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Toward a Management Doctrine for Texas Groundwater

Heather Welles

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Toward a Management Doctrine for Texas Groundwater

Heather Welles*

The tension between advancing water science and the outdated legal regimes underlying water allocation produces thorny issues for courts, which must apply rules based on outdated assumptions, and water managers, who are tasked with understanding water’s physical behavior, allocating supplies fairly, and preserving the resource for future generations. Texas is legendary for its long-standing commitment to the common law “rule of capture,” which allows landowners to keep as much groundwater as they can pump without liability to nearby landowners whose supplies are depleted. Texas recently took this property rights scheme a step further in Edwards Aquifer Authority v. Day, in which the state Supreme Court concluded that common law provides Texas landowners vested rights in groundwater while it is in place beneath their land, prior to capture. Although the decision has been criticized for expected deleterious effects on groundwater management, this Note argues that the court provided a path supporting more aggressive regulation. Therefore, this flawed ownership doctrine is not determinative of Texas’s ability to manage its groundwater moving for the future. Rather, this Note concludes that Texas must expand its legislative scheme because modern management goals demand more comprehensive, flexible, and expert management than an adjudicatory strategy can produce.

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INTRODUCTION

In Edwards Aquifer Authority v. Day, the Texas Supreme Court resolved
“a century-old tug of war” that lies “at the heart of every major groundwater
issue” in Texas—who owns the water? The court extended its existing
document of absolute ownership of groundwater by holding that landowners own
groundwater “in place,” before it is captured. The court analogized
groundwater to oil and gas, reasoning that the two were similar enough that the
oil and gas ownership in place rule should apply to groundwater as well.
However, the court also reaffirmed its long-standing position that groundwater
regulation lies properly within the legislative domain, and ultimately endorsed
the state’s general groundwater regulatory system.

Water managers have long recognized that conjunctive management of
groundwater and surface water, particularly when the two are hydrologically
connected, facilitates maximum beneficial use, which is particularly important
in water-stressed areas like the Edwards Aquifer basin. Harmful effects of
groundwater pumping on surface water flows and an increasingly sophisticated
scientific understanding of groundwater resources have demonstrated the need
for conjunctive management of connected waters. Many Texas state officials

1. Morgan Smith, Lawsuit Could Determine Future of Groundwater, TEX. TRIBUNE (Apr. 22,
3. Id. at 831–32.
4. See id. at 833.
5. See, e.g., Otis W. Templer, Hydrology and Texas Water Law: . . . A Logician’s Nightmare, 2
and water managers are working to avoid the rule of capture’s logical consequences of unrestrained pumping, suggesting that the state’s common law doctrine is outdated and inadequate. The Day court missed an opportunity to incorporate advancing scientific knowledge into this common law framework by failing to recognize the fundamental differences between oil and groundwater. Most significantly, the fact that water management must reckon with the hydrologic connections between groundwater and surface water and the divergent legal regimes that govern them undermines the court’s analogy.

However, despite the failings of the Day court and the rule of capture doctrine, and contrary to the ardent criticism of the ruling’s likely effects on regulation, Day need not undermine Texas groundwater management. The state’s common law doctrine is less important to its ability to achieve successful conjunctive management than the extent to which it embraces a “management doctrine”—a comprehensive statutory scheme that provides a consistent legal foundation for regulation and supports the flexibility required to manage diverse groundwater basins. A statutory management doctrine that allows managers to limit groundwater pumping and promotes managing hydrologically connected groundwater and surface water as one resource is required to meet the challenges of the future. Texas officials have begun to join other states moving away from reliance on common law groundwater ownership doctrines to facilitate modern management strategies like conjunctive use. And although the Day court’s decision may appear to jeopardize Texas’s ability to regulate groundwater, it ultimately provides a framework for Texas to continue its progress toward a successful regulatory system.

Part I of this Note provides background on early groundwater common law, Texas’s constitutional authority to regulate groundwater, the Texas Supreme Court’s evolving groundwater case law, and Texas’s current regulatory structure. Part II describes Day, and argues that despite criticism asserting that the case represents the downfall of groundwater regulation in Texas, Day actually provides a framework that supports more aggressive regulation. Part III presents conjunctive management as an example of the type of modern management strategy that our water governance systems must support, and uses Texas and California as illustrations of the weakness of an adjudication-based approach to groundwater management. This Note concludes


by asserting that only a “management doctrine” based on comprehensive legislation can overcome the weaknesses of an adjudicative approach.

