights to the latter.[82] Other members agreed, echoing Hutchins's comments.[83] The committee clearly took these comments to heart. To protect "those who invest the funds necessary to put water to beneficial use" and their "continued right to the use of the quantity they have developed, against injury through diminution of the supply by later would-be users, a workable code applicable to this interrelated water supply is needed."[84]

The second change concerned doctrine. Because water was a renewable resource, the prior appropriation doctrine best protected those who had invested for the long term in its diversion and beneficial use.[85] "It is a wise and sound principle of law," stressed the committee, "that those who first put water to use should not have the supply injuriously diminished and their investments impaired by such later users."[86] And because the "protective features of the [prior] appropriation doctrine apply alike to both surface and groundwater," the doctrine meshed well with the need for adequate

79. Transcript of Conference of the Governor's Committee on the Appropriation of Water in Kansas, Oct. 16–17, 1944 [hereinafter Conference Transcript]. Notable among the participants were Spencer L. Baird, District Counsel for the Bureau of Reclamation, Amarillo, Texas; Wells A. Hutchins, Senior Irrigation Economist for the U.S. Department of Agriculture, Berkeley, California; D. J. Robinson of the Federal Land Bank, Wichita, Kansas; John Riddell, Assistant Attorney General for Nebraska; and Dan S. Jones, Assistant Chief of the Nebraska Bureau of Irrigation, Water Power and Drainage. George S. Knapp, Kansas chief engineer, chaired the committee.

80. 149 P.2d 604 (Kan. 1944).

81. *See, e.g.*, HUTCHINS, *supra* note 38, at i.

82. Conference Transcript, *supra* note 79, at 63, 81–83 (comments of Mr. Hutchins).

83. *Id.* at 177–78 (comments of Chairman Knapp and Mr. Milford E. Rogers, Superintendent and Engineer, Water Supply Division, Department of Service, Wichita, Kansas).

84. 1944 REPORT, *supra* note 24, at 16.

85. *See id.* at 17–18 (distinguishing oil and water reserves and explaining the benefit of favoring private and public water conservation efforts).

86. *Id.* at 18.

administrative control over all appropriations of water statewide.[87]

The third change was related to both power and doctrine, and concerned the quantification of the state's water resources. It was imperative to be able to quantify those resources, because quantification was an essential step in making them available for appropriation and beneficial use. The Republican River Compact had made water rights quantification a major issue. By equitably allocating the waters of the basin among Colorado, Nebraska, and Kansas, the compact had made possible federal investment in Bureau of Reclamation reservoirs and irrigation projects. Yet the riparian half of Kansas water law made it virtually impossible to quantify the amount of water that had been put to beneficial use east of the 99th Meridian;[88] and that uncertainty raised Reclamation's concerns about how much water might be available in Kansas for any Reclamation project.[89] By contrast, Nebraska's centralized system of (surface) water rights administration according to the prior appropriation doctrine defined and quantified the sum of that state's water rights in its portion of the Republican River Basin, enabling the determination of the amount of water available to develop Reclamation projects.[90] Unless Kansas could quantify its water rights under such a centralized legal regime that adopted prior appropriation statewide, Reclamation would not commit to investing in diversion, storage, and flood control works, because "of the uncertainty as to source of supply," and because the legal rights undergirding such works would not be stable or secure.[91] Such a centralized system, where a chief engineer supervised, monitored, and quantified all appropriation rights, clearly appealed to Kansans who sought federal support for multipurpose reservoir projects within their part of the basin.[92] Without these changes at state law, the Republican River Compact, on its own, would not confer the full benefits of Reclamation.[93]

Finally, the committee stressed as a "fundamental principle" that the state has both the power and the "duty to control and conserve natural resources" including water, oil, gas, and the air "for the benefit of its

87. *Id.* at 45.

88. *See supra* notes 28 and 73.

89. Conference Transcript, *supra* note 79, at 15 (comments of Mr. Baird of Reclamation).

90. *Id.* at 36–37 (comments of Mr. Baird); *id.* at 130–31 (interchange between Jones and Watkins); *Id.* at 135–39 (Hutchins on the virtues of a centralized administrative system). Mr. D.J. Robinson, of the Federal Land Bank of Wichita, Kansas, similarly voiced strong support for a centralized system "that would clarify the situation here in Kansas." *Id.* at 142.

91. *Id.* at 22–23 (statement of Frederic H. Guild).

92. *Id.* at 145–48 (comments of Mr. Knapp and Mr. Porter Ahrens of Scandia, Kansas).

93. *Id.* at 151–57 (comments of Mr. Knapp and Mr. John M. Gray of Kirwin, Kansas).

inhabitants . . . ."[94] Whereas many western states had established this principle in their state constitutions, and eastern states had clear judicial decisions affirming it, Kansas law lacked such an explicit statement, and the committee clearly believed that a reformed Kansas water law code must make such a public dedication clear.[95]

In accord with these four recommended changes, the committee produced draft legislation[96] that became, virtually intact, the Kansas Water Appropriation Act (KWAA).[97] The KWAA endowed the chief engineer with clear and broad statutory authority over all the waters of Kansas, both surface and groundwater, to grant, protect, and administer water rights according to the doctrine of prior appropriation; the riparian doctrine was repudiated.[98] The KWAA established mechanisms for recognizing and quantifying pre-existing water uses as vested rights,[99] for quantifying and perfecting new appropriation rights,[100] and for quantifying the effects of changes in existing water rights according to the same standards as those that applied to new rights.[101] The KWAA placed the chief engineer under a statutory duty to grant applications for water rights, provided that the water was available for appropriation.[102] Once granted, those water rights received the full protections of his authority in accordance with the prior appropriation doctrine.[103] Finally, the KWAA dedicated "[a]ll water within the state of Kansas . . . to the use of the people of" Kansas,[104] and charged the chief engineer to administer the KWAA "for the benefits and beneficial

94. 1944 REPORT, *supra* note 24, at 16.

95. *Id.* at 27 (citing the Nebraska constitution); *id*. at 26 (citing Trenton v. New Jersey, 262 U.S. 182, 185 (1923) ("[T]he State undoubtedly has power, and it is its duty, to control and conserve the use of its water resources for the benefit of all of its inhabitants . . . .")).

96. *See id.* at 45–52 (providing the text of the draft legislation that the committee suggested).

97. Kan. L. 1945, ch. 390, § 1 (codified at KAN. STAT. ANN. § 82a-701 (Supp. 2012)). For the standard treatment of the KWAA, see generally John C. Peck, *The Kansas Water Appropriation Act: A Fifty-Year Perspective*, 43 U. KAN. L. REV. 735 (1995) (discussing the KWAA's history and application); *see also* Myrl L. Duncan, *High Noon on the Ogallala Aquifer: Agriculture Does Not Live by Farmland Preservation Alone*, 27 WASHBURN L.J. 16 (1987) (tracing availability of land space to water supply for successful agriculture).

98. *See* KAN. STAT. ANN. §§ 82a-702, -706, -721 (2013) (authorizing and outlining the "duties of [the] chief engineer").

99. *Id.* §§ 82a-704a to -704b (providing rules to determine vested water rights).

100. *Id.* §§ 82a-711 to -711a (creating new water rights); *Id.* §§ 82a-712 to -714 (perfecting the authorized quantities of new water rights).

101. *Id.* § 82a-708b (containing provisions for owners to make various changes to water rights).

102. *Id.* § 82a-711(a) (requiring the chief engineer to "consider the economics of diverting or pumping water for the water uses involved" and clarifying other duties).

103. *Id.* § 82a-706 (directing the chief engineer to fulfill his duties according to the prior appropriation doctrine).

104. *Id.* § 82a-702.

uses of all of its inhabitants," not just the owners of or applicants for water rights,[105] requiring him to limit his approval of new water rights and changes to existing water rights according to the public interest.[106] The KWAA has repeatedly survived frontal challenges to its authority to regulate Kansas waters.[107]

The KWAA is a good example of how one western state domesticated the prior appropriation doctrine by establishing adequate administrative controls over the appropriation of water in order to prevent overdevelopment.[108] The KWAA is largely predicated upon the hydrological inseparability of groundwater and surface water, and the administration of both supplies under the doctrine of prior appropriation. Despite reports of its demise, prior appropriation survives as a potent doctrine.[109] While federal environmental law and water policy reforms have tempered its operation,[110] priority still has immediate and expensive consequences. Senior water right owners can depend on it, especially where state law extends the doctrine to hydrologically connected groundwater. In Colorado, surface water rights owners have secured the curtailment of junior alluvial groundwater rights,[111] despite sophisticated legal mechanisms such

105. *Id.* § 82a-706.

106. *Id.* §§ 82a-711(a), -708b.

107. *See, e.g.*, Williams v. City of Wichita, 374 P.2d 578 (Kan. 1962) (holding that the KWAA did not violate the Due Process Clause of the Fourteenth Amendment); F. Arthur Stone & Sons v. Gibson, 630 P.2d 1164 (Kan. 1981) (holding that the KWAA was a valid use of the state's police powers to regulate water consumption).

108. 1944 REPORT, *supra* note 24, at 44.

109. *See* Charles F. Wilkinson, *In Memoriam: Prior Appropriation 1848-1991*, 21 ENVTL. L. v (1991) (announcing the death of the prior appropriation doctrine). Justice Gregory J. Hobbs of the Colorado Supreme Court vehemently disagreed with Wilkinson's announcement of the death of the doctrine. *See* Gregory J. Hobbs, *Ecological Integrity, New Western Myth: A Critique of the Long's Peak Report*, 24 ENVTL. L. 157 (1994); *see also* Gregory J. Hobbs, *Priority: The Most Misunderstood Stick in the Bundle*, 32 ENVTL. L. 37, 50–55 (2002). For a discussion of the vitality of the prior appropriation doctrine across the West, see A. Dan Tarlock, *Prior Appropriation: Rule, Principle, or Rhetoric?*, 76 N.D. L. REV. 881 (2000) [hereinafter Tarlock, *Rule, Principle, or Rhetoric?*]; A. Dan Tarlock, *The Future of Prior Appropriation in the New West*, 41 NAT. RESOURCES J. 769 (2001) [hereinafter Tarlock, *Future of Prior Appropriation*].

110. *See* David H. Getches, *The Metamorphosis of Western Water Policy: Have Federal Laws and Local Decisions Eclipsed the State's Role?*, 20 STAN. ENVTL. L.J. 3 (2001). It is worth noting that the late Professor Getches published this article on the eve of the events described *infra* note 111.

111. A prominent recent example is from Colorado. In the wake of the severe drought of 2002–03 and the Colorado Supreme Court's decision in *Simpson v. Bijou Irrigation Co.*, 69 P.3d 50 (Colo. 2003), nearly 4,000 junior groundwater pumpers in the South Platte River Basin, some with priorities dating back to the 1950s, were curtailed, with substantial economic consequences. Gregory J. Hobbs, *Protecting Prior Appropriation Water Rights Through Integrating Tributary Groundwater, Colorado's Experience*, 47 IDAHO L. REV. 5 (2010) [hereinafter Hobbs, *Protecting Prior Appropriation Water Rights*]. *See also* Gregory J. Hobbs, *Reviving the Public Ownership,*

as substitute supply and augmentation plans, which are designed to enable junior groundwater rights to operate even in times of drought.[112] In Kansas, senior surface water rights owners have secured priority protections through both straight priority calls and through Intensive Groundwater Use Control Areas (IGUCAs), even where the relevant statute enables the modification of prior appropriation.[113]

The classical western water right—the right established within these assumptions of hydrologically connected surface and groundwater—has survived into the twenty-first century because the imperatives that produced it in the first place remain, and have become even more pressing. The physical imperative remains, and will intensify as global warming reduces western water supplies through higher temperatures during irrigation season.[114] The legal imperative to protect and to rely upon the water right owner's investment in a private property interest quite obviously remains, as water rights become more valuable. The intensity of the West's recent droughts have underlined the regulatory imperative, and the growing importance of water as a public and environmental resource has produced amendments to western law codes that underline the public imperative.[115]

The classical western water right remains a credible property interest for

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Antispeculation, and Beneficial Use Moorings of Prior Appropriation Water Law, 84 U. COLO. L. REV. 97, 114–21 (discussing the consequences of *Empire Lodge Homeowner's Ass'n v. Moyer*, 39 P.3d 1139 (Colo., 2001)). For a survey of South Platte water administration since *Empire Lodge*, see generally P. Andrew Jones, *South Platte Well Crisis, 2002-2010: Evolving Alluvial Groundwater Regulation*, 78 THE WATER REPORT 1 (2010).

112. COLO. REV. STAT. §§ 37-90-137(2) & 37-92-305(5), (10) (2013).

113. IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES, KANSAS 102–03, ¶¶ 23–24 (Jan. 29, 1992), *available at* http://www.ksda.ks.gov/docs/default-source/igucas/wc1992.pdf?sfvrsn=2 (Order of the Chief Engineer, Kansas Division of Water Resources, allocating water in the Walnut Creek Intensive Groundwater Use Area according to a cutoff priority date of Oct. 1, 1965); KAN. STAT. ANN. § 82a-1038(b)(2) (2013) (requiring the chief engineer, Division of Water Resources, to follow priority dates of water rights "insofar as may be reasonably done").

114. The United States Geological Survey forecasts an increase in annual mean maximum temperature of 3.6 degrees Celsius for the State of Kansas and 3.7 degrees of the States of Colorado and Nebraska, based on a comparison of the historical average of years 1980–2004 and a modeled forecast average of years 2050–74. *See* UNITED STATES GEOLOGICAL SURVEY, CLIMATE AND LAND USE CHANGE RESEARCH AND DEVELOPMENT PROGRAM, *available at* http://www.usgs.gov/climate_landuse/clu_rd/nex-dcp30.asp. S*ee also* HIGH PLAINS REGIONAL CLIMATE CENTER (LINCOLN, NEBRASKA), CLIMATE CHANGE ON THE PRAIRIE: A BASIC GUIDE TO CLIMATE CHANGE IN THE HIGH PLAINS REGION—UPDATE (Aug. 2013), *available at* http://www.hprcc.unl.edu/publications/files/HighPlainsClimateChangeGuide-2013.pdf; Johannes Feddema & Nathaniel Brunsell (Department of Geography, University of Kansas), *Kansas and Climate Change, available at* http://www.ipsr.ku.edu/conferen/kepc07/Feddema_KEPC.pdf.

115. *See, e.g.*, KAN. STAT. ANN. § 82a-703a to -703c. (2013) (establishing minimum desirable streamflows).

another reason: its legal and administrative claims correspond fairly well with what its owner can rely upon. In wet years, the owner can rely upon receiving the full supply of water to which he is entitled. The owner knows his relative priority in his water rights neighborhood, and so in times of water shortage and drought, he can estimate the relationship between that shortage and the amount of water he will likely receive. Because that supply is generally located within a complex of closely monitored mountain snowpack[116] and reservoir[117] levels, the owner can make informed cropping decisions in advance of irrigation season, based on annual forecasts. The owner also knows how drought affects his regulatory situation. Just as he can be expected to place a call on the river if diversions by juniors threaten to impair his senior right, he can rely on owners of rights senior to him to do the same, or threaten to do so, and such threats have real consequences. In either case, he can rely upon a call for administration to actually result in administration.[118] And because of the hydrology of a water rights neighborhood of surface and alluvial groundwater rights, he can rely upon that administration to produce wet water in the stream. The classical western water right answers to hydrological reality and to administrative practice, and it works reliably. Finally—and this is not a trivial point—its owner can credibly hope that the drought will end.