I. BACKGROUND: TEXAS GROUNDWATER LAW

A. Justifications for Early Groundwater Law & the East Case

Early American cases viewed groundwater as a “secret, occult” resource, deep beneath the ground, hidden and unknowable.⁸ American courts in the nineteenth century imported English common law,⁹ which rejected the argument that groundwater and surface water should be governed by the same doctrine because a “marked and substantial difference” existed between “running streams” and “springs beneath the surface.”¹⁰ Since groundwater was so poorly understood, courts reasoned that “an attempt to administer any set of legal rules . . . would . . . be practically impossible” and would lead to uncertainty that would undermine economic development.¹¹ Because courts could not establish such rules, the reasoning went, any rights that would allow others to sue a landowner for harm to their property caused by his pumping should be denied.¹²

The Texas Supreme Court relied on this reasoning when it adopted the “rule of capture,” in 1904’s *Houston & T.C. Railway v. East*.¹³ Under the rule of capture, a landowner legally owns as much groundwater as he can pump, subject to prohibitions against waste and malice, without liability to any neighbors whose wells go dry as a result, “even if the water originated beneath the land of another.”¹⁴ Despite its origination as a tort rule,¹⁵ the rule of capture has been interpreted over time as a property rule, granting the landowner “absolute ownership” of captured water.¹⁶

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¹¹. *Frazier*, 12 Ohio St. at 311.
¹⁵. *See Eric Opiela, The Rule of Capture in Texas: An Outdated Principle Beyond Its Time*, 6 U. DENV. WATER L. REV. 87, 92 (2002) (arguing that because the *Acton* court “appl[ied] the tort principles of duty, breach, and foreseeability to reach its holding,” it “was clearly not recognizing a property right; rather it was merely addressing the impracticality of recognizing a cause of action for well interference”).
¹⁶. Some commentators have argued that ownership of groundwater in place gave rise to the rule of capture at the outset. *See, e.g.*, Edmond R. McCarthy, Jr., *Mixing Oil and Gas With Texas Water Law*,
B. Constitutional Authority for Legislative Regulation

In 1917, following two droughts, Tex. Const. art. XVI, § 59(a). Although the court’s 1904 adoption of the rule of capture was not based on any constitutional or legislative authority, the court has since held that the Conservation Amendment vests primary authority for groundwater governance in the legislature.

C. Groundwater in the Texas Supreme Court

Many states, particularly in the arid West, quickly modified or abandoned absolute ownership, moving instead toward reasonable use or prior appropriation rules. California, for instance, reasoned that the absolute ownership doctrine’s lack of protection against a neighbor who could pump “unlimited quantities” of water undermined its economic efficiency rationale. 44 TEX. TECH L. REV. 883, 900 (2012). However, others reason that the rule arose only as a tort principle, and morphed into a property rule over time, partly due to confusion over the court’s terminology in East and subsequent rule of capture cases. See, e.g., Opiela, supra note 15, at 92, 95.

18. Id. at 78 –80. Because the court has not completely abdicated authority in this area, I characterize the Legislature’s authority as “primary.”
19. Smith, supra note 9, at 641 n.2. American states have adopted two principle doctrines instead of absolute ownership of groundwater: the reasonable use doctrine, or American rule, under which a landowner may use only as much groundwater as he can put to a beneficial, reasonable use on his own land; and a modification of the surface water prior appropriation doctrine, under which the first party to divert water to a beneficial use perfects a water right. Id. at 641–42. California has a unique correlative rights rule, under which groundwater pumping is “apportioned pro rata” among overlying landowners in times of shortage, often relying on piecemeal adjudications to settle rights. Rossmann & Steel, supra note 21, at 908.
20. Katz v. Walkinshaw, 141 Cal. 116, 133 (1903); see also id. at 137 (characterizing absolute ownership as “leaving property without any protection from the law”).
and failed to account for the dry conditions and competition for water that characterized the state.\textsuperscript{24} Texas courts, however, have held fast to absolute ownership. The Texas Supreme Court has consistently reaffirmed its support of the doctrine and rejected alternatives, despite acknowledging that the rule of capture produces “harsh and outmoded” results\textsuperscript{25} and a widespread recognition that the legal division between groundwater and surface water is often no longer justifiable on a scientific basis.\textsuperscript{26} Nonetheless, the state courts have also recognized that the legislature could use its police power\textsuperscript{27} and its constitutional authority under the Conservation Amendment\textsuperscript{28} to limit “excessive” pumping.\textsuperscript{29}

Throughout its decisions upholding the rule of capture, the court has identified instances in which the legislature could involve itself to address management problems that the common law failed to solve. In \emph{City of Corpus Christi v. City of Pleasanton}, for instance, Corpus Christi transported millions of gallons of groundwater 118 miles downstream, allowing up to 74 percent of the water to be lost through evaporation, transpiration, and seepage.\textsuperscript{30} The court first held that the common law provided no protection against Corpus Christi’s use, because the common law did not restrict transportation methods.\textsuperscript{31} The court reasoned that the state’s constitutional authority under the Conservation Amendment meant that the duty to preserve water “belong[ed] exclusively to the legislative branch, not the courts,” and thus the court would not alter the common law doctrine,\textsuperscript{32} even though it knew that the movement of

\begin{itemize}
\item \textsuperscript{24} \textit{Id.} at 126–28, 133 (noting that although the court had previously, in dictum, suggested support for the absolute ownership doctrine, the arid conditions of California were “radically opposite to those prevailing where the doctrine arose”).
\item \textsuperscript{25} \textit{Friendswood Dev. Co. v. Smith-Sw. Indus.}, 576 S.W.2d 21, 28–29 (Tex. 1978); \textit{Sipriano}, 1 S.W.3d at 75 (affirming the rule of capture and refusing to adopt the reasonable use doctrine or the rule articulated in the Restatement (Second) of Torts § 858); \textit{Sherman v. Pub. Util. Comm’n}, 643 S.W.2d 681, 686 (Tex. 1983). \textit{See alsoTempler, supra note 5, at 43.}
\item \textsuperscript{26} \textit{See}, e.g., W. F. Hardt, \textit{Hydrology and Water Law—Cooperation for the Future, in Water Resources Law: Proceedings of the National Symposium on Water Resources Law, Dec. 15-16, 1986, Hyatt Regency, Chicago, Ill.}, 221 (1986) (“Of particular hydrologic significance is the relation between surface water and ground water. Surface water and ground water in many court decisions were considered as separate hydrologic and legal entities. This concept has largely been refuted as a result of comprehensive hydrologic studies.”).
\item \textsuperscript{27} \textit{See Houston & T.C. Ry. v. East}, 81 S.W. 279, 280 (Tex. 1904) (“In the absence of . . . positive authorized legislation, as between proprietors of adjoining land, the law recognizes no correlative rights in respect to underground waters percolating, oozing, or filtrating through the earth . . . .” (quoting Frazier v. Brown, 12 Ohio St. 294, 311 (1861))).
\item \textsuperscript{28} \textit{Tex. Const.} art. XVI, § 59(a).
\item \textsuperscript{29} \textit{Edwards Aquifer Auth. v. Day}, 369 S.W.3d 814, 827 (Tex. 2012). The court has also acknowledged the legislature’s ability to create correlative rights in both oil and groundwater, although the state’s common law does not recognize them. \textit{See id.} at 830.
\item \textsuperscript{30} \textit{City of Corpus Christi v. City of Pleasanton}, 276 S.W.2d 798, 799–800 (Tex. 1955).
\item \textsuperscript{31} \textit{Id.} at 802.
\item \textsuperscript{32} \textit{Id.} at 803. However, the court did create a judicial exception to the common law doctrine in \textit{Friendswood Development Co. v. Smith-Southwest Industries, Inc.}, in which it held that a pumper could be liable to a neighbor for negligent pumping that caused subsidence. 576 S.W.2d 21, 30 (Tex. 1978).
groundwater was no longer quite so “occult.”"33 “Undoubtedly,” the court stated, “the Legislature could prohibit the use of any means of transportation of percolating or artesian water which permitted the escape of excessive amounts, but it has not seen fit to do so.”34 Indeed, the court recognized that its ruling would have negative consequences for water management, and essentially implored the legislature to get involved:

The Legislature is now in session. It will have this opinion before it before adjournment. It will recognize the problem. If it wishes to declare that such transportation of water in conduits which permit the escape of a large percentage is wasteful and unlawful it will have ample time in which to do it.35

The court echoed this sentiment in Sipriano v. Great Spring Waters of America, Inc., its most recent case reaffirming the rule of capture. Sipriano argued that the court should abandon the rule of capture and adopt the reasonable use doctrine after Ozarka Spring Water began pumping 90,000 gallons of groundwater per day for bottling, depleting his wells.36 The court, however, determined that the Conservation Amendment “made clear that in Texas, responsibility for the regulation of natural resources, including groundwater, rests in the hands of the Legislature,”37 a power it characterized as both broad and necessary.38 The court reasoned that it saw “no reason . . . for the Legislature to feel constrained from taking appropriate steps to protect groundwater,”39 and emphasized that the Legislature had recently used this authority by passing Senate Bill 1, a comprehensive water planning bill that significantly enhanced the state’s regulatory framework for water.40 In light of the legislature’s activity, the court reasoned that although it would not “shy away from change when it is appropriate,” “[g]iven the Legislature’s recent efforts to regulate groundwater, we are not persuaded that it is appropriate today for this Court to insert itself into the regulatory mix by substituting a rule of reasonable use for the current rule of capture.”41 Thus, ironically, the

33.  Corpus Christi, 276 S.W.2d at 805 (Wilson, J., dissenting) (“These cases [East and Frazier v. Brown] were decided (1843–1904) before the development of most of our present knowledge of geology and hydrology . . . . It is understandable that [Frazier’s rationale] should appeal to this court in 1904 but I regret to see us reaffirm it now, as the majority does, in 1955 . . . . I am convinced that the rationale of [Frazier v. Brown] has been rebutted and answered by the course of our history and the entire trend of our jurisprudence since that decision and since the [East] case. Although this court can close its eyes to the advancement of scientific and legal knowledge and governmental techniques by reaffirming this rationale as the majority do here, I do not believe that this court will always do so . . . .”).
34.  Id. at 803 (majority opinion). Although Texas had passed a statute prohibiting waste, the court held that evaporation did not meet the statutory definition. Id. at 800, 802.
35.  Id. at 803.
37.  Id. at 77.
38.  Id. at 78, 79.
39.  Id. at 79.
41.  Sipriano, 1 S.W.3d at 80.
legislature’s efforts to regulate and conserve groundwater may provide an explanation for the longevity of the rule of capture in Texas.