II. THE GROUNDWATER REVOLUTION AND THE GROUNDWATER RIGHT

Yet for all of these virtues of the classical water right, it did not do what it could not do: it did not anticipate the groundwater revolution that began during the 1950s. Across the Great Plains, legislatures and courts considered the hydrologic connection between groundwater and surface streams, but they retained the assumption that the system as a whole was

116. *See, e.g.*, UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, NATIONAL WATER AND CLIMATE CENTER, SNOTEL DATA AND PRODUCTS, *available at* http://www.wcc.nrcs.usda.gov/snow/ (providing snowpack and snow moisture content data for the western mountain states); UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, UPPER COLORADO REGION, RIVER BASIN SNOWPACK CONDITIONS, *available at* http://www.usbr.gov/uc/water/notice/snowpack.html (showing the snow water equivalent of sub-basins within the Upper Colorado River Basin).

117. *See, e.g.*, UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, SNOWPACK & RESERVOIR LEVELS, GREAT PLAINS REGION, *available at* http://www.usbr.gov/gp/hydromet/curres_google.htm?lat=38.4879&lng=-98.4396&zoom=7 (scalable map showing real-time reservoir levels across the Great Plains region).

118. *See, e.g.*, KAN. STAT. ANN. § 82a-706b (2013) (providing "[u]pon making a determination of an unlawful diversion the chief engineer . . . shall direct that the headgates, valves, or other controlling works . . . be opened, closed, adjusted, or regulated as may be necessary to secure water to the person having the prior right to its use").

replenished on a regular basis by rainfall.[119] The largest supply of water in the region, the huge but effectively non-renewable supplies of the Ogallala, did not figure into their considerations. Over the next several decades, it turned the legal world of water upside down.

To understand why, consider the physical situation. The climate is the same, if not slightly warmer and more arid than it was in the nineteenth century. But wherever irrigable land is located over the Ogallala, the fact of climatic aridity does not impose the sentence of dry land farming: water can be obtained from beneath the farm itself, with no need for further diversion and transportation. The history of western water law would be fundamentally different, and the ambit of its peculiar doctrines substantially limited, had the Forty-Niners mined the Central Valley instead of the Sierra Nevada, or the Fifty-Niners the Great Plains instead of the Rockies.[120] And in contrast to the annual variability of the West's river systems, the Ogallala exists almost entirely in geological time. The deposition of the Ogallala Formation began ten to twelve million years ago, as clays, silt, sands, and gravels washed off of the Rocky Mountains; most of the water in the aquifer came later, from retreating glaciers and streams during the last ice age. Annual recharge of water into the aquifer from precipitation is low, ranging from less than one inch at the aquifer's western edge to six inches at its eastern portion, the Equus Beds sub-aquifer.[121] As a result, the waters of the Ogallala are mostly unconfined, and do not vary in supply as surface systems do; as they decline from excessive groundwater pumping, they decline in a mostly linear fashion over the long term.[122] There is also less variability in place. Where the surface water systems of the West (and its major irrigation districts) are concentrated in river valleys, the Ogallala Aquifer, while locally variable in depth and in saturated thickness, is diffused, if not uniformly so, across the Great Plains.[123] In short, the Ogallala provided irrigators with a fundamentally different water situation than that which confronted their nineteenth century forebears. It provided

119. *See, e.g.*, 1944 REPORT, *supra* note 24, at 11–16, 17.

120. HAWORTH, *supra* note 23, at 46–47.

121. REX C. BUCHANAN, ROBERT R. BUDDEMEIER, & B. BROWNIE WILSON, LAWRENCE, KANSAS: KANSAS GEOLOGICAL SURVEY PUBLIC INFORMATION CIRCULAR 18, THE HIGH PLAINS AQUIFER (2009).

122. *See, e.g.*, J. J. Butler et al., *High Plains Aquifer Index Well Program: 2012 Annual Report*, LAWRENCE, KANSAS: KANSAS GEOLOGICAL SURVEY, OPEN-FILE REPORT NO. 2013-1 at 43, Figure 20 (Mar. 2013) (showing mean annual water-level change in the High Plains Aquifer in the three groundwater management districts of western Kansas between 1996 and 2012, with linear regression for the data).

123. BUCHANAN ET AL., *supra* note 121, at 3, Figure 4.

them with a large, stable, and easily accessible water supply, one that needed neither diversion works nor reservoirs. The water was right where it was needed, readily available in both wet years and drought years.

The distinctive characteristics of Ogallala groundwater as a resource—its size, dependability, location, and hydrology—prompted the question of whether to retain established limits that governed the development of new water rights. Starting in the late 1950s, state legislatures amended their water codes to exploit the Ogallala, but without setting a limit on its depletion. The opportunity to irrigate above the Ogallala was too good to restrict within a legal regime predicated upon the assumptions of the classical western water right. The problems of depletion, if they arose, could be put off for later. As a result, the groundwater revolution fundamentally redefined the most important water right across the Great Plains—the right to the effectively non-renewable waters of the Ogallala.

Kansas confronted the groundwater revolution from a strong statutory position. Under the original 1945 KWAA, prior appropriation applied with identical force across groundwater rights as it did across surface rights, in obedience to the recommendations of experts such as Hutchins. As a consequence, if the operation of a junior groundwater right in any way affected a senior right, then the application for that junior groundwater right would be denied.[124] Such a principle protected the maintenance of groundwater levels upon which existing rights relied; it did not countenance depletion.

Yet the doctrinal purity and regulatory strictness of this approach lasted little more than a decade. Kansas policy makers recognized that any significant development of the Ogallala would inevitably lower water levels, making impairment of senior rights under the strict prior appropriation doctrine of the KWAA "merely a matter of time . . . ."[125] The intolerant approach to depletion set forth in the 1945 KWAA would effectively prohibit subsequent development of the Ogallala. So it was decided that the sure prospect of economic growth justified a compromise in the protections afforded to prior appropriators, a compromise that redefined impairment according to economics first and hydrology second. The Kansas Legislature in 1957 redefined impairment as impairment "beyond a reasonable economic

124. KAN. STAT. ANN. § 82a-711 (Kan. L. 1945, ch. 390, § 11) (1945) required the chief engineer to reject a water rights application if "the water sought to be appropriated would impair vested rights, prior appropriations, or be detrimental to the public interest."

125. KANSAS WATER RESOURCES BOARD, REPORT ON THE LAWS OF KANSAS PERTAINING TO THE BENEFICIAL USE OF WATER 91 (1956) [hereinafter 1956 REPORT].

limit."[126] Junior rights could legally impair prior rights from a hydrological perspective (by lowering the water table), but not from an economic one (by lowering the water table below a reasonable economic limit). Even as it reduced the level of protection to which a senior right was entitled, the legislature enhanced the legal status of a water right itself, by explicitly redefining it in statute as a real property right[127] and protecting it from loss by adverse possession.[128]

These amendments were intended to clarify the KWAA rather than to substantively modify it,[129] but together with the groundwater revolution, they produced a legal paradox. For as water rights tapped into the non-renewable, impermanent supplies of the Ogallala, their legal status as permanent, real property rights was explicitly stated.[130] The KWAA's 1957 redefinition of impairment, together with a liberal policy of granting water rights applications, substantially enabled the over-appropriation of groundwater in Kansas.[131] DWR did not assess the long-term availability of the water supply in evaluating new groundwater applications, and the amount of water authorized under new applications eventually defaulted to the irrigation requirements of the appurtenant land.[132] It has been asserted that the KWAA's express definition of water rights as real property rights "thereby protect[s] them against 'takings' by the government," and that this definition has "acted as a deterrent to retroactive restrictions of water right pumping."[133] While experts differ concerning the first assertion,[134] the belief in the heightened status of water rights as property rights is a common

126. KAN. STAT. ANN. § 82a-711 (Kan. L. 1957, ch 539, § 16) (1957).

127. 1957 Kan. Sess. Laws ch. 539, § 1 (now found at KAN. STAT. ANN. § 82a-701(g) (Supp. 2012)).

128. 1957 Kan. Sess. Laws ch. 539, § 7 (now found at KAN. STAT. ANN. § 82a-705 (Supp. 2012)).

129. 1956 REPORT, *supra* note 125, at 76.

130. John C. Peck, *Property Rights in Groundwater—Some Lessons from the Kansas Experience*, 12 KAN. J.L. & PUB. POL'Y 493, 496–98 (2003).

131. Water rights applications under the 1945 KWAA numbered just 334 between 1945 and 1950. By contrast, DWR recorded 5,730 applications during the 1950s, 6,433 during the 1960s, and 16,226 in the 1970s, mostly for irrigation rights from the Ogallala Aquifer. John C. Peck, *Groundwater Management in Kansas: A Brief History and Assessment*, 15 KAN. J.L. & PUB. POL'Y 441, 443 (2006).

132. KAN. ADMIN. REGS. § 5-5-12 (1994) (net irrigation requirements by county); *id.* § 5-24-2(c)(2)(A)(ii) (2004) (net irrigation requirements for corn as the baseline for calculating available water supply).

133. Peck, *supra* note 131, at 460.

134. *See, e.g.*, Sax, *supra* note 58, at 260 ("The constitutional law of water [rights] is the same as the constitutional law of potatoes and pork chops.").

one, and that belief has indeed deterred restrictions.[135] As depletion set in during the late 1960s and 1970s, water rights owners who had obtained their rights without an evaluation of a sustainable water supply were nonetheless legally entitled to defend those rights as real property rights predicated upon such a supply. In the parlance of Professor Carol Rose, Kansas began with a crystalline water code in 1945; just twelve years later, the groundwater revolution spattered it with mud.[136]

By contrast, Colorado began with mud, and responded to the groundwater revolution by forming clearly distinct crystals. Between the 1940s and the 1960s, Colorado struggled to achieve legal clarity as groundwater development expanded across the Ogallala in the eastern part of the state. The 1943 Adjudication Act did not address groundwater,[137] but in 1951 the Colorado Supreme Court established a presumption that all groundwater was tributary to its watershed and subject to appropriation accordingly.[138] The Colorado Ground Water Law of 1957 attempted to address groundwater depletion across the non-tributary groundwater supplies of the Ogallala by establishing a Ground Water Commission, and by requiring wells in that part of the state to be registered with and permitted by the state engineer.[139] However, the Colorado Supreme Court later ruled that the state engineer lacked the authority both to adjudicate and to administer rights to non-tributary groundwater.[140] By the early 1960s, the law for tributary groundwater and the law for non-tributary, Ogallala groundwater had diverged in Colorado.[141]

Colorado's response to this divergence was to make a fundamental statutory distinction between its two principal sources of groundwater. Rather than placing all of the state's water within the same statutory regime—as Kansas had in 1945, and then adjusted for the Ogallala in

135. Sax, *supra* note 58, at 260 n.5 (citing a letter from Professor Lawrence J. MacDonnell).

136. *See generally* Carol M. Rose, *Crystals and Mud in Property Law*, 40 STAN. L. REV. 577, 577–610 (1988).

137. Adjudication Act of 1943, ch. 190, 1943 Colo. Sess. Laws 613 (codified at COLO. REV. STAT. §§ 148-9-1 to -27 (1963), *repealed by* The Water Right Determination and Administration Act of 1969, ch. 373, 1969 Colo. Sess. Laws 1200, 1223). *See* Justice Gregory J. Hobbs, *Colorado Water Law: An Historical Overview*, 1 U. DENV. WATER L. REV. 1, 20–22 (1997).

138. Safranek v. Town of Limon, 228 P.2d 975, 977 (Colo. 1951).

139. *See* Act of of May 1, 1957, ch. 289, §§ 3, 5, 1957 Colo. Sess. Laws 863-863-69. *See* Gregory J. Hobbs, *Colorado's 1969 Adjudication and Administration Act: Settling In*, 3 U. DENV. WATER L. REV. 1, 12–14 (1999).

140. Whitten v. Coit, 385 P.2d 131, 139 (Colo. 1963).

141. In contrast to *Whitten v. Coit*, *supra*, see *City of Colorado Springs v. Bender*, 366 P.2d 552, 555 (Colo. 1961) (asserting judicial responsibility over tributary groundwater). The same subject is discussed in Hobbs, *supra* note 139, at 12–13.

1957—Colorado established distinct categories of groundwater instead. First, there is "tributary groundwater," which is defined as groundwater that has a significant hydrologic connection to a natural surface stream—predominantly, the groundwater that lies within the alluvial aquifers of Colorado's rivers. Due to this close hydrological connection, the pumping of tributary groundwater has a relatively rapid impact on surface flows and thus on surface water rights. Under the Water Rights Determination and Administration Act of 1969, Colorado decided that these tributary groundwater supplies should be governed according to the same doctrine of prior appropriation that had governed surface water rights since statehood.[142] "With the advent of conjunctive use of tributary groundwater and surface water, the maximum utilization of the waters of the state, through vested rights, was heralded as Colorado's constitutional water law doctrine."[143] As a consequence, those who seek to obtain a water right in tributary groundwater must pursue the same procedures as obtaining a right to surface water—by obtaining a decree through one of Colorado's seven water courts, whose jurisdiction applies to the state's seven principal watersheds.[144]

The other major type of groundwater in Colorado was labeled "designated groundwater"—a category defined according to both hydrological and historical conditions.[145] The hydrological condition locates designated groundwater in alluvial aquifers that do not underlie a flowing stream, and in the unconfined and semi-confined aquifers on Colorado's Eastern High Plains—the waters of the Ogallala. As a result of this hydrological situation, the withdrawal of such water does not have the rapid impact on surface flows and surface water rights that occur with the pumping of tributary groundwater. The historical condition concerns the extent of water rights development in the area: designated groundwater was either groundwater that would not supply pre-existing, decreed surface rights, or groundwater that was not adjacent to alluvial (and therefore tributary) groundwater supplies upon which tributary groundwater rights had

142. COLO. REV. STAT. § 37-92-101 (2014).

143. Hobbs, *supra* note 139, at 21 (citing Fellhauer v. People, 447 P.2d 986, 994–95 (Colo. 1968)).

144. A successful applicant for a right to tributary groundwater obtains a decree to that right after going through a civil court case in which the water court resolves claims brought by protestants to the application, who usually claim that the new water right will impair their prior rights. Once obtained, a water right to tributary groundwater receives the same protections as surface water rights receive—namely, the administration of water rights in priority, as performed by the state engineer. COLO. REV. STAT. § 37-90-137 (2014).

145. 1965 Ground Water Management Act, COLO. REV. STAT. §§ 37-90-103(6)(a) (2014).

depended for at least fifteen years.[146] Where the aquifer's connection to surface water systems was attenuated, but where it constituted the principal source of the area's water supply, that source would be defined as designated groundwater.[147]

Because little groundwater development had taken place across Colorado's portion of the Ogallala before the 1950s, this definition effectively enabled those groundwater supplies to be defined as designated groundwater. Colorado applied a modified doctrine of prior appropriation to designated groundwater, protecting prior appropriations of groundwater at "reasonable groundwater pumping levels," but not absolutely; the law would not secure the "maintenance of historical water levels."[148] In establishing this category of groundwater, Colorado, like Kansas in 1957, recognized that the development of groundwater across the Ogallala could not take place without compromising the doctrine of prior appropriation and condoning depletion. That compromise carried a notable nominal cost: the right to pump designated groundwater does not qualify as a "water right" under Colorado law, but is instead a "well permit."[149]

As for Nebraska, it did not make any substantial adjustments to its water law in the immediate wake of the groundwater revolution. Although it had enshrined the doctrine of prior appropriation in its state constitution, Nebraska never extended that doctrine to groundwater, which is governed instead by the doctrine of correlative rights.[150] The doctrinal gap between surface and groundwater in Nebraska is a longstanding one, and is largely a matter of design.[151] Subsequent statutes have explicitly recognized the fact of hydrologically connected groundwater and surface water supplies.[152] Yet despite this acknowledgment, the Nebraska Supreme Court has not protected the owners of senior surface water rights from impairment by groundwater pumpers.[153]

146. COLO. REV. STAT. § 37-90-103(6) (2014).

147. Hobbs, *supra* note 139, at 21 (citing Colorado Ground Water Comm'n v. Eagle Peak Farms, Ltd., 919 P.2d 212, 215 (Colo. 1996); Danielson v. Vickroy, 627 P.2d 752, 756 (Colo. 1981)).

148. COLO. REV. STAT. § 37-90-102(1) (2014).

149. *Id.* §§ 37-90-107, 37-90-108.

150. Osterman et al. v. Cent. Neb. Pub. Power & Irr. Dist., 268 N.W. 334 (1936); *In re* Metro. Util. Dist. of Omaha, 140 N.W.2d 626, 637 (1966).

151. "As to ground water, practically speaking, we do not have any law. There is no question but what in the future something will have to be done about that, probably the sooner the better." Conference Transcript, *supra* note 79, at 95 (comments of Mr. John Riddell, Assistant Attorney General for Nebraska).

152. NEB. REV. STAT. § 46-703(1)–(4) (2013).

153. Spear T Ranch v. Knaub, 691 N.W.2d 116 (2005); *In re* Complaint of Cent. Neb. Pub.

Across Kansas, Nebraska, and Colorado, the groundwater revolution produced a significant expansion in the practical property right to pump groundwater. Kansas law removed the strict definitional constraints of what constituted impairment. Colorado placed its Ogallala water resources under a regime of "modified" prior appropriation, and excepted them from the procedural and administrative burdens attached to decreed Colorado water rights. As for Nebraska, it maintained its correlative rights regime for groundwater, which enabled the development of, and subsequent reliance upon, groundwater pumping beyond the domain of central state regulation under the priority system. This expansion helped to establish the dominance of groundwater irrigation, and it produced in turn a contraction of the legal means by which senior water rights could challenge new groundwater development. The groundwater revolution transformed the classical western right into a substantially different property right, largely in response to the characteristics of the Ogallala itself.

The groundwater revolution also produced important changes in how Ogallala water rights and well permits were regulated. Across these distinct regulatory regimes, the groundwater revolution produced something that is perhaps more important, and something that may determine the future of the Ogallala itself: it produced its own type of public.

While Kansas modified its water law in 1957 in response to the groundwater revolution, it retained centralized authority over all types of groundwater; yet in response to the distinctive characteristics of the Ogallala, Kansas created local groundwater districts. After a false start in 1968,[154] Kansas enacted the Groundwater Management District Act (GMD Act) in 1972.[155] The GMD Act expressly sought to establish a degree of local involvement (in partnership with DWR) with the regulation of groundwater rights over the Ogallala, and in this regard the GMD Act has largely succeeded.[156] Five GMDs were formed in western Kansas.[157] Endowed with the power to assess taxes within their boundaries,[158] and with

Power, 699 N.W.2d 372 (2005); Cent. Neb. Pub. Power and Irr. Dist. v. N. Platte Natural Res. Dist., 788 N.W.2d 252 (2011).

154. 1968 Kan. Sess. Laws 1537–39 (previously codified at KAN. STAT. ANN. §§ 82a-1001 to -1019; repealed 1972).

155. 1972 Kan. Sess. Laws 827–35, (now codified at KAN. STAT. ANN. § 82a-1020 (1997 & Supp. 2011)). For a fuller treatment of the GMD Act, which has been regularly amended since 1972, see John C. Peck, *Kansas Groundwater Management Districts*, 29 U. KAN. L. REV. 51 (1980); Peck, *supra* note 131.

156. KAN. STAT. ANN. § 82a-1020 (2013).

157. *See* Peck, *supra* note 131, at 444.

158. KAN. STAT. ANN.§ 82a-1028(h) (2013).

a voting membership limited to holders of groundwater rights,[159] the GMDs have become the most powerful force in Kansas water politics.

Yet the intractable problem of over-appropriation remains. Pursuant to the GMD Act, the GMDs and DWR have closed large areas to new water rights, and have adopted-specific regulations such as yield and depletion formulae for new water rights applications.[160] Yet these actions, while significant, have largely avoided confronting the difficult challenge of reconciling the rules of prior appropriation with the reality of the Ogallala's permanent depletion. Indeed, in Southwest Kansas Groundwater Management District No. 3, the state has deferred to local irrigators by adopting a policy that condones further depletion. For new water rights and changes to existing water rights, GMD No. 3 and DWR will accept the effect of a depletion of forty percent or more of the local area of the aquifer over a twenty-five period.[161] Despite its initial and perceived intent to limit excessive groundwater development, this formula has instead become "an open throttle on aquifer mining," exacerbating the regional impairment of groundwater rights.[162]

Kansas law has long contained a tool to confront the problem of over-appropriation, a tool devised at the local level. In 1978, the GMD Act was amended to allow for the establishment of IGUCAs.[163] The IGUCA statutes originated from local initiative, taken at a time when DWR was less concerned with the problem of groundwater depletion than the GMDs were.[164] Under the IGUCA statutes, a GMD, local irrigators, or the chief engineer may initiate the establishment of such an area to address groundwater depletion, including situations where excessive groundwater pumping has reduced streamflows upon which surface water rights depend.[165] To address such problems, the IGUCA statutes enable the chief engineer to reduce the authorized quantities of groundwater rights within an IGUCA—even where such a reduction does not strictly follow prior

159. *Id.* § 82a-1021(a)(5) (2013).

160. KAN. ADMIN. REGS. § 5-21-1 to 5-25-30 (2014) (Regulations for GMDs 1–5 respectively). *See* Leland E. Rolfs, *Comparing and Contrasting the Roles of the Division of Water Resources and the Groundwater Management Districts in Groundwater Management and Regulation*, 15 KAN. J.L. & PUB. POL'Y 505 (2006).

161. KAN.ADMIN. REGS. § 5-23-4a(b) (2014).

162. *See* Michael K. Ramsey, *Kansas Groundwater Management Districts: A Lawyer's Perspective*, 15 KAN. J.L. & PUB. POL'Y 517, 522 (2006).

163. For a fuller treatment of IGUCAs, see John C. Peck, *Kansas Groundwater Management Districts*, 29 U. KAN. L. REV. 51 (1980); Peck, *supra* note 131.

164. Rolfs, *supra* note 160, at 509.

165. KAN. STAT. ANN. § 82a-1036 (2013).

appropriation.[166] The tools afforded the chief engineer are powerful ones. Yet while eight IGUCAs have been established across western Kansas, none have been established over the Ogallala.[167]

The power of the GMDs and the conspicuous absence of an IGUCA over the Ogallala reveal one of the most politically important consequences of the groundwater revolution in western Kansas: a divergence between the long-accepted notion of the public as a statewide whole, and the more recent notion of local groundwater publics. Both notions are real, but Kansas water law is confused about this divergence. The GMD Act seeks to "establish the right of local water users to determine their destiny with respect to the use of groundwater," yet at the same time it also seeks to "preserve basic water use doctrine"[168]—namely, that of prior appropriation, enforced centrally by the chief engineer.[169] The GMD Act established five powerful political bodies in western Kansas, granting them a degree of local autonomy over groundwater management, while at the same time endowing the chief engineer with explicit powers to impose substantial reductions in groundwater use within those very districts through the IGUCA statutes. This divergence has created a tense situation across western Kansas. Irrigators who genuinely want to address the problem of the Ogallala's depletion may be willing to accept reductions in groundwater pumping, but they are clearly not willing to risk an IGUCA that imposes reductions which exceed their expectations.[170] In the opinion of Ogallala irrigators, the IGUCA is too powerful a tool to risk using.[171]

A recent innovation in Kansas water law offers hope to bridge this divide between DWR's central regulatory authority and the local GMD's. In 2012, the Kansas Legislature enacted a statute allowing for the creation of Local Enhanced Management Areas (LEMAs).[172] The statute allows GMDs to address groundwater declines through locally-generated management

166. KAN. STAT. ANN. § 82a-1038 (2013).

167. For a summary of Kansas IGUCAs, see *Intensive Groundwater Use Control Areas (IGUCAs)*, KAN. DEP'T OF AGRIC., http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/intensive-groundwater-use-control-areas (last visited Mar. 27, 2014).

168. KAN. STAT. ANN. § 82a-1020 (2013).

169. *Id.* § 82a-706 (2013). Professor Peck was the first to recognize this contradiction. Peck, *supra* note 131, at 445.

170. KANSAS DEPARTMENT OF AGRICULTURE, DIVISION OF WATER RESOURCES, ORDER OF DESIGNATION APPROVING THE SHERIDAN 6 LOCAL ENHANCED MANAGEMENT AREA WITHIN GROUNDWATER MANAGEMENT DISTRICT NO. 4, at 2 (Apr. 17, 2013), http://dwr.kda.ks.gov/LEMAs/SD6/LEMA.SD6.OrderOfDesignation.20130417.pdf [hereinafter LEMA Order].

171. *See, e.g.*, *id.* at 8 (comments of Mr. Mitchell Baalman).

172. 2012 Kan. Sess. Laws 382–85 (codified at KAN. STAT. ANN. § 82a-1041).

plans that include specific goals and corrective control provisions—usually, reductions in groundwater pumping. This local autonomy over both the management initiative and the management plan distinguishes LEMAs from IGUCAs. Unlike the more open-ended IGUCA process, which allows the chief engineer to initiate IGUCA proceedings independently of a GMD and allows substantial leeway to consider various goals and corrective control provisions,[173] LEMA proceedings can only be initiated by the GMD, and the subject of the proceedings is limited to the GMD's management plan—two important differences, both substantively and procedurally.[174] In the event the chief engineer approves the local management plan, he issues a final "Order of Designation" setting forth that plan; and the chief engineer, not the GMD, enforces its terms.[175] The LEMA statute thus achieves a compromise between local control over a groundwater management plan—provided that plan provides for meaningful reductions in pumping—and central control over review and enforcement of the plan.

In 2013, DWR and Northwest Kansas GMD No. 4 cooperated in the formation of the first LEMA in Kansas, the Sheridan County 6 LEMA, which is located within the boundaries of Northwest Kansas GMD No. 4.[176] This LEMA imposed a twenty percent reduction in groundwater pumping for five years[177] across nearly 100 square miles in Sheridan and Thomas Counties.[178] Tellingly, the LEMA Order gives no respect to priority: all irrigation rights receive the same reduction.[179] Both the LEMA statute and the Sheridan County 6 LEMA have garnered considerable attention outside of Kansas.[180]

Colorado's statutory redefinitions of Ogallala groundwater during the 1960s also had important regulatory and public consequences. The 1965 Ground Water Management Act not only redefined most of the waters of the Colorado High Plains, but also changed the law to defer to local

173. *See* KAN. STAT. ANN. §§ 82a-1036, 82a-1038(b).

174. *Id.* §§ 82a-1041(a), 82a-1041(c).

175. *Id.* § 82a-1041(f).

176. *See generally*, *Local Enhanced Management Areas (LEMAs)*, KAN. DEP'T OF AGRIC, DIV. OF WATER RESOURCES, http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/lists/lemas/sheridan-county-6-lema (last visited Apr. 5, 2014).

177. LEMA Order, *supra* note 170, at 22–23.

178. *Id.* at 28–29.

179. *Id.* at 17–18 ("By contrast, the Proposal reduces all non-domestic water rights of the same use made of water by the same amount, regardless of priority.").

180. *See, e.g.*, *Sip It Slowly: Farmers in Kansas Are Starting to Adapt to Declining Stocks of Groundwater*, THE ECONOMIST, Sept. 28, 2013, http://www.economist.com/news/united-states/21586874-farmers-kansas-are-starting-adapt-declining-stocks-groundwater-sip-it-slowly.

groundwater management districts, giving them the power to make important decisions regarding the use and conservation of water. Under the 1965 Act, Colorado decentralized the appropriation and administration of designated groundwater to three related entities: the Colorado Ground Water Commission, the state engineer, and local groundwater management districts.[181] The commission, whose executive director is the state engineer, issues well permits for the designated basin. The commission is essentially a political body: of its ten voting members, six must be "resident agriculturists of designated ground water basins."[182] The Act thus intends to achieve a balance of enforcement power, to be shared by a technical expert in water rights (the state engineer and his staff), a politically-appointed, statewide body (the commission), and the local groundwater district, which, like its Kansas counterpart, is dominated by irrigators. The district usually relies upon the state engineer and the commission in enforcing the terms of well permits in the basin, but it does have independent enforcement authority.[183] More importantly, the district has the power to regulate pumping to reduce the lowering of the water table through its right to "exercise . . . administrative and regulatory authority concerning the ground waters of the district" (except for the processing of well permit applications).[184] And in the event that a well owner in a designated basin places a priority call against other well owners in his water rights neighborhood, the Colorado Supreme Court has ruled that neither the commission nor the state engineer has the power to administer the relevant rights; instead, the local groundwater management district alone must take action.[185] Although direct priority was typically the province of the state engineer, Colorado decided that local bodies are more effective at making those decisions than a state body (in this case, the commission) or the state engineer. This contrasts with the long-established system for tributary water, which makes no such local compromises.[186]

Colorado's statutory distinction between tributary and designated groundwater is more than a hydrological distinction: it excised much of the Ogallala in Colorado from the public itself. Before the groundwater

181. COLO. REV. STAT. § 37-90-101 to -143 (2001).

182. *Id.* § 37-90-104(3)(b).

183. *Id.* § 37-90-111.5(1)(a) (referring to district's right to seek an injunction and civil penalties).

184. *Id.* §§ 37-90-130(2)(a), (j).

185. Upper Black Squirrel Creek Ground Water Mgmt. Dist. v. Goss, 993 P.2d 1177, 1186 (Colo. 2000).

186. *See supra* text accompanying notes 142–44.

revolution, Colorado law could have been construed to include groundwater as a public resource. The Colorado Constitution states that "[t]he water of every natural stream, not heretofore appropriated . . . is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as hereinafter provided."[187] It also establishes the "right to divert the unappropriated waters of any natural stream to beneficial uses" according to the doctrine of prior appropriation.[188] Finally, Colorado's adjudication statutes, first enacted in 1879, provided the means to enforce and implement this right to appropriate previously unappropriated "water in the natural stream or streams."[189] All groundwater in Colorado is connected to the "waters of the stream";[190] the connection is a matter of degree. Conceivably then, all groundwater is part of the waters of the state. However, these statutes did not resolve the question of whether groundwater was a public resource; on the contrary, they became anachronistic and troublesome, and threatened to force every groundwater pumper to obtain a water court decree.[191] Yet the fact that the constitutional provisions referred to "natural streams" provided a legal exclusion for groundwater supplies (such as those occurring in the deeper Ogallala and Dakota formations) that were distant from live streams. Faced with this choice, Colorado reclassified most of its Ogallala groundwater supplies apart from the public domain, by limiting "waters of the state" to surface and groundwater that was tributary to the natural streams of Colorado.[192] Groundwater that was tributary to surface water supplies was within the constitutional domain of public water available for prior appropriation, while non-tributary groundwater was not.[193] While implicit, such clarity is nonetheless notable, and it raises a remarkable question: can a local groundwater management district effectively dictate what is in the best

187. COLO. CONST. art. XVI, § 5.

188. *Id.* § 6.