The court also upheld the legislature’s authority to cap Edwards Aquifer withdrawals against a series of facial constitutional challenges, including a facial takings claim, in *Barshop v. Medina County Underground Water Conservation District.* First, the court recognized the long history of regulation of the Edwards Aquifer and the importance of conserving the resource before reaffirming the Legislature’s role in groundwater regulation. The court rejected the plaintiff’s takings claim because any violation of the state’s takings clause was “hypothetical,” since the Edwards Aquifer Authority Act (EAAA), which capped pumping from the aquifer and established the Edwards permitting scheme, had yet to go into effect. Although the court did not decide whether landowners had a vested property right in groundwater in place beneath their land, it reasoned that even assuming such a right existed, the EAAA did not violate the takings clause so long as compensation was provided for any future taking. However, the court left open the possibility that future as-applied challenges to the EAAA could be successful if a landowner could establish a vested property right to groundwater in place, prove damages, and demonstrate the state’s failure to compensate.

The court also upheld the EAAA’s pumping cap against a substantive due process claim, reasoning that “[t]he specific provisions of the Act, such as the grandfathering of existing users and the caps on water withdrawals...are all rationally related to legitimate state purposes in managing and regulating this vital resource” under the Conservation Amendment. Thus, at least as a general matter, the court has evidenced its support for regulation of pumping in the Edwards specifically as well as groundwater more generally.

The court’s past decisions demonstrate its unwillingness to abandon the absolute ownership doctrine, largely out of concerns about stability and proper deference to the legislature. Nonetheless, it has also acknowledged the value of groundwater regulation and has consistently upheld the legislature’s authority to act under its constitutional authority to preserve groundwater by

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42. The Edwards Aquifer is the highly used Central Texas aquifer at the center of the Edwards Aquifer Authority v. Day case. *See infra* notes 84–96 and accompanying text for a description of the aquifer’s hydrogeology.
44. *Id.* at 625–26.
45. *Id.* at 633 (“Water regulation is essentially a legislative function.”).
46. *Id.* at 631.
47. *Id.*
48. *Id.*
49. *Id.* at 633.
50. *See Sipriano v. Great Spring Waters of Am., Inc.*, 1 S.W.3d 75, 80 (Tex. 1998); City of Corpus Christi v. City of Pleasanton, 276 S.W.2d 798, 803 (Tex. 1955).
51. *See Sipriano*, 1 S.W.3d at 79.
limiting pumping.  

**D. Groundwater Regulation in Texas**

1. **Chapter 36 Groundwater Districts**

Under its constitutional authority, the Texas Legislature has modified the rule of capture through an overlying regulatory scheme based on local management by groundwater conservation districts (GCDs). GCDs generally have the authority to adopt permitting systems based on a range of considerations, such as effects on existing groundwater or surface water permit holders, how permit applicants will use the water, and historic use. To protect neighboring landowners, they may require permit holders to follow well spacing guidelines and limit individual well production. GCDs must also develop management plans for aquifers within their jurisdiction, which are subject to approval by the Texas Water Development Board.

In recent years, the scheme has become more complex and comprehensive. Local districts must work together across specified management areas to manage aquifers based on projected desired future conditions (DFCs) of the groundwater table. Local districts develop their own DFCs, which are appealable to the state but may vary depending upon the priorities of the individual district. The legislature has also instructed districts to issue permits “up to the point that the total volume of exempt and permitted groundwater production will achieve an applicable desired future condition” set by the districts in the management area, which is also known as “modeled..."
available groundwater.” Thus, the legislature has approved the creation of a regulatory cap on the total amount of water that can be subject to ownership within a particular basin. Although the legislation prevents GCDs from directly choosing to permit below the available groundwater cap, more conservation-minded GCDs can choose a more conservative DFC, which will reduce available groundwater. Conversely, districts can choose GCDs that essentially set a schedule for aquifer mining, as other western states have done. Despite this risk, this change is critical to the sufficiency of Texas’s regulatory system. Critics characterized the previous voluntary system as a “non-management” strategy because of its failure to provide any statutory restrictions on groundwater mining.

The legislature has also taken steps to facilitate conjunctive management. In 2011, the legislature added groundwater-surface water connections as a factor that GCDs should consider in developing DFCs, one of several statutory elements allowing or requiring GCDs to consider impacts to surface water.