189. 1879 Colo. Sess. Laws 94–108; Adjudication Act of 1881, 1881 Colo. Sess. Laws 142. The 1903 adjudication statute did not change in this regard. Adjudication Act of 1903, 1903 Colo. Sess. Laws at 297 (referring to "water rights derived from any natural stream, water-course, or any other source . . ."). The 1943 Adjudication Act was silent regarding groundwater. *See supra* note 137. For a longer treatment of the Colorado adjudication acts, see Hobbs, *supra* note 137, at 9–10.

190. Safranek v. Limon, 228 P.2d 975, 977 (Colo. 1951).

191. GEORGE VRANESH, COLORADO WATER LAW, at § 3.5 (1987).

192. COLO. REV. STAT. § 37-92-103(13) (2001).

193. *Id.* § 37-82-101(1). Another category of groundwater—"not nontributary ground water"—describes the stacked aquifers within the Denver Basin, which supply water to the newer communities along the suburban Front Range. Due to their high economic value as municipal water sources, the Colorado General Assembly did not apply the doctrine of prior appropriation to them; ownership of these resources is connected to the overlying land, and assumes a 100-year depletion period. *Id.* § 37-90-102(2).

interests of the State as a whole? Recent litigation suggests how local groundwater management districts in Colorado can exert a decisive influence in statewide decisions.[194]

Because Nebraska has never claimed central authority over the regulation of groundwater, it has never had to delegate that authority. Thus, Nebraska's legal reaction to the groundwater revolution has largely been to continue its longstanding state of divided governance. Surface water and water rights are administered by the Nebraska Department of Natural Resources (DNR).[195] Groundwater is governed by a different set of laws and administered by Natural Resource Districts (NRDs), which usually comprise several counties and are distinct political subdivisions of the state.[196] In making this distinction, the Nebraska Legislature made the express finding that groundwater is a matter for local control, stating "local entities are the preferred regulators of activities which may contribute to ground water depletion."[197] The growth in groundwater irrigation in Nebraska has brought with it a commensurate increase in the power of the NRDs. Each NRD has its own taxing authority, its board members are popularly elected, and its authority is limited to a discrete geographic area.[198] With certain complex exceptions that relate to interstate rivers,[199] NRDs control the granting, administration, and regulation of groundwater permits in Nebraska, and even when the DNR is involved in the management of groundwater, such involvement is dependent on the local NRD approval through rules and regulations.[200] Because of this bifurcated approach, Nebraska "has not developed an appropriation system that addresses direct

194. *See, e.g.*, *In re*: Non-Binding Arbitration Pursuant to the Final Settlement Stipulation, Kansas v. Nebraska and Colorado, No. 126 Original, U.S. Supreme Court, before Martha O. Pagel, Arbitrator, Arbitrator's Decision on Colorado Compact Compliance Pipeline Dispute, November 27, 2013, at 6 (describing an interstate augmentation pipeline pumping Ogallala groundwater from beneath the Sand Hills Groundwater Management District, water necessary to achieve the State of Colorado's compliance with the Republican River Compact, and operated by the Republican River Water Conservation District).

195. NEB. REV. STAT. § 61-206(1) (2009) ("The Department of Natural Resources is given jurisdiction over all matters pertaining to water rights for irrigation, power, or other useful purposes except as such jurisdiction is specifically limited by statute.").

196. *See id.* § 2-3213(1) (describing NRDs).

197. *Id.* § 46-702.

198. *See generally id.* §§ 2-3201 to -32,115.

199. Kansas v. Nebraska, No. 126 Orig., REPORT OF THE SPECIAL MASTER 123 (Nov. 15, 2013), http://media.ca1.uscourts.gov/special_master/files/2013-11-15_511.pdf (noting that "Nebraska's statutory law is complex, and contains no express statement that the DNR may order groundwater pumping curtailments").

200. NEB. REV. STAT. § 46-715(1) (NRDs jointly develop integrated management plans with DNR). This is the opposite of the Kansas system, where local GMD rules and regulations must be approved by the chief engineer to become effective. KAN. STAT. ANN. § 82a-1028(o) (2013).

conflicts between users of surface water and ground water that is hydrologically connected."[201] Because groundwater irrigation dominates in Nebraska, the managers of the NRDs collectively exert considerably more influence over irrigation than the Director of the DNR, whose jurisdiction is limited to surface waters, and who lacks independent authority "to regulate ground water users or administer ground water rights for the benefit of surface water appropriators."[202]

III. DROUGHT, DEPLETION, AND THE MODERN GROUNDWATER RIGHT IN PRACTICE

State law has established the modern groundwater right, and it has defined and described its attributes, its entitlements, and its boundaries. Pursuant to the state's police power, state legislatures have conferred upon state agencies certain duties to grant, regulate, and administer that right. Yet while legal definitions, descriptions, and procedures may set the legal boundaries of a client's conduct, they cannot begin to capture the way in which the client actually behaves, even when the client stays within those boundaries. Too fixed a focus "on the formal law ignores the significant changes in its function."[203] To understand how irrigators across the Ogallala are responding to its permanent depletion, it is necessary to understand the functional differences between such depletion and a typical drought. While drought and groundwater depletion both create water shortages, they are distinct problems that affect the administration and operation of water rights in significantly different ways. Water law experts recognized this difference at the outset of the groundwater revolution,[204] but the difference has itself changed, and it has become more urgent.

Drought is the temporary shortage of an average water supply due to shortages in precipitation. Low precipitation translates to less water soaking into the ground; low recharge from low precipitation translates into falling groundwater levels; and falling groundwater levels reduce and can even reverse the movement of water to tributary streams, drying them up entirely.[205] In a water rights neighborhood where the principal sources of

201. *In re* Central Nebraska Public Power and Irr. Dist., 699 N.W.2d 372, 377 (Neb. 2005) (citing Spear T Ranch v. Knaub, 691 N.W.2d 116 (Neb. 2005)).

202. *Id.* at 378.

203. Tarlock, *Future of Prior Appropriation*, *supra* note 109, at 770.

204. 1956 REPORT, *supra* note 125, at 37.

205. *See* WINTER ET AL., *supra* note 32, at 1–3 (describing "[t]he Hydrologic Cycle and Interactions of Ground Water and Surface Water").

water supply are surface waters and alluvial groundwater, surface rights will typically be senior to alluvial groundwater rights. Drought reduces the number of rights that can divert from that supply; but as precipitation returns to normal, increased recharge restores groundwater levels and corresponding streamflows accordingly. In this regard, streamflow is the final "product" of the hydrological cycle. Droughts force the administration of water rights by priority on a regular basis, and prior appropriation imposes fairly clear and reliable consequences as water rights owners divert according to their respective priorities. Absent non-diverting, environmental flow water rights or minimum streamflow requirements, the owners of surface water rights can divert the entire stream if the total of those rights meets or exceeds its available flow. Because almost all of the streams in the West are over-appropriated by diverting water rights, and because minimum streamflow requirements do not necessarily trump senior water rights,[206] stream-drying can occur on a regular basis. Yet when drought dries up the stream, the surface water shortage cannot get worse, because no more diversion from the stream is possible until the drought abates and flows return.[207] After all, a water right is contingent upon water being available for diversion and beneficial use.[208]

Groundwater depletion is a different phenomenon. While surface water

206. *See* KAN. STAT. ANN. § 82a-703a to -703c (2013) (requiring withholding of necessary water for legislatively ordered "minimum desirable streamflows").

207. This is a generalized scenario, and so some qualification is probably appropriate. In a situation where there is a substantial alluvial supply, such as the South Platte River in Colorado, it is probable that alluvial wells will not be pumping in such a manner as to worsen stream drying, because those wells will either be shut off as a result of their junior priority to senior surface rights, or will be pumping and providing augmentation or substitute supply water to compensate for that pumping. In a situation where there is little alluvial supply, such as the Verdigris River in southern Kansas, few alluvial rights exist. Both of these situations presume that the administration of junior groundwater rights is legally available, as they are in Colorado (for tributary groundwater) and in Kansas (for all water), and that such administration actually takes place. Where it is not legally available, as in Nebraska, or where it does not take place, the problem of stream drying can become considerably worse by lowering the water table below the streambed, creating losing reaches of streams.

208. *See* KAN. STAT. ANN. § 82a-701(f) (Supp. 2012) (requiring that "water is available in excess of the requirements of all vested rights that relate to such supply and all appropriation rights of earlier date that relate to such supply"). In such a situation, surface water rights could conceivably change the point of diversion from the stream to a groundwater well, but in Kansas, such a change may be more difficult than it appears for at least two reasons. Substantively, some western water codes treat surface and groundwater supplies as distinct sources of supply in certain administrative situations, which can rule out such a change. *See, e.g.*, KAN ADMIN. REGS. § 5-3-9(b) (2010) (identifying, as distinct, "groundwater or surface water"). Procedurally, such a change requires an application and administrative approval, can be as time consuming as applying for a new water right due to the no-injury rule, and is not necessarily reversible. *See, e.g.*, KAN. STAT. ANN. § 82a-708b (2013) (outlining extensive application procedures for changing certain attributes of water rights).

rights divert from streamflow, groundwater pumping intervenes earlier in the hydrological cycle, intercepting water that would otherwise flow to the stream. Depletion occurs when groundwater pumping exceeds recharge from the hydrological cycle. The over-pumping of groundwater produces depletions whose effects vary according to the local hydrological situation, such as the degree of connection of the groundwater formation to a surface water body, the geology of the formation, and the location of the pumping well or wells. Where the groundwater is alluvial, in a permeable and porous formation, and where the well is near a stream, then the impact of pumping can show up relatively quickly, depleting streamflows during the same irrigation season in which pumping takes place, sometimes almost immediately. In this situation, shutting down a junior groundwater right can have nearly the same effect as shutting down a junior surface right. Different hydrological situations can produce much different effects, however. Where the groundwater formation is farther away from the stream, in a less permeable and porous formation, and where the well is far from the stream, or some combination of all three, then the effect of pumping on streamflow lags behind the pumping itself. These depletions are known as delayed or "lagged" depletions, and their effect on streamflow can take years, even decades, to show up after the pumping itself takes place. Unless groundwater pumping is reduced to a sustainable level, lagged depletions can become permanent. Finally, where the groundwater formation is not hydrologically connected to a stream (or minimally so), then the depletions cannot be replaced by recharge into streams from surplus precipitation; these are permanent depletions, the predominant type of depletion across the Ogallala. Over-appropriation of groundwater produces depletions; over-appropriation of non-renewable groundwater produces permanent depletions.

Depletion has less immediate consequences than drought, but those consequences are more profound. Depletion usually takes longer to appear, in the form of reduced streamflow; but its effects on the hydrological system can endure far longer. Because it takes longer to appear but endures longer as well, depletion presents a series of problems about groundwater rights, especially their reliability over the long term. For the most part, both the owners of groundwater rights and the state have avoided these problems. In Kansas, this practice of avoidance has become recognizable, and it has produced a property right whose actual use does not correspond with its formal legal contours.

Across western Kansas, owners of groundwater rights know that the

depletion of the Ogallala threatens to reduce their property interests over the long term.[209] Yet they have mostly avoided deploying the legal tools available to protect themselves. Most of them comply with their annual pumping limits and the other terms of their rights;[210] but because the Ogallala is over-appropriated, this widespread compliance does not address the problem of depletion. They have mostly avoided using the most obvious tool at their disposal, that of prior appropriation. Although Kansas contains nearly 40,000 groundwater rights, most of which draw from the Ogallala,[211] only sixteen groundwater impairment claims were filed with DWR between 2006 and 2008, and most of these were in north-central Kansas, away from the Ogallala.[212] Owners do not need to rely solely upon DWR to protect their rights; Kansas water law grants them the express right to pursue impairment and other actions independently in court.[213] Yet senior groundwater pumpers are hardly racing to the courthouse to do so: only two impairment lawsuits appear to have been brought in the last four decades.[214] Kansas so far lacks a reported case on the impairment of groundwater rights.

What accounts for this huge disparity between the number of valuable senior rights that are threatened by impairment due to groundwater depletion, and the statistically miniscule number of such rights that have been protected by the chief engineer or by the owners themselves in court? Put another way, if a principal virtue of the KWAA is its centralized jurisdiction over both surface and groundwater,[215] why aren't its most threatened beneficiaries using it more frequently to defend themselves? Two well-known creatures stand ready to explain. First and most

209. For example, the home page on the Northwest Kansas GMD 4 website features a hydrograph from an index well in Thomas County that is updated on the website every two hours. *GMD4 Hompage*, NW. KAN. GROUNDWATER MGMT. DIST. NO. 4, http://www.gmd4.org/ (last visited Mar. 18, 2014). The well declined over ten feet between 2010 and 2013. *Id.*

210. Over ninety-nine percent of Kansas water rights owners "comply with state water usage and water-reporting regulations." John C. Peck & Burke W. Griggs, *Groundwater Law and Management: The Asia (IWMI)-Kansas Program*, 41 CREIGHTON L. REV. 315, 332 (2008).

211. *2011 Active Points of Diversion – Groundwater*, KAN. GEOLOGICAL SURVEY, *available at* http://www.kgs.ku.edu/HighPlains/HPA_Atlas/Water%20Rights%20and%20Water%20Use/index.html#2011%2520Active%2520Water-Right-Permitted%2520Points%2520of%2520Diversion%2520-%2520Ground%2520Water.jpg (Kansas groundwater atlas showing locations of 39,506 active groundwater points of diversion, primarily above the Ogallala-High Plains Aquifer).

212. KANSAS DEPARTMENT OF AGRICULTURE, DIVISION OF WATER RESOURCES, FACT SHEET: INVESTIGATING IMPAIRMENT COMPLAINTS 2 (Apr. 2009), http://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/impairmentinvestigations.pdf?sfvrsn=2.

213. KAN. STAT. ANN. §§ 82a-716, -721a (2013).

214. File v. Solomon Valley Feedlot, Inc. (Mitchell Co., Kansas, No. 8831, Nov. 29, 1972); Garetson Brothers v. American Warrior, Inc. (Haskell Co., Kansas, No. 12-CV-9, 2012).

215. *See, e.g.*, 1956 REPORT, *supra* note 125, at 9.

predictably, there is the creature awakened by Garrett Hardin in 1968, the "tragedy of the commons."[216] Depending upon the audience and the occasion, it can speak about groundwater using the vocabularies of economics and political science,[217] as well as law.[218] Yet the Kansas variety of the tragedy is a peculiar one: unlike more commonly studied states such as California and Texas, senior groundwater right holders in Kansas have discrete and quantified rights, and they can eject and enjoin juniors who impair their rights.[219] In theory, prior appropriation "limits individual use and produces a relatively broad and stable distribution of water use opportunities."[220] In practice in Kansas, the reality of over-appropriation complicates the analysis considerably. Yet sixteen impairment complaints out of nearly 40,000 groundwater rights? That is not a tragedy; it seems more like a farce.

Second, there is that darling of the law and economics movement, the Coase Theorem.[221] This theorem candidly assumes that transaction costs are zero,[222] and holds that a change in the rule of liability—in this case, the laws and regulations that give senior water rights holders the ability to hold juniors liable for impairment—will not affect the allocation and use of resources, either in water, money, or other resources. As applied to western water rights, Coasean reasoning would appear to conclude that making a junior water right owner liable for his impairing a senior right would not cause the junior to reduce his water use. The junior, who could be shut down or held liable for impairment, has a legal incentive to deploy all economically justified measures to keep his water use within the limits of his permit. But according to Coase, even if the chief engineer did not shut the

216. Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1243–48 (1968), *available at* https://www.sciencemag.org/content/162/3859/1243.full.

217. A most notable scholar in these related fields is the late Elinor Ostrom. *See, e.g.*, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1990). A more recent work that relies upon Ostrom's approach for an optimistic appraisal of Kansas water management (at least in the interstate context) is EDELLA SCHRAGER AND WILLIAM BLOMQUIST, EMBRACING WATERSHED POLITICS 156–59 (2008).

218. *See, e.g.*, Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711, 722–23 (1986) (discussing the impact of legal ownership rights on certain properties that are open for public use); Barton H. Thompson, Jr., *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241, 249–53 (2000) (discussing the tragedy of the commons in the context of groundwater shortages). For an early discussion of the subject, see Samuel C. Wiel, *Natural Communism: Air, Water, Oil, Sea, and Seashore*, 47 HARV. L. REV. 425 (1934).

219. KAN. STAT. ANN. §§ 82a-701(f), 82a-717a (2012).

220. Tarlock, *Rule, Principle, or Rhetoric?*, *supra* note 109, at 887.

221. Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 1–44 (1960).

222. *Id.* at 15.

junior down, or even if a court did not find the junior liable for damages, the senior water right holder—the victim of a water rights "trespass" by the junior—would still pay the junior to reduce his water use so that it did not impair the senior right. Theoretically, market forces would thus internalize the costs of regulation, regardless of how the law determines impairment.[223]

There are numerous other explanations for such apparently irrational behavior, so let us dispense with the least credible ones first. There is the explanation that groundwater irrigators do not have an accurate understanding of the water rights they have in the first place. Such an explanation may be possible in riparian states or western states whose groundwater codes do not require metering or otherwise condone such uncertainty, but in Kansas such an explanation is demonstrably false and legally indefensible: vested water rights must be quantified and approved,[224] and post-1945 water right certificates specify and limit their amounts, rates, and locations.[225] There is the explanation that Kansas irrigators are not aware of the problem of depletion and impairment. Given the technological and financial sophistication of most Kansas irrigators, the legal requirement to report their annual pumping amounts,[226] and the common awareness of groundwater depletion,[227] this explanation can at best apply only to a small set of unusually obtuse irrigators. There is the explanation that defending rights—either through an administrative impairment action or a civil lawsuit—costs more than such a defense is worth. Given both the low expense of an impairment investigation and the substantial difference in the value between land with water and land without it, this defense also makes little sense.[228]

The better explanations evoke comparisons with the legal situation facing California miners in the mid-nineteenth century. Because of their water situation, Ogallala irrigators in Kansas do not see much utility in the enforcement capabilities of the water law they have received—in this case, the sometimes crystalline, other times muddy, tools of prior appropriation.[229]

223. *Id.* at 8. My characterization of the Coase Theorem in this paragraph relies upon ROBERT C. ELLICKSON, ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES 2 (1991).

224. KAN. STAT. ANN. § 82a-704a (2012).

225. *Id.* § 82a-701(f) (Supp. 2012).

226. *Id.* § 82a-732 (2012).

227. *See, e.g.*, PERRY, *supra* note 20, at 1; Tarlock, *Future of Prior Appropriation*, *supra* note 109, at 770.

228. The administrative procedure for an impairment investigation does require the complainant to submit a report prepared by a licensed well driller, a professional engineer, or a licensed geologist. KAN. ADMIN. REGS. §§ 5-4-1(b)(2)(A), 5-4-1a(a) (2010).

229. For the crystal, see KAN. STAT. ANN. §§ 82a-706b, -716 (2013); for the mud, see KAN.

While they continue to operate under a comprehensive prior appropriation regime for both groundwater and surface water, their response to this comprehensiveness has largely been one of avoidance. That avoidance can have good reasons. A causal connection between an impairing junior groundwater right and an impaired senior groundwater right can be difficult to establish.[230] It is much more difficult to assign impairment in a groundwater-dominated system than it is in a surface water system.[231] Is the impairment beyond a reasonable economic limit?[232] This question does not produce a prompt answer. Prior appropriation in a surface system has immediate and discrete consequences; but in a groundwater-dominated system, its consequences are uncertain, and potentially too extreme to consider. Making a groundwater call can have greater impacts than making a surface water call: protecting a senior groundwater right at its full authorized quantity may require that many nearby junior rights be shut down, and for a long time. Groundwater irrigation communities in Kansas are acutely aware of this potential consequence, which may explain why so few irrigators have brought impairment complaints. Strict enforcement of priorities in a non-renewable groundwater system raises fundamental questions of fairness,[233] and can seem "harsher and less just than a system based upon the idea of proration."[234] The result is that they are deliberately avoiding the tools of prior appropriation, and effectively sharing the water shortage.

Having avoided the available legal tools to protect their senior rights, irrigators have developed alternative methods to avoid, or at least delay, the consequences of administration by priority. Irrigators who pump from the same declining aquifer area know the relative priorities within it, and they know their rights. Using this knowledge, they can employ contracts with other irrigators to forestall the legal effects of a shortage. Juniors (who otherwise might be cut off as the result of an impairment investigation) make arrangements with senior water right holders (who otherwise might initiate one). These arrangements can be as complex as the parties require, and can include waivers of legal claims (including the right to make a priority call), non-diversion agreements, water-supply agreements, financial

ADMIN. REGS. § 5-4-1a (2010).

230. Tarlock, *Rule, Principle, or Rhetoric?*, *supra* note 109, at 899–901. For reasons set forth more fully below, the author does not share Professor Tarlock's categorical assertion that "priority does not work for nonrenewable resources such as ground water aquifers." *Id.* at 900.

231. *See* KAN. ADMIN. REGS. § 5-4-1 (2010).

232. *See* KAN. STAT. ANN. §§ 82a-711, 82a-708b (2013).

233. Tarlock, *Rule, Principle, or Rhetoric?*, *supra* note 109, at 902.

234. 1956 REPORT, *supra* note 125, at 37.

settlements, and land and water-right purchase options, to name a few.[235] Prior appropriation works to some extent in this context: as a threat to prod private contractual arrangements that resolve otherwise looming conflicts over a water shortage; as a risk allocation mechanism; and as a signifier of value—the more senior the priority, the stronger the bargaining position at contract.[236] On one hand, these arrangements appear to validate the Coase Theorem: owners have contracted their way to positions of mutual advantage, without the chief engineer intervening to protect the seniors. Yet on the other hand, the theorem appears to have it backward: as applied to water rights, the theorem dictates the opposite arrangement, by which seniors would pay juniors.[237]

Regardless of theory, the aquifer itself is in permanent decline, the shortage is not temporary, and so the agreements are inevitably impermanent. Except for cases where water rights owners have contracted away the defense of their rights forever—effectively exchanging the extinction of their water rights for a price—the viability of these contractual arrangements, like the water rights themselves, remains dependent on the water being available to pump. Irrigators who engage in these contracts are buying access to water, protection from liability, or both; perhaps more importantly, they are buying time. Some such contracts could arguably be deniable by the chief engineer on the grounds that they violate the public interest; but for now, DWR actively encourages them.[238]

These contractual arrangements assume a shared concern about the long-term future of the water supply. That assumption, however, may not be as widespread as one might think. Irrigators faced with the problem of multiple declining wells can consolidate these "crippled" wells into a common irrigation system.[239] This consolidation enables the further depletion of the groundwater supply, by combining individual wells that are not capable of viable irrigation on their own (and that otherwise might be retired or rededicated to less water-intensive uses) into a system that is at

235. In water law parlance, a "non-diversion agreement" is an agreement not to pump or otherwise divert water from the source of supply. If such an agreement concerns an area in Kansas that is closed to new appropriations of groundwater, a non-diversion agreement could be perpetual, since groundwater rights are no longer subject to abandonment in such areas. KAN. STAT. ANN. § 82a-718(e) (2012).

236. Tarlock, *Rule, Principle, or Rhetoric?*, *supra* note 109, at 901–02; Hobbs, *Protecting Prior Appropriation Water Rights*, *supra* note 111, at 17.

237. *See supra* text accompanying notes 221–223.

238. *See supra* note 223.

239. *See, e.g.*, LEMA Order, *supra* note 170, at 10–11 (reporting the comments of Mr. Gary Ross).

least temporarily viable, pumping water at the well's (declining) maximum yield capacity.[240] Even with the exhaustion of large portions of the Ogallala in sight, continued irrigation at maximum levels is still viewed as rational behavior, based on the economic expectations of the groundwater irrigation community, as measured by gross revenues, purchases of agricultural equipment and inputs, and tax revenues, all of which are higher on irrigated ground than on dry land ground. Between the commonly perceived dictates of the discount rate and the difficulty of making an "intertemporal tradeoff" by which irrigators forgo present levels of pumping to avoid uncertain future losses,[241] water left in the ground is still largely believed to translate to money left on the table.

On the other, depleted side of the groundwater revolution, we have at least three serious problems with a groundwater right that draws from the non-renewable supplies of the Ogallala. First, we have a problem of legal description: such a right does not necessarily mean what the law says it means. Kansas law proclaims that it is a real property right, and the clear implication of that statutory definition is one of permanence, rather than a temporary real property right such as a lease, or a right such as a license.[242] Yet the water supply upon which that property right depends is not permanent; in many areas of the Ogallala, it is effectively gone.[243] That depletion has forced changes, many of them permanent, in the attributes of many Kansas Ogallala water rights. Their typical authorized annual quantity and pump rate have declined, often far below their certified quantities; and their authorized acreage has shrunk, in proportion to the depletion of the well. In response, many irrigators have changed the locations of their wells to a more productive part of the aquifer, a tactic known as "chasing water," and which meets with opposition from neighboring water rights owners who may suffer impairment as a result.[244] As certain wells decline in their productivity and become "crippled," their owners have connected them with other such wells, combining them to irrigate fewer and fewer parcels.[245] As

240. An industry standard for a viable irrigation well dedicated to irrigating corn in Kansas is 400 gallons per minute. *See, e.g.*, *Vision for the Future of Water in Kansas*: *Frequently Asked Questions (FAQs)*, KAN. WATER OFFICE, http://www.kwo.org/50_Year_Vision/Doc_FAQs_50YRVision_110513_ki.pdf.

241. Thompson, *supra* note 218, at 262–65.

242. *See, e.g.*, KAN. STAT. ANN. § 82a-701(g) (2009) (water right a real property right); *id.* § 82a-718 (conditions under which a water right can be abandoned); *id.* § 82a-705 (water rights cannot be obtained by adverse possession).

243. *See supra* notes 17–18.

244. *See, e.g.*, LEMA Order, *supra* note 170, at 19.

245. *See supra* note 239.

a consequence of depletion and owners' response to it, a water rights certificate can be a fundamentally misleading document, promising far more in "paper water" quantity than the wet water that the aquifer can actually deliver, and containing layers of administrative changes that require forensic expertise to understand. In terms of quantity and acreage, the certificate of appropriation for a Kansas Ogallala water right may be as misleading and defective a document as the decreed water rights on the Cache la Poudre River were in 1902.[246]

That raises the second problem, one of doctrine. Prior appropriation, as adapted to Kansas groundwater rights since 1957, matters less above the Ogallala than it does elsewhere in Kansas, and it does not appear to work as an enforcement mechanism there. As described above, irrigators and other large water users with senior rights are not deploying their priorities to protect themselves from water shortages. They are not requesting IGUCAs. They are filing almost no impairment complaints with DWR. They are not suing junior owners whose pumping is allegedly impairing their senior rights. And when groundwater pumpers do come together to achieve a coordinated plan of water conservation, such as the Sheridan County 6 LEMA, they consistently assert that priority should confer no benefits: all irrigation rights should be reduced the same, regardless of priority.[247] The development of groundwater across western Kansas from the 1950s through the 1970s produced the expectation that the quantity of water authorized under a water right should correspond the irrigation requirements of the appurtenant land.[248] Where priority does not appear to matter (except, importantly, in the context of an IGUCA and as a threat in certain contractual situations), the result for Kansas, a half century later, may not be all that practically different than simply granting water rights or well permits in proportion to the amount of land irrigated—an approach effectively similar to that of states such as Oklahoma and Nebraska, Ogallala states which do not extend the doctrine of prior appropriation to groundwater.[249]

Third, we have a property problem, one of regulatory uncertainty. Most owners of groundwater rights over the Ogallala in Kansas know all too well

246. MEAD, *supra* note 33.

247. *See supra* note 179 and accompanying text. However, the LEMA Order expressly provides that nothing shall preclude a water right owner from requesting administration of water rights or from bringing an impairment complaint. LEMA Order, *supra* note 170, at 38–39.

248. KAN. ADMIN. REGS. § 5-5-12 (1994) (net irrigation requirements by county); *Id.* § 5-24-2(c)(2)(A)(ii) (2004) (net irrigation requirements for corn as the baseline for calculating available water supply).

249. *See supra* note 75. Professor Tarlock has made the same observation. Tarlock, *Rule, Principle, or Rhetoric?*, *supra* note 109, at 900–01.

that their water supply declines every year. However, it is unclear what property protections they can rely upon; they lack accurate knowledge of what they own, and such knowledge is an important stick in the bundle of rights that make up a Kansas water right. This uncertainty is partly the result of the nature of water rights regulation in the context of non-renewable groundwater.[250] At one, albeit theoretical extreme, there is the threat of total water rights regulation: the administration of water rights by strict priority, shutting off many junior rights in a water neighborhood to protect a few senior rights. At least one irrigator with senior rights has recently decided to forgo such administrative action, and has so far successfully pursued a civil action against a junior water right whose operation has impaired his rights.[251] At the same extreme is the threat of a water rights adjudication: a court could take the hydrological evidence of groundwater pumping and depletion in a particular area, and then use it to correct the growing imbalance between "paper water," or the authorized quantities of all of the water rights certificates in that area, and the actual water supplies remaining. Such a correction would likely produce a similar result as administration by priority, wherein a few senior water rights retain all of their original authorized quantities at the expense of many junior rights. These are the pure and effective regulatory possibilities, available to those who seek them. But because priority is not seen as equity over the Ogallala,[252] and because irrigators understand the force of such threats, Kansas law has made them unlikely.[253] As a consequence, a straightforward application of prior appropriation to address the permanent drought of the Ogallala is a rational but politically offensive impossibility.