60. See Robert E. Mace et al., TEX. WATER DEV. BD., A STREETCAR NAMED DESIRED FUTURE CONDITIONS: GROUNDWATER AVAILABILITY FOR TEXAS 3 (rev. ed. 2008) (“Before House Bill 1763, it was arguable whether or not groundwater conservation districts . . . had the ability to place a cap on groundwater production. With the passage of House Bill 1763, statute now states that “[a] district, to the extent possible, shall issue permits up to the point that the total volume of groundwater permitted equals the managed available groundwater . . . .” Before this time, the majority of districts did not have an overall cap on groundwater production.”). The legislature modified House Bill 1763 in 2011, changing the term “managed” to “modeled.” Act of May 31, 2011, 82d Leg., R.S., ch. 1233, § 17, 2011 Tex. Gen. Laws __ (codified as amended at TEX. WATER CODE ANN. § 36.108(d-2)).


63. See Kaiser & Skillern, supra note 6, at 291 (“The issue is whether the state will provide aquifer-sustainable use standards for local groundwater management districts to follow.”).


65. Act of May 31, 2011, 82d Leg., R.S., ch. 1233, § 17, 2011 Tex. Gen. Laws __ (codified as amended at TEX. WATER CODE ANN. § 36.108(d)(4) (West 2012)). Although the statute characterizes these connections as “environmental impacts,” it also contains a provision instructing GCDs to consider “the impact on the interests and rights in private property.” TEX. WATER CODE ANN. § 36.108(d)(7). In July 2012, a nonprofit group filed a lawsuit alleging that a DFC approval did not properly consider impairment of surface water property rights. See Environmental Stewardship Sues to Appeal Decision by the Texas Water Development Board, ENVTL. STEWARDSHIP (July 20, 2012), http://www.environstewardship.org/2012/07/20/environmental-stewardship-sues-to-appeal-decision-by-the-texas-water-development-board/. Districts are also required to consider whether “the proposed use of water unreasonably affects existing groundwater and surface water resources or existing permit holders” before granting any permit. TEX. WATER CODE ANN. § 36.113(d)(2).
Similarly, the Texas Commission on Environmental Quality, which manages surface water permitting, must “consider the effects, if any, on groundwater or groundwater recharge” before granting a surface water diversion permit. Texas has also adopted statutes to facilitate aquifer storage and recovery projects, including the development of pilot projects and eligibility for grant funding. To be successful, however, these projects require water usage rights to translate into rights to withdraw the stored water, something that is unsettled under the current system.

Despite recent improvements, the decentralized nature of Texas’s system leaves it vulnerable to capture by local interests that favor unsustainable pumping for short-term economic gain. Districts also struggle with uneven enforcement, limited technical ability, and insufficient resources. Although legislators and managers have recognized the negative effects of these problems on the state’s ability to conduct effective and coordinated water supply policy, a decentralized system is likely the only politically tenable groundwater management strategy in Texas, and theoretically supports the

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66. See Tex. Water Code Ann. § 36.1071 (requiring districts’ management plans to address conjunctive management and include an estimate of aquifer discharge into surface water bodies); Tex. Water Code Ann. § 36.1086 (allowing joint GCD studies of groundwater-surface water interaction).

67. Id. § 11.151.

68. See id. §§ 11.153–155.

69. Id. § 11.153(a).

70. Id. § 11.153(e).

71. See William Blomquist et al., Institutions and Conjunctive Water Management among Three Western States, 41 Nat. Resources J. 653, 659 (2001). The legislature has attempted to address this concern by instructing Texas Commission on Environmental Quality to consider whether “reasonable diligence will be used to protect the water stored in the receiving aquifer from unauthorized withdrawals to the extent necessary to maximize the permit holder’s ability to retrieve and beneficially use the stored water without experiencing unreasonable loss of appropriated water” before granting an aquifer storage project permit. Tex. Water Code Ann. § 11.154(c)(3).


significant geographical variance in both hydrologic structures and water needs. To continue to improve its system, the state must determine how it will address these challenges within its decentralized framework.

2. The Edwards Aquifer Authority

The Edwards Aquifer Authority, which governs groundwater withdrawals from the Edwards Aquifer in Central Texas, is a unique body under Texas state law, with different statutory directives than the general, or Chapter 36, GCDs. The state legislature passed the EAAA in 1993 specifically to limit groundwater withdrawals from the Edwards Aquifer in response to an endangered species lawsuit prosecuted by the Sierra Club. To advance the pumping limit required to preserve endangered species habitat in the aquifer’s discharge springs, the EAAA directs the Authority to issue permits prioritizing existing users who “withdrew and beneficially used” aquifer water prior to 1993. “[T]otal withdrawals under all permits must be reduced proportionately as necessary so as to not exceed the statutory maximum annual withdrawal from the aquifer.” Because Texas law also protects tributary groundwater
pumpers from any liability for damage done to surface water users, the legislature set maintenance of the surface springs supported by Edwards Aquifer discharge as the effective DFC for the aquifer in addition to establishing an absolute cap on withdrawals.

II. **EDWARDS AQUIFER AUTHORITY V. DAY**

A. Factual Background

The Edwards Aquifer is a highly productive limestone karst aquifer located in south central Texas. The aquifer’s groundwater migrates steadily from its northwest recharge zone toward discharge springs and streams in the southeast. Its fairly rapid rate of recharge and discharge is characteristic of karst aquifers, which are formed by the gradual dissolution of carbonate rock. Karst aquifers feature conduits that recharge very efficiently and their discharge often supports sizeable surface water springs. This rapid, dynamic recharge results in a renewable resource that can be sustainably pumped without mining, unlike fossilized groundwater systems formed by thousands of years of accumulation.

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82. *See* Denis v. Kickapoo Land Co., 771 S.W.2d 235, 238–39 (Tex. App. 1989) (Texas follows the English rule whereby “percolating waters tributary to springs were treated the same as all other percolating waters as part of the soil where found” and “it is immaterial that the springs so supplied with water were the sources of a stream or surface water course upon which riparian rights had vested.”). Once again, Texas is in the minority with this rule; western states more commonly regard tributary groundwater as connected to the surface water right. *See* M. W. Bittinger, *The Problem of Integrating Ground-Water and Surface Water Use*, 2 GROUND WATER 33, 34 (1964).


90. *See, e.g.,* Zbigniew W. Kundzewicz & Petra Döll, *Will Groundwater Ease Freshwater Stress Under Climate Change?*, 54 HYDROLOGICAL SCI. 665, 666 (2009) (“[R]enewable groundwater resources can be defined as being equal to long-term average groundwater recharge.”). However,
of years of stored recharge.91

The Edwards is also highly stressed92 and, therefore, closely managed. It serves as the primary water source for the city of San Antonio,93 which is heavily dependent on groundwater,94 in addition to supplying many private wells throughout the basin.95 It also provides habitat for eight different threatened or endangered species.96

R. Burrell Day and Joel McDaniel (collectively “Day”) purchased land within the Authority’s jurisdiction in 1994.97 A well on the property flowed under artesian pressure into a lake, which the prior owners had used for irrigation and recreation.98 Based on the prior owners’ use, Day applied for a permit to pump 700 acre-feet of groundwater per year, which the Authority denied.99 When Day protested the decision, an administrative law judge concluded that the water from the lake was state surface water, limiting Day’s

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92. A. Garrido & M.L. Livingston, Economic and Financial Perspectives on Intensive Groundwater Use, in INTENSIVE USE OF GROUNDWATER: CHALLENGES AND OPPORTUNITIES 221 (Ramón Llamas & Emilio Custodio eds., 2003) (characterizing the Edwards as “clearly[] one of the most stressed aquifers in Texas”).


98. Id.

99. Id. at 820–21.
permit to seven acres that the prior owners had irrigated directly from the well, a total of fourteen acre-feet of groundwater. Day then sued the Authority, alleging that the Authority had taken his property without just compensation in violation of the Texas Constitution’s takings clause by prohibiting him from pumping enough water to irrigate the full acreage.

B. The Day Opinion

Despite its past concerns about the effects of the rule of capture, the Texas Supreme Court further solidified its commitment to the rule in Edwards Aquifer Authority v. Day. The court held that landowners have a vested property interest in groundwater in place under their land, prior to capture, and that the vested right could provide the basis for a takings claim under the state Constitution. However, the court also reaffirmed its prior statements regarding the legislature’s authority to regulate groundwater and seemingly endorsed the Chapter 36 permitting process, leaving the door open for the Texas Legislature to continue to advance a “management doctrine” for groundwater in Texas in spite of the state’s flawed common law foundation.

Despite the rule of capture’s long history, Texas had not yet determined whether landowners owned groundwater in place prior to being pumped to the surface. It had previously decided, however, that oil and gas, which are also governed by the rule of capture, are owned in place. Under its oil and gas precedent, “[o]wnership of gas in place [does] not entitle the owner to specific molecules of gas that might move beneath the surface tracts but to volumes