At the other extreme is the threat of total non-regulation. Owners may decide not to protect their water rights.[254] With some notable exceptions, such as the contractual methods discussed above, water rights owners have largely made this decision so far. At the collective scale of the Sheridan

250. For a different treatment of the problem of uncertainty, *see* Thompson, *supra* note 218, at 258–62.

251. *See* Garetson Brothers v. American Warrior, Inc. (Haskell Co., Kansas, No. 12-CV-9, 2012).

252. LEMA Order, *supra* note 170, at 18; *contra* Frank J. Trelease, *State Water and State Lines: Commerce in Water Resources*, 56 U. COLO. L. REV. 347, 349 (1985).

253. Kansas is the only western state where the Division of Water Resources is subordinate to the Department of Agriculture. KAN. STAT. ANN. § 74-606b (Supp. 2011). Some of the most important decisions of the chief engineer, a classified employee under the Kansas civil service laws, are subject to administrative review by the Secretary of Agriculture, a political appointee. *Id.* § 82a-1901 (2013).

254. *See* Eric T. Freyfogle, *The Tragedy of Fragmentation*, 36 VAL. U. L. REV. 307, 308–22 (2002).

County 6 LEMA, they have decided to do so only on a temporary basis.[255] With the exception of GMD No. 4, no other GMD has yet to initiate a LEMA. The State may effectively condone such a collective decision; so far, the chief engineer has neither effected priority administration nor initiated proceedings for an IGUCA anywhere over the Ogallala. In short, the extreme of non-regulation is an all too real possibility, borne of the collective inaction by water rights owners, GMDs, and DWR. It is an equally rational, equally offensive possibility.

What is the difference between the extreme threat of total regulation and the opposite extreme threat of total non-regulation? It is a matter of time. If the tools that the KWAA provides to protect water rights are left unused, then the groundwater crisis will take care of itself. Ultimately, in the context of non-renewable groundwater, we have a situation that is importantly different than that of the classical western water right. Experts have long known that the different hydrological properties of non-renewable groundwater required an adjustment to the principles and regulation of a classical western water right.[256] But now that we are in the age of permanent depletion, that adjusted property interest in non-renewable groundwater has become a permanently damaged interest. Consider the following contrast.

The owner of a classical western water right knows what she owns, and she knows upon what she can rely. She knows that conditions are variable—some years are drier than others—but that over the long term, the water supplies upon which her water right depends will not appreciably change (aside from the impacts of climate change). In wet years, she can obtain the full water supply to which her right entitles her. In normal and drier years, she can depend upon her priority, and that priority is meaningful. It affects the value of her property interest, because it affects her option to make a priority call. She can rely upon seniors to make such a call, she can be relied upon to make one herself, and she can rely upon the historical record of water supply availability and water rights administration in her water neighborhood. As a result of these reliable components of her water right, the owner of a classical western water right knows to a useful degree of accuracy just how much water she can rely upon under variable circumstances.

By contrast, the owner of an Ogallala right knows less about his right, and he can depend less upon the protections it claims to confer. He knows that his situation is most decidedly not like that of a surface water drought,

255. LEMA Order, *supra* note 170, at 20–24.

256. 1956 REPORT, *supra* note 125, at 91.

whose temporary shortages result from abnormally low precipitation. The aquifer is declining and permanently so. The temporal variability that applies to his surface water counterpart simply does not apply: the owner of a groundwater right has been using approximately the same amount of water in wet years as he has in drought years, because his Ogallala supply is underground, non-tributary, and therefore drought-proof. Indeed, precipitation may not even figure into his irrigation scheduling.[257] But the aquifer is declining: he is facing a permanent water shortage. In this very different shortage situation—that of permanent drought—the owner of an Ogallala right cannot really depend upon his priority, because that place is not really meaningful. His priority affects his property interest less directly because a priority call in his neighborhood may not secure him water when he needs it, given the lag time between cutting off junior well pumping and reducing impairment as a result. His priority is also less meaningful because the regulatory outcomes of making a priority call can be slow, unclear, and unpredictable. Outside of contracts with others in his water neighborhood, prior appropriation is not a reliable threat—and it is one to which he and his neighbors are probably hostile. The only records upon which he can rely are the ever-shrinking quantities recorded in his water use reports, and the all-too linear increase in his well's depth to water.

IV. REFORMING WATER RIGHTS IN THE AGE OF PERMANENT DEPLETION

The permanent depletion of the Ogallala has degraded the water right which depends upon its supplies into a substantially inferior property interest as compared to its legal (and legally coequal) antecedent—the classical western water right, whose source of supply is annually variable but nonetheless permanent.[258] While this distinction has been recognized in statute in Colorado,[259] Kansas has approached the situation indirectly. It has enacted the statutory mechanisms of IGUCAs and LEMAs to address the problem of groundwater depletion on a collective scale,[260] and it has adopted regulations tailored to the distinctive challenges of administering local as opposed to regional, or renewable as opposed to non-renewable, supplies of

257. *See, e.g.*, Kansas v. Nebraska, No. 126 Orig., Pre-Filed Testimony of Kansas Expert Dr. Norman L. Klocke, P.E., July 19, 2012, 12–14 (on file with author) (opining on the variability and practical effectiveness of precipitation during the growing season).

258. *See supra* notes 203–09.

259. *See supra* text accompanying notes 142–49.

260. *See supra* text accompanying notes 163–80.

groundwater.[261] Yet most statutory and regulatory attempts to modify the treatment and administration of groundwater rights have not really confronted the problem of permanent depletion. And while most Kansas groundwater rights certify what has become over time a hydrologic fiction, most of their owners have decided not to engage Kansas law to protect these rights in the face of permanent depletion. Because the groundwater right, its owners, and its regulatory structure have all responded to depletion in this indirect and evasive manner, the rate of that depletion has accelerated. Candor thus compels us to reconsider the groundwater right itself: in obedience to the actual hydrological bases upon which the right depends, in accordance with its actual rather than perceived legal status, and in deference to the cultural, political, and administrative realities that have shaped its contours and conferred legitimacy upon its regulation.

Taking the long view of western water law takes us back to the genesis of the KWAA itself, seventy years ago. Within that perspective, it becomes clear that the same four problems which Kansas faced in 1944—of power, of doctrine, of quantification, and of the public—have returned with greater potency.[262] This historical view produces four related historical observations which, in turn, recommend certain legal and policy reforms to address the permanent depletion of the Ogallala.

The first historical observation concerns power. The history of the exercise and regulation of the property right in groundwater provides a truer portrait of that right than its formalistic reflection in the law alone.

The history of the KWAA is apparently clear and consistent. The Kansas Legislature and Kansas courts have mostly maintained and upheld both the centralized administrative structure of DWR and the power and jurisdiction of the office of the chief engineer over all of the waters of Kansas. This was a fundamental purpose behind the KWAA, in response to the political and legal crises of the 1940s. The groundwater revolution produced statutory changes, most notably in 1957, which modified how the chief engineer granted new water rights and protected existing rights, but they did not restrict the powers of the office. The GMD Act recognized the arrival of distinct groundwater publics across the Ogallala, and made them active partners with DWR in groundwater policy; but unlike Colorado and Nebraska, Kansas did not modify the authority of DWR and the chief engineer. The onset of groundwater depletion starting in the late 1960s

261. *Compare, e.g.*, KAN. ADMIN. REGS. § 5-4-1 (2010), *with* KAN. ADMIN. REGS. § 5-4-1a (2010).

262. *See supra* text accompanying notes 78–106.

motivated local groundwater publics to develop the IGUCA statutes. Compared to the IGUCA statutes, the LEMA statute grants greater control to local groundwater publics in designing a management plan; but they cooperate with the chief engineer in producing that plan, and the chief engineer retains the same enforcement authority over a LEMA order as he does over an IGUCA order, as the local groundwater publics intended.

But the apparent and formal consistency of this legal power is potentially deceptive, and should not be confused with its exercise or lack thereof. The past four decades have shown that the exercise of that power largely depends upon the relevant hydrologic context. In the context of alluvial and renewable groundwater, the administration of water rights by priority (whether discretely, or collectively as in an IGUCA) protects senior rights at the expense of junior rights until conditions improve—whether by an increase in precipitation or a reduction in diversions. In this context, the power of the chief engineer has been critical in restoring some degree of integrity to the hydrologic systems upon which senior water rights depend, including senior rights that protect groundwater-dependent ecosystems; and its exercise in this context has been regular, substantial, and mostly unchallenged.[263] By contrast, conditions will almost certainly never improve sufficiently to replenish non-renewable groundwater. From the 1950s through the 1970s, the chief engineer exercised his statutory duty to grant water rights where water was available at the time;[264] and because far more water rights were approved than the aquifer can sustain, the exercise of this authority made the problem of groundwater depletion irreversible. Owners of senior water rights did not challenge those approvals, because impairment in the Ogallala context took years to become manifest. Regulatory action over the Ogallala has remained confined mostly to adopting regulations that attempt to foreclose future water rights[265] and place limits on how existing

263. *See, e.g.*, FINDINGS, CONCLUSIONS, AND ORDER OF DAVID L. POPE, CHIEF ENGINEER, DIVISION OF WATER RESOURCES, KANSAS STATE BOARD OF AGRICULTURE, IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES 1–2, 16, 22–23 (1992), *available at* https://agriculture.ks.gov/docs/default-source/igucas/wc1992.pdf?sfvrsn=2. For a complete description of the Walnut Creek IGUCA, see Peck, *supra* note 131, at 451–52. *See also* note 167, *supra*. For groundwater-dependent ecosystems in general, see Barton H. Thompson Jr., *Beyond Connections: Pursuing Multidimensional Conjunctive Management*, 47 IDAHO L. REV. 273 (2011).

264. KAN. STAT. ANN. § 82a-711(a).

265. KAN. ADMIN. REGS. §§ 5-3-10, 5-3-11 (DWR), 5-21-4 (GMD1) (safe yield requirements); *id.* §§ 5-21-3 (GMD1), 5-23-3 (GMD3), 5-24-3 (GMD4) (well-spacing requirements); *id.* §§ 5-3-26 (DWR), 5-23-4, 5-34-4a, 5-23-4b (GMD3) (closing townships and counties to new groundwater rights).

water rights can be changed.[266]

Beyond these regulatory responses, the GMDs and DWR have done little to impose reductions on current groundwater pumping. In this different hydrologic context, many irrigators view administration by priority as an arbitrary and regulatory overreach rather than the orderly protection of private property rights. That perception is largely grounded in the fact of the Ogallala's over-appropriation. As a consequence, administration by priority over the Ogallala has been exceptionally rare, and IGUCAs have been nonexistent. One could easily view and probably should view four decades of depletion without a direct regulatory, legal, or political response as a major policy failure. But such a judgment is as obvious as it is unhelpful, for it obscures what that inaction reveals about the political culture of Ogallala irrigators. That culture accepts some regulatory actions as legitimate but not others, even though all such actions are entirely legal and many of them are hydrologically imperative. For better and for worse, the chief engineer has understood this distinction between legitimacy and illegitimacy; for worse, the wider public has paid little attention to it at all. Water policy initiatives that have not engaged the political and cultural realities of groundwater irrigation in Kansas have produced little more than failure and further inaction.[267]

In light of this impasse—an impasse not over what is legal and necessary, but over what is legitimate—the LEMA statute and its first application in northwest Kansas provide some guide to how Kansas irrigators view the legitimate use of regulatory power over non-renewable groundwater on a wide scale. They recognize that significant reductions in pumping are necessary to extend the life of the aquifer. They are willing to accept such reductions, but with some important provisos that deviate significantly from the KWAA. The reductions for irrigation rights should apply equally, without regard for priority; higher-value uses of water such as municipal, domestic, recreational, and industrial use should receive lesser reductions; and the penalties for violating a LEMA order should be higher than usual. These are the principal elements of the local management plan. The Sheridan County 6 LEMA provides an example of how water rights owners have "achieve[d] cooperative outcomes not by bargaining from legally established entitlements" such as priority, as the Coase Theorem might suppose, "but rather by developing and enforcing adaptive norms of

266. *Id.* § 5-21-5 (GMD1); *id.* § 5-24-6 (GMD4) (chasing water and crippled wells into a battery).

267. *See* Peck, *supra* note 130, at 505–06 (describing the "two pool" regulatory approach and its failure due to opposition from western Kansas).

neighborliness that trump formal legal entitlements."[268] And unlike the sort of resolution that Coase predicted—mutual advantage without state supervision—that plan depends upon state authority, because the irrigators specifically sought the chief engineer's supervision and enforcement. The management plan achieved a remarkable level of support thanks largely to the technical authority of state entities—the Kansas Geological Survey, irrigation experts and economists at Kansas State University, and the logistical expertise of both DWR and GMD No. 4. It depends upon the support of the chief engineer as a threshold matter, and upon the regulatory authority of his office and his water commissioner to enforce. In short, the Sheridan County 6 LEMA may provide a blueprint for how to achieve meaningful reductions in groundwater depletion in Kansas. It may also reveal a lasting change in the political culture of groundwater irrigation.

It is too soon to tell, and political culture is local. Optimists may point to the Sheridan County 6 LEMA in GMD No. 4, and to discussions in GMD No. 1 to establish a district-wide LEMA.[269] Pessimists may point to the temporary duration of the Sheridan County 6 LEMA.[270] They will point to the idea of building a pipeline project that would divert water from the Missouri River in northeast Kansas and pump it over 300 miles and 3,000 vertical feet uphill to the high plains of western Kansas[271]—a plan redolent of earlier trans-basin schemes[272] and as ambitious as the Central Arizona

268. ELLICKSON, *supra* note 223, at 4, 123–206.

269. WESTERN KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 1, 40TH ANNUAL MEETING (2013), *available* at http://www.gmd1.org/ACTIVITIES_2013_Annual_Meeting_FINA_take_Mar19aWEBSITE.pdf (last visited Mar. 20, 2014).

270. *See* LEMA Order, *supra* note 170, at 22–23.

271. *See, e.g.*, MARK RUDE, EXECUTIVE DIRECTOR, SOUTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 3, KANSAS GROWS WHERE WATER FLOWS: THE KANSAS AQUEDUCT PROJECT (KAP), *available at* http://www.gmd3.org/pdf/2013/2013FallKDHEAqueductDiscussion.pdf (last visited Mar. 12, 2014).

272. *See* JOHN OPIE, OGALLALA: WATER FOR A DRY LAND 274–86 (2d ed. 2006) (summarizing various plans to divert water from outside the Ogallala for purposes of aquifer recharge). The most ambitious of these plans, the North American Water and Power Alliance (NAWAPA) plan, envisioned diverting 152 million acre-feet of water per year—more than the annual flow of the Mississippi River—from the large rivers of northwest Canada, and then distributing that water across the West. The NAWAPA plan's cost estimate ran to $300 billion in 1982 dollars ($1.174 trillion in 2014 dollars), "roughly equivalent . . . to the annual defense budget of the United States [in 1977] . . . ." *Id.* at 279. The 1982 High Plains Study commissioned by the United States Department of Commerce explored the feasibility of importing water to the High Plains along four routes from the Missouri and Mississippi Rivers, as identified by the U.S. Army Corps of Engineers. The estimated cost of piping water along "Route B," from the Missouri River in northeast Kansas (near St. Joseph, Missouri) to west-central Kansas, ranged from $226 to $569 per acre-foot per year in 1977 dollars ($884 to $2,226 per acre-foot per year in 2014 dollars respectively), and did not include the cost of distributing the water from the pipeline terminals to individual farms, making "outside-

Project on the Colorado River.[273] Until such a pipe dream becomes reality, there is the LEMA process, which harnesses the power of Kansas groundwater communities, acting through their GMDs, together with the power of the state over its groundwater resources, acting through DWR and the chief engineer. Given the history of Kansas groundwater, that is progress. The multi-million acre-foot question is whether the GMDs will exercise that power. If they do not, they may secure a reputation in groundwater management akin to that of "a fox guarding the chicken house."[274]

A second and similar historical observation concerns custom and its relationship to legal doctrines in water. The customary use of these doctrines by water rights owners and the state, not their mere codification, determines their meaning in practice. Policy makers should therefore consider any amendment of these doctrines with caution, and with a clear understanding of their interdependence and the regulatory and transactional contexts in which they cooperate.

Consider two principal doctrines of western water law, prior appropriation and beneficial use. Like other western states, Kansas fuses these doctrines.[275] The doctrine of prior appropriation has been the law of western Kansas for nearly 150 years, and the law of all of Kansas since 1945. Such was the belief in its legitimacy that not one irrigator challenged it along the Arkansas River between 1886 and 1945.[276] Such was the belief in its value in defining, quantifying, and protecting water rights that it was adopted statewide in 1945.[277] In a system of surface water rights and alluvial groundwater such as the Arkansas River, prior appropriation and beneficial use can operate in relative harmony: because a dry year makes beneficial use impossible for all rights, priority administration enables the full beneficial use of at least some senior rights. Yet the groundwater revolution pitted these doctrines against each other. As described above, strict application of the doctrine of priority would have greatly retarded and

water costs prohibitive." *Id.* at 286. "Route B" is similar to the route envisioned by the Kansas Aqueduct Project, note 271 *supra*.

273. For the Central Arizona Project (CAP), see SAX, THOMPSON, LESHY, & ABRAMS, *supra* note 14, at 698–99 (describing the $4.7 billion (as of 2000, or $6.47 billion in 2014 dollars), 1.5 million acre-feet, "highly subsidized public works project" whose cost made irrigation water from the CAP unaffordable to Arizona irrigators). Irrigation water from the CAP has a real cost of $2,000 per acre-foot per year in 2000 ($2,753 in 2014 dollars). OPIE, *supra* note 272, at 279.

274. Peck, *supra* note 131, at 457.

275. KAN. STAT. ANN. §§ 82a-706, 82a-707(a).

276. *See* 1944 REPORT, *supra* note 24, at 45.

277. *See supra* text accompanying notes 81–114.

even prohibited irrigators from putting the waters of the Ogallala to beneficial use; in response to that recognition, the KWAA was amended, and regulations adopted, that effectively place the beneficial use doctrine over that of prior appropriation. Kansas is no outlier in this regard; across the West, the duty to put groundwater to beneficial use can all too easily displace the duty to enforce the prior appropriation doctrine.[278]

Yet prior appropriation still retains value over the Ogallala. It quantifies rights, and frames the problem of over-appropriation more clearly than it would be framed otherwise.[279] It is a familiar doctrine, and one that is used. Irrigators across the Ogallala have not directly employed it in the regulatory arena, to initiate impairment investigations and priority calls. Yet they have employed it indirectly as a regulatory tool—by assigning value to priority as a risk-allocation mechanism in contractual agreements intended to avoid such investigations and calls. And in the transactional arena, the priority of a right to use Ogallala groundwater still determines much of its market value. Priority remains a valid regulatory backstop and a signifier of value.

As for the doctrine of beneficial use, both the well-known fact of the Ogallala's permanent depletion and our appreciation of that depletion as a serious problem raise the question of whether current, highly depleting beneficial uses of water remain reasonable. The amount of water beneficially used under a water right must be reasonable: this is an important and uncontroversial corollary of the beneficial use doctrine.[280] Similarly, a water right does not entitle its owner to waste water.[281] Just as the doctrine of beneficial use has evolved over time to embrace new uses that were technologically impossible,[282] economically unfeasible,[283] or culturally marginal[284] for earlier generations of water users, the principle of reasonable

278. *See* G. EMLEN HALL, HIGH AND DRY: THE TEXAS-NEW MEXICO STRUGGLE FOR THE PECOS RIVER 119–120 (2002) ("Both principles [i.e., beneficial use and prior appropriation] were equally embedded in the New Mexico State Constitution of 1912. But State Engineer Steve Reynolds believed in the first principle and disliked the second so much that he disregarded it.").

279. 1956 REPORT, *supra* note 125, at 37 (prior appropriation "establishes the character, extent, and limits of water rights with greater clarity and certainty than the other doctrines").

280. KAN. STAT. ANN. § 82a-707(e) ("Appropriation rights in excess of the reasonable needs of the appropriators shall not be allowed."). *See also* Schodde v. Twin Falls Land and Water Co., 224 U.S. 107, 118 (1912) (the reasonableness of a beneficial use of water under a water right is an essential attribute of that right).

281. KAN. ADMIN. REGS. § 5-1-1(kkkk)(4) (defining waste as "the application of water to an authorized beneficial use in excess of the needs for this use"); *Id.* § 5-5-7 (prohibiting waste and authorizing the chief engineer to suspend use of a water right pursuant to a finding of waste).

282. *Id.* § 5-1-1(o)(8) (recognizing artificial aquifer recharge as a beneficial use).

283. *Id.* §§ 5-1-1(o)(5), 5-1-1(qq) (recognizing the industrial use of secondary and tertiary oil recovery as a beneficial use).

284. *Id.* §§ 5-1-1(6), 5-1-1(mmm) (recognizing recreational use as a beneficial use, including

use is not a fixed one. Rather, it is a dynamic principle that has responded to changes in hydrology, technology, scientific information, water demand, and social and economic conditions.[285] The same goes for waste: "what is a beneficial use at one time may, because of changed conditions, become a waste of water at a later time."[286] And vice versa: in 1944, water that was permitted to flow toward the ocean, undiverted for beneficial use, was assumed to be water wasted.[287] Four decades later, such waters received statutory protection—but not against diversions by senior rights.[288] States now recognize the value of leaving water in the stream as a beneficial recreational use; the Colorado Water Conservation Board holds such instream flow rights on 8,000 miles of Colorado streams.[289]

Changes in water doctrine apply with equal force to groundwater. Growing corn across the Great Plains west of the 99th Meridian was a reckless idea for over a century, unless one's farm was located within one of the region's relatively few surface water irrigation districts. The revolutions in postwar agriculture changed that mindset. Groundwater irrigation systems and Ogallala supplies sprinkled water on demand across the Great Plains, and the law evolved to accommodate these higher levels of water use.[290] The green revolution in agriculture produced corn and soybean hybrids that could survive western conditions; innovations in fertilizer, pesticide, and herbicide chemistry produced higher and more reliable yields; and advances in biotechnology and genetics produced genetically engineered crops that reduce the need for applied chemicals. These innovations, alongside those of mechanized agriculture, enabled fewer and fewer irrigators to farm increasingly higher acreages. Efficiency gains in irrigation technology and more sophisticated methods of timing the application of irrigation water produced higher yields from the same amount of water. These advancements have produced large corn and soybean monocultures across the Ogallala, and their stakeholders and regulators have produced water regulations that assume a commensurately high level of water use.[291] What was inconceivable a century ago has become normal.

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use dedicated to fish and wildlife).

285. Envtl. Def. Fund, Inc., v. E. Bay Mun. Util. Dist., 52 Cal. App. 3d 828 (1975) (rev'd on other grounds) (stressing the need for flexibility in construing the law "to keep pace with the needs and transformations constantly taking place in our rapidly changing society").

286. Tulare Irr. Dist. v. Lindsay-Strathmore Irr. Dist., 45 P.2d 972, 1007 (Cal. 1935).

287. 1944 REPORT, *supra* note 24, at 52.

288. KAN. STAT. ANN. §§ 82a-703a, 82a-703b (establishing minimum desirable streamflows).

289. Hobbs, *supra* note 139, at 9.

290. *See supra* text accompanying notes 125–28.

291. *See supra* text accompanying note 132.

Precisely because of these changes, we remain bound, just as we were in 1855, to take notice of the condition of the country.[292] That condition—one of rapid and permanent groundwater depletion—dictates a conclusion that the present normalcy cannot endure. As the groundwater revolution expanded the scope of what was a reasonable use of water, the depletion of the Ogallala should force a contraction in that scope. Have current levels of irrigation become recognized as unreasonable or wasteful in light of the fact of depletion? If the state were to make such a finding, then the authorized quantity of the groundwater right could be reduced, in light of that recognition, to a less water-intensive but still beneficial irrigation use; and that reduction, properly implemented, should withstand a legal challenge as an unconstitutional taking of property under the United States and Kansas Constitutions.[293] No one can acquire a protectable property interest in the unreasonable use of water; while the determination of reasonable use depends on the circumstances of each case, it cannot be resolved in isolation from "statewide considerations of transcendent importance. Paramount among these we see the ever increasing need for the conservation of water . . . ."[294] As for waste, it has always applied differently to groundwater than it has to surface water: unused groundwater does not flow toward the ocean,[295] but stays in place, protected from evaporative loss and available for future beneficial use. Nonuse of non-renewable groundwater thus cannot amount to waste—a logical conclusion stressed by the most articulate opponent of the KWAA himself.[296]

Consider instead that the state, perhaps at the behest of those with interests in current levels of groundwater pumping, deems present levels of irrigation to be reasonable. If so, then the rapid depletion of the Ogallala must also be reasonable. These are not hypothetical positions; they are the

292. Irwin v. Phillips, 5 Cal. 140, 146 (1855).

293. *See* Peck, *supra* note 130, at 501–05, 509 (suggesting how reductions in water use that represent "reasonably necessary quantities for the type of use" would pass constitutional muster under a takings analysis). For a recent comprehensive survey of takings cases in groundwater that reinforces Professor Peck's view, see Dave Owen, *Taking Groundwater*, 91 WASH. U. L. REV. 253, 254 (2013) (arguing that "the application of a relatively mainstream version of takings doctrine, which treats groundwater rights as property but allows substantial government regulation of groundwater use, is both the most traditional and the most theoretically justifiable approach").

294. City of Barstow v. Mojave Water Agency, 5 P.3d 853, 864 (Cal. 2000). *Barstow* construed article X, § 2 of the California Constitution, which requires that "the waste or unreasonable use or unreasonable method of use of water be prevented . . . ." As such, it accords well with KAN. STAT. ANN. § 82a-707(e), which forbids appropriations in excess of the reasonable needs of the appropriator.

295. 1944 REPORT, *supra* note 24, at 52.

296. F. Arthur Stone & Sons v. Gibson, 630 P.2d 1164, 1175 (Kan. 1981) (Schroeder, C.J., dissenting).

implicit positions of the present.[297] Yet these present positions are irreconcilable with the longstanding status of a Kansas groundwater right as a permanent real property right. A water right that enables its owner to eliminate the source of water upon which that right depends cannot be a permanent real property right; it cannot even be a usufructuary one.[298] A policy determination endorsing current rates of groundwater depletion requires a proportionate demotion in the legal status of the groundwater right. This is not a policy position; it is a logical one.

A third historical observation concerns quantification. A primary goal in balancing prior appropriation, reasonable use, and other doctrines in western water law is to achieve a stable, reliable, and predictable property interest; yet without a definite and reliable quantification of both the groundwater right and the water supply upon which it depends, there can be little reliance upon it as a property right and little predictability in its regulation. This is not a doctrinal matter; hydrological and legal uncertainty about the future of the Ogallala is "the greatest single issue" facing western Kansas water users seeking reliable, long-term water supplies.[299] The inaccuracies and excesses of water claims under the prior appropriation doctrine during the nineteenth century produced absurd levels of over-appropriation that called out for administrative oversight.[300] The need to accurately quantify the relationship between available water supply and actual water rights motivated the repeal of the riparian doctrine in 1945.[301] Yet the 1957 amendments to the KWAA encouraged the chief engineer to postpone a true reckoning of that relationship, and he did, producing a degree of over-appropriation in groundwater that is as bad if not worse than the over-appropriation of western streams a century ago.

Given the extent of the Ogallala's over-appropriation and its depletion, the need seems clear for a return to the quantitative clarity that was briefly achieved between 1945 and 1957. Such a return should correct Kansas groundwater rights according to the reality of their available water supply, so that owners, buyers, and third parties can rely upon what water is actually reliable, rather than upon fictional quantities that the aquifer can no longer

297. *See, e.g.*, KAN. ADMIN. REGS. § 5-23-4a(b).

298. BLACK'S LAW DICTIONARY 1684 (9th ed. 2009) (defining "usufruct" as the right to use property "without damaging or diminishing it, but allowing for any natural deterioration in the property over time").

299. Ramsey, *supra* note 162, at 522.

300. *See supra* text accompanying note 67.

301. *See supra* text accompanying notes 88–93.

yield. A water right does not guarantee water,[302] but it is legally and factually predicated on the durable availability of the water supply.[303] Yet depletion has made much of that water permanently unavailable, and it has made the annual authorized quantities of Kansas groundwater rights permanently fictitious and misleading, undermining the central predicate of tens of thousands of real property rights. That is no way to run a legal regime for real property, as Kansas water experts recognized in 1944.

The fact of the Ogallala's depletion raises another quantification issue: the need for clarity in terms of time. The prior appropriation doctrine is backward-looking, favoring the oldest rights, which enjoy higher value because they are most reliable in times of shortage. The groundwater revolution looked forward instead, favoring the principle of beneficial use above the rule of priority, and neither groundwater irrigators nor the state engaged priority all that much as a regulatory device. But the present predominance of the beneficial use doctrine revives the issue of temporal priority, yet with a different perspective: the most important issue across the Ogallala is not who has the oldest rights, but whose wells will last dependably in the future. This is largely a hydrological question, not a legal one, but it raises an important policy question. Because Kansas law administers water rights according to priority of appropriation, should it also, in the context of non-renewable groundwater, consider a logical corollary of that principle in the context of non-renewable groundwater, namely, priority of depletion? The most vulnerable groundwater areas across the Ogallala are already recognized as "high priority areas," and that priority is defined hydrologically.[304] Should these high priority areas be administered or otherwise regulated differently than others? In an individual impairment situation, should wells with different estimated life spans be treated differently? If so, should the wells with longer life spans be favored above those with shorter life spans, or placed below them? What factors should inform such differential treatment? It seems appropriate that the regulation of the property interest in non-renewable groundwater should consider not only the priorities of the past, but also those of the future. The former are immovable; the latter engage questions of reasonableness and beneficial use, and can change over time. Permanent depletion may force priority to look both ways in time.

Such clarity in quantity and in time can be accomplished under existing

302. *E.g.*, KAN. STAT. ANN. § 82a-701(f).

303. *Id.* § 82a-711; *see supra* text accompanying notes 129–32.