100. Id. at 821.
101. Id.
103. Day, 369 S.W.3d at 831–33.
104. See id. at 833–37.
105. See id. at 841–43. Although the court did not explicitly state that the Chapter 36 process could not result in a taking in an applied challenge, it emphasized that by “requir[ing] that all relevant factors be taken into account,” as under the Chapter 36 process, “[t]he Legislature can discharge its responsibility under the Conservation Amendment without triggering the Takings Clause.” Id. at 843 (internal quotations omitted).
106. I have borrowed the term “management doctrine” from George Gould, who described it thus: The term ‘management doctrine’ is my own. Technically, most states in [the management doctrine] group apply surface water statutes to groundwater or have adopted a groundwater code which superficially resembles the appropriation doctrine. However, differences in the nature of groundwater and surface water require substantial modifications in actual operation. . . . What results is a system managed by a government official or commission which has considerable flexibility to regulate groundwater withdrawals to achieve objectives suitable to the particular aquifer.
107. Id. at 821.
108. Id. at 823.
that, while they could be diminished through drainage, with ‘proper diligence,’
could also be replenished through drainage” from other neighboring lands
overlying the same reservoir. 109 Despite “‘the fugitive nature of oil and gas,’”
the court has held that “the rule of capture provide[s] no ‘substantial ground’”
for treating it differently than “non-fugacious minerals” that are subject to
ownership in place, such as coal. 110 The Day court reasoned that the same rule
should apply to groundwater despite the significant differences between
groundwater and hydrocarbons, concluding that it saw “no basis in these
differences to conclude that the common law allows ownership of oil and gas in
place but not groundwater” 111 despite the fact that it acknowledged that the
differences between oil and water would provide justification for different
regulatory strategies. 112

The court further held that because the Authority’s method of permitting,
based only on historical use, was “more restrictive” than the Chapter 36
provisions governing general groundwater permitting, the Authority’s permit
restrictions could constitute a taking under the Texas Constitution. 113 Using the
three-factor Penn Central Transportation Co. v. New York City analysis, 114 the
court reasoned that although Day had adequate information to analyze whether
investing in the property made sense in light of the EAAA’s restrictions on
groundwater pumping, the state could not “immunize itself” from a takings
claim “merely by discouraging investment.” 115 Thus, it “[could not] say that
[Day] should necessarily have expected that his access to groundwater would
be so severely restricted.” 116

Turning to the “nature” of the challenged restriction, the court first stated
that groundwater regulation was “essential to its conservation and use.” 117 It
reasoned that fair regulation should take into account more than land surface
area, and that historical use was a proper factor for consideration. 118 However,
the court found that historical use alone could not serve as a fair basis for

1923)).
110. Id. at 829 (quoting Tex. Co. v. Daugherty, 176 S.W. 717, 719–20, 722 (Tex. 1915)).
111. Id. at 831.
112. Id. at 840–41.
113. Id. at 842–43. Texas takings doctrine “has generally been guided by the United States
Supreme Court’s construction and application” of the Fifth Amendment. Id. at 838.
114. The court used the Penn Central analysis after concluding that the restriction did not
constitute a physical invasion and that although the record was “inconclusive,” it “may be doubted”
that the permit restriction constituted a deprivation of all economically beneficial use of Day’s property. Id.
at 839–40. The Penn Central factors are: (1) “[t]he economic impact of the regulation on the claimant,”
(2) the “extent to which the regulation has interfered with distinct investment-backed expectations,” and
(3) the “character of the governmental action.” Penn Cent. Transp. Co. v. New York City, 438 U.S. 104,
115. Day, 369 S.W.3d at 840.
116. Id.
117. Id.
118. Id. at 840–41.
permitting, because it would incentivize waste rather than conservation.\footnote{119. Id. at 841. The Authority argued that basing permits on historical use “is sound policy because it recognizes the investment landowners have made in developing groundwater resources.” Id. However, the court reasoned that “had the permit limitation been anticipated before the EAAA was passed, landowners would have been perversely incentivized to pump as much water as possible, even if not put to best use, to preserve the right to do so going forward. Preserving groundwater for future use has been an important strategy for groundwater rights owners.” Id. Thus, it concluded, “[t]he Authority’s policy argument is flawed.” Id.}

Although the court did not reach a conclusion regarding whether a taking had occurred in Day’s case,\footnote{120. Id. at 842–43.} it implied that it would find a taking if a landowner was “deprived of all beneficial use of the groundwater below his property merely because he did not use it during an historical period and supply is limited.”\footnote{121. Id. at 843.}

Despite significant problems with the court’s oil and gas analogy,\footnote{122. See infra notes 169–84 and accompanying text.} the court ultimately demonstrated its support for the state’s general regulatory system. The court first reaffirmed that “the responsibility for the regulation of natural resources, including groundwater, rests in the hands of the Legislature.”\footnote{123. Day, 369 S.W.3d at 833 (quoting Sipriano v. Great Spring Waters of Am., Inc., 1 S.W.3d 75, 77 (Tex. 1999)). Indeed, although the court grounded its extension of groundwater ownership in common law, it justified its holding in part based on the legislature’s recent passage of Senate Bill 332, which affirmed the state’s recognition of absolute groundwater ownership, and on a provision in the EAAA affirming that the state intended that just compensation be paid for any taking effectuated by the Act. Id. at 832, 837–38, 842–43; Act of May 27, 2011, 82d Leg., R.S., ch. 1207, 2011 Tex. Gen. Laws 3224; see also McCarthy, supra note 16, at 908–09 (discussing the passage of Senate Bill 332). However, the court failed to acknowledge the import of other recent legislative actions that arguably strengthened GCDs’ regulatory authority, particularly the imposition of the “modeled available groundwater” cap. See Day, 369 S.W.3d at 833–36 (discussing Chapter 36’s regulatory scheme without discussion of the modeled available groundwater’s function).} It then noted that GCDs created under Chapter 36 “are the state’s preferred method of groundwater management,”\footnote{124. Id. at 835–36. In his Sipriano concurrence, Justice Hecht explicitly favored a legislative management doctrine over common law governance of groundwater, which indicates that the court will continue to support legislative innovation in this area. See Sipriano, 1 S.W.3d at 83 (“[N]either [Restatement (Second) of Torts] section 858 nor any other common law rule of water regulation is preferable to almost any effective legislative solution . . . .”).} and described with seeming approval the general GCD permitting scheme, under which GCDs can regulate well spacing, issue permits, limit production, and manage total groundwater production from an aquifer.\footnote{125. Id. at 835.} The court specifically noted that the general regulatory scheme gives local authorities the ability to consider management challenges related to conjunctive use, like the effect of groundwater pumping on surface water right holders and long-term water supply, when deciding whether to grant well permits.\footnote{126. Day, 369 S.W.3d at 835.}
its responsibility under the Conservation Amendment without triggering the Takings Clause\textsuperscript{127} under the Chapter 36 regulatory scheme. Thus, the court recognized the legitimacy and importance of groundwater regulation and management while cabining that regulatory capacity within the framework of the state Constitution in a way that preserved significant power for courts to check future legislative actions.\textsuperscript{128}

The court’s ultimate support for regulation is not surprising in light of previous decisions. Justice Hecht, who authored the \textit{Day} opinion, has very clearly stated his support for regulation of groundwater. In his \textit{Sipriano} concurrence, Justice Hecht only reluctantly upheld the rule of capture, reasoning that “[i]n the past several decades it has become clear, if it was not before, that it is not regulation that threatens progress, but lack of it.”\textsuperscript{129} He concluded that \textit{East} should not be overruled “only for now” because Senate Bill 1 “together with the increasing demands on the State’s water supply, may result before long in a fair, effective, and comprehensive regulation of water use that will make the rule of capture obsolete.”\textsuperscript{130} Justice Hecht thus signaled that his deference to the legislature would be tested not by its development of a cohesive regulatory scheme, but by its failure to pursue regulation.\textsuperscript{131} The concurrence also demonstrates Justice Hecht’s belief that the state can produce a “fair, effective, and comprehensive” regulatory system within the bounds of the Takings Clause—something his decision in \textit{Day} indicates the legislature may have achieved through the Chapter 36 system.\textsuperscript{132}

\textbf{III. ADVANCING A MANAGEMENT DOCTRINE}

Despite its recognition of the importance of groundwater regulation, the \textit{Day} court’s analogy between groundwater and oil and gas further exacerbates the artificial legal division of groundwater and surface water by failing to account for their scientific connection. Although Texas courts have continually reinforced the doctrine, the legislature and water managers have moved toward a reliance on regulation to avoid uncontrolled pumping.\textsuperscript{133} As Texas legislators

\textsuperscript{127.} Id. at 843.


\textsuperscript{129.} \textit{Sipriano}, 1 S.W.3d at 82 (Hecht, J., concurring).

\textsuperscript{130.} Id. at 83.

\textsuperscript{131.} See id.; see also \textit{City of Corpus Christi v. City of Pleasanton}, 276 S.W.2d 798, 805 (Tex. 1955) (Wilson, J., dissenting) (warning that the court would not always “close its eyes to the advancement of scientific and legal knowledge” by reasoning that groundwater regulation is a “primarily legislative” problem).

\textsuperscript{132.} \textit{See Day}, 369 S.W.3d at 843.

\textsuperscript{133.} Smith, supra note 64, at 263 (“In states that still follow the absolute ownership doctrine, like Texas, competition has ultimately led to the depletion of the resource—overdrafting to the point of the water becoming useless for most economic purposes.”).
and water managers are coming to realize, \(^{134}\) a management scheme grounded in comprehensive legislation provides a necessary foundation for the active management that conjunctive use requires, \(^{135}\) minimizing the importance of debates over common law rules.

### A. Conjunctive Management: A Western Imperative

#### 1. The Importance of Conjunctive Management

Water managers have long recognized the potential benefits of managing groundwater and surface water together as a single resource, particularly in regions with significant hydrologic connection between groundwater and surface water sources. \(^{136}\) Legal commentators have also noted the benefits of conjunctive management, especially where use of surface water or groundwater affects the availability of the other. \(^{137}\) Critics have consistently lambasted state law for failing to promote conjunctive