304. The Sheridan County-6 LEMA overlies one such area. *See* LEMA Order, *supra* note 170, at 2, 14–15.

law; it is largely a matter of political will. On his own, or upon the recommendation of a GMD or its voters, the chief engineer could initiate proceedings for an IGUCA[305] and issue an IGUCA order imposing reductions in pumping to address the disparity between pumping and supply that produces unreasonable groundwater declines.[306] Likewise, a GMD can initiate similar action by recommending the approval of a local enhanced management plan to the chief engineer through the LEMA process.[307] Both an IGUCA and a LEMA can be as large as the GMD itself; there is no limit to their size, as long as they are contained within the boundaries of a GMD.[308] At this most ambitious level, the chief engineer and the GMDs, acting together, could produce an administrative result nearly equivalent to a groundwater basin adjudication.

Absent this level of ambition, more modest means could achieve such clarity. Thanks to the unusual detail of Kansas water rights information and water use data, one relatively straightforward approach beckons. Because the KWAA has required the submission of water use reports since 1988, the record of actual water usage for each non-domestic water right across the Ogallala is a detailed one.[309] This record, a data set produced by the owners of the water rights themselves, enables a historical comparison between the "paper water" of a right's authorized quantities and the actual quantities of "wet water" that have been put to beneficial use under that right since 1988. The Kansas Geological Survey (KGS) has already taken steps to quantify this discrepancy.[310] Two GMDs have established regulations that adopt by reference KGS groundwater data concerning the amount of and the percentage change in the saturated thickness of the Ogallala.[311] Building on these regulations, the GMDs and DWR could cooperatively adopt all of the relevant hydrological data of the KGS and the United States Geological Survey concerning the state of the aquifer, including groundwater models that evaluate the hydrological consequences of reductions in pumping.[312]

305. KAN. STAT. ANN. § 82a-1036.

306. *Id.* § 82a-1038(b); *see supra* text accompanying notes 165–67.

307. KAN. STAT. ANN. § 82a-1041; *see supra* text accompanying notes 172–80.

308. *Id.* §§ 82a-1036, -1041(a)(1)-(2).

309. *Id.* § 82a-732 (L. 1988, ch. 395, § 1).

310. *See, e.g.*, *Normal Precipitation (2010) Water Use to Appropriation Ratio*, KAN. GEOLOGICAL SURVEY, *available at* http://www.kgs.ku.edu/HighPlains/HPA_Atlas/Water%20Rights%20and%20Water%20Use/index.html#Normal%2520Precipitation%2520%25282010%2529%2520Water%2520Use%2520to%2520Appropriation%2520Ratio.jpg (last accessed March 29, 2014).

311. KAN. ADMIN. REGS. §§ 5-21-8, 5-21-9 (GMD1); *id.* § 5-23-15 (GMD3).

312. *See, e.g.*, LEMA Order, *supra* note 170, at 12, 26 (stipulating to the use of the Northwest Kansas Model; accepting it as "an adequate predictor" of the effects of groundwater pumping).

Such an approach could significantly reduce the scope of potential technical conflicts over such reductions; in the event of litigation, it could significantly reduce the evidentiary burden for the parties by establishing a stipulated hydrological record. In Idaho, the Department of Water Resources and the University of Idaho have jointly produced a groundwater model "that all stakeholders have broadly accepted for use in analyzing alternative plans and policies."[313] It seems difficult to question adopting hydrological reality and regulating accordingly. The government cannot take what the property cannot yield.

A final historical observation concerns the public. Because water is an inherently public resource, considerations of the public and the public interest have long played a central role in the administration of western water law.[314] Yet the groundwater revolution weakened that role.[315] Because that revolution has produced a condition of permanent depletion, it has returned us to the original western condition of permanent water scarcity, and that return requires the restoration of the importance of the public.

The framers of the KWAA viewed the relationship between water rights, the state, and the public as an integrated and interdependent one. The KWAA dedicated all of the state's waters to the use of the people of the state; that use was impliedly a private use by water rights owners, subject to the control and regulation of the state.[316] However, the state's purpose in such control and regulation was not merely to transform an unclaimed public resource into discrete private property rights. The KWAA depends upon the premise that all unused water belongs to all of the people of the state, subject to state regulation: "[t]his is the heart of the statute."[317] The state, through

313. Charles W. Howe, *Water Law and Economics: An Assessment of River Calls and the South Platte Well Shut-Down*, 12 U. DENV. WATER L. REV. 181, 188 (2008) (citing Donna M. Cosgrove & Gary S. Johnson, *Aquifer Management Zones Based on Simulated Surface Water Response Functions*, 131 J. WATER RESOURCES PLANNING AND MGMT. 89, 99 (2005)).

314. Young & Norton v. Hinderlider, 110 P. 1045, 1050 (N.M. 1910) (finding the public interest "should be read broadly in order to secure the greatest possible benefit from [the public waters] for the public"); *see also* Samuel C. Wiel, *Natural Communism: Air, Water, Oil, Sea, and Seashore*, 47 HARV. L. REV. 425, 430–40 (1934) (noting prominent judicial reactions against excessively private constructions of the prior appropriation doctrine); Shokal v. Dunn, 707 P.2d 441, 449–50 (Idaho 1985) (construing broadly the statutory term "local public interest" to discourage waste and encourage conservation).

315. For a recent review of the concept of the public interest in western water law, see Michelle Bryan Mudd, *Hitching Our Wagon to a Dim Star: Why Outmoded Water Codes and "Public Interest" Review Cannot Protect the Public Trust in Western Water Law*, 32 STAN. ENVTL. L.J. 283, 307–27 (2013).

316. KAN. STAT. ANN. § 82a-702 (L. 1945, ch. 390, § 2); 1944 REPORT, *supra* note 24, at 46.

317. State *ex rel*. Emery v. Knapp, 207 P.2d 440, 447 (Kan. 1949).

the chief engineer, has a complementary duty to control, conserve, regulate, and allot the state's waters for the benefits and beneficial uses of "all of its inhabitants," and not just its water rights owners.[318] The KWAA sought to "establish principles for appropriation and use of water with a view toward conservation of this natural resource for the greatest benefit of its people . . . ."[319] Like other western water law codes, the KWAA made it clear that the private use of water would be regulated by the state so as to ensure that such use would benefit the community as a whole, and not just the owner of the water right. That is why the public retains an interest in every water right, and why water rights are defined in terms of the public interest.[320] This is basic western water law.[321] The state can rededicate its waters to the public, subject to vested rights; indeed, that is what the KWAA accomplished in 1945, by displacing the common law theory of absolute ownership of groundwater.[322]

In a surface water system, the relationship between water rights, the state, and the public is clearly apparent. The diversion of water from an upstream tributary diminishes the flow of both near and distant rivers "by a certain amount," and that diversion affects the owners of downstream rights and the public accordingly.[323] The same goes for upstream diversions of alluvial groundwater. In either hydrologic situation, upstream diversions can become sufficiently damaging to downstream interests such that the state itself takes legal action.[324] Importantly, it does so on behalf of all of its citizens, and not just its water rights owners.[325] The state as a whole is more

318. KAN. STAT. ANN. § 82a-706; 1944 REPORT, *supra* note 24, at 46.

319. 1944 REPORT, *supra* note 24, at 52.

320. KAN. STAT. ANN. § 82a-711(a) (2013); *Id.* § 82a-708b. *See also supra* text accompanying notes 94–95, 104–06.

321. *See, e.g.*, SAX, THOMPSON, LESHY, AND ABRAMS, *supra* note 14, at v.

322. Williams v. City of Wichita, 374 P.2d 578, 591 (Kan. 1962); F. Arthur Stone & Sons v. Gibson, 630 P.2d 1164,1170 (Kan. 1981) (discussing *Williams* and other apposite cases).

323. 1944 REPORT, *supra* note 24, at 53.

324. *See, e.g.*, Kansas v. Colorado, 206 U.S. 46 (1907), *and* Colorado v. Kansas, 320 U.S. 383 (1943) (both brought by Kansas, seeking the equitable apportionment of the Arkansas River in response to upstream surface water diversions by Colorado); Texas v. New Mexico, 462 U.S. 554 (1983) (brought by Texas to enforce the Pecos River Compact against New Mexico and to reduce groundwater pumping in the New Mexico portion of the Pecos River Basin); Kansas v. Colorado, 514 U.S. 673 (1995) (brought by Kansas to enforce the Arkansas River Compact and to reduce excessive pumping of alluvial groundwater); Kansas v. Nebraska, 525 U.S. 1101 (1999), 538 U.S. 720 (2003), *and* Kansas v. Nebraska, 131 S. Ct. 1847 (2011) (both brought by Kansas to enforce the Republican River Compact against Nebraska and to reduce groundwater pumping in the Nebraska portion of the Republican River).

325. *See, e.g.*, Wyoming v. Colorado, 286 U.S. 494, 509 (1932) (private owners of state law water rights are represented by their state under the *parens patriae* doctrine and they are bound by any decree that results).

than a mere agent or trustee for its private water rights owners.[326]

Yet the groundwater revolution complicated this relationship. The more attenuated hydrological connection between the Ogallala and down-gradient water rights brought with it a similarly attenuated civic relationship between Ogallala pumpers, distant water rights, and the public. Like legislation in other Ogallala states, the GMD Act acknowledged the importance of distinct local groundwater communities; yet it also placed their interests as coequal or superior to that of the state as a whole.[327] Just as importantly, those communities were not composed of "inhabitants" or citizens; rather, the voting membership of GMDs is limited to landowners and owners of water rights.[328] The dominance of groundwater irrigation in Kansas has thus produced polarities that the architects of the KWAA could not have foreseen: it produced two distinct publics, with competing notions of the public itself. The first was a statewide public as envisioned by the KWAA, predicated upon the hydrological interdependence of all of the water rights across a river system, and equally predicated upon the need to consider the interests of this statewide public independently from the private interests of water rights owners. The second is a set of localized publics, grouped above regions of the Ogallala in western Kansas, and effectively controlled by private property interests that are under far less of an obligation to consider wider public interests. In light of these distinct publics, the depletion of the Ogallala in western Kansas is less of a story about the long-term failure of collective action at the state level than it is about the short-term success of collective inaction at the local level.

Yet depletion is a statewide problem, and it affects local communities regardless of whether their members own water rights or not. While the groundwater revolution produced an enormous increase in the state's use of water, it has generally coincided with (but not caused) declines in both population growth and the population of rural Kansas.[329] In an era where

326. Kansas v. Colorado, 533 U.S. 1, 7–8 (2001) (citing New Hampshire v. Louisiana, 108 U.S. 76 (1883); North Dakota v. Minnesota, 263 U.S. 365 (1923)).

327. KAN. STAT. ANN. § 82a-1020 (2012); *see supra* text accompanying notes 168–69.

328. KAN. STAT. ANN. § 82a-1021(a)(5) (2012) (defining "eligible voter" as a landowner or owner of a water right).

329. The populations of most western Kansas counties have experienced either negligible or negative population growth since groundwater irrigation became dominant in the 1950s and 1960s. *See* The University of Kansas Institute for Policy & Social Research, *Population in Kansas, by County, 1860-1970* (enhanced online ed., 2013), http://www.ipsr.ku.edu/ksdata/ksah/population/2pop16.pdf. With the exception of Hamilton and Ford counties, the majority of the counties that overlie the Ogallala in western Kansas are forecasted to experience population declines in excess of thirty percent over the next thirty years; Greeley County (named after Horace Greeley) may decline by over sixty percent. *See* The University of

irrigation accounts for over ninety percent of the state's water use,[330] fewer people every year, on a per capita basis, are pumping most of the state's water supplies. Yet the effects upon the communities which rely upon irrigation, and statewide secondary economic effects from irrigation, are significant;[331] and the groundwater irrigation communities of western Kansas recognize the importance of these effects.[332] Because more people depend upon irrigation than those who pump groundwater, it is imperative to make considerations of the public and the public interest more prominent in evaluating current levels of groundwater pumping, and to reintegrate those considerations into the regulation of water rights.

V. CONCLUSION

In 1897, Erasmus Haworth, a geologist at the University Geological Survey of Kansas (later the Kansas Geological Survey), published a survey of the groundwater supplies of southwestern Kansas.[333] Like many such treatises of the period, it sought to "obtain information concerning the amount and quality of the underground waters [of the region], in order to throw light upon the problems connected with the utilization of these in the development of agriculture upon the Great Plains."[334] His survey is mostly sober; but geologists are ultimately historians, and when Haworth confronted the Ogallala, he fell victim to contrafactual wonder.

> The existence of such vast quantities of water in an arid and semi-arid portion of the Great Plains appears very remarkable. Could the thousands of pioneers who traversed these regions prior to the operation of the transcontinental railway lines have known that the purest and sweetest water existed in such unlimited quantities at so short a distance between the surface, how many of them in a few hours' time with spade and shovel would have supplied water to slake the thirst and maintain the life of man and beast throughout the course of

Kansas Institute for Policy & Social Research, *Projected Percent Population Change in Kansas, by County 2010-2040* (enhanced online ed., 2013), http://www.ipsr.ku.edu/ksdata/ksah/population/projpopchg.pdf.

330. PERRY, *supra* note 20, at 1.

331. *See, e.g.*, John C. Leatherman, Hanas A. Cader, and Leonard E. Bloomquist, *When the Well Runs Dry: The Value of Irrigation to the Western Kansas Economy*, KANSAS POLICY REVIEW, Spring 2004 at 7, 17–20.

332. *See, e.g.*, LEMA Order, *supra* note 170, at 11.

333. Haworth, *supra* note 23.

334. *Id.* at 9 (F. H. Newell, Hydrographer in Charge, Department of the Interior, United States Geological Survey, Division of Hydrography, Letter of Transmittal to Charles D. Walcott, Director, United States Geological Survey, April 9, 1897). Newell would later become the first director of the Reclamation Service, the predecessor agency to the Bureau of Reclamation. S*ee supra* note 69.

> those perilous journeys! But the idea of such quantities of water existing within easy reach rarely entered their minds. It took years of occupancy of the Great Plains by thousands of citizens for such an idea to become well established. Even now, after almost ten years of active agitation of the subject, few people outside the immediate localities where such water exists realize the extent to which water may be found.[335]

The aquifer that put Haworth in such a state turned western water law upside down. That law was based on the imperative need to establish secure water rights in an insecure and arid region, and one plagued by regular drought. It has adjusted fitfully and belatedly to the contradictions of the Ogallala, because the Ogallala has defied aridity and even drought by fulsomely irrigating many of the driest yet most fertile regions of the Great Plains for over two generations. But now that the Ogallala is dying out, the drought has gone underground, and permanently so.

This article has attempted to convey that the legal crisis over the Ogallala is rooted in an unwillingness to recognize and to confront the temporal aspects of its contradictions. We know how and why western water law has changed over time; we know how and why the Ogallala has changed over time; and we know that these changes are inherently interrelated. These are matters of historical record, not ideology. The short-lived historical anomaly of the groundwater revolution has produced a condition of permanent scarcity and depletion. As a result, the need for sound and secure water rights is more pressing than ever—for at least the third time in the history of Kansas. Absent merciful acts of God or foolhardy acts of the federal government, the Ogallala will never be restored. Only by restoring our historical perspective can we honestly confront that depletion, so that we can clearly decide whether to protect the security of property rights and the vitality of the public interest in the waters of the Ogallala, or to abandon them both to the past. In either case, we will know what we have done.

335. HAWORTH, *supra* note 23, at 46–47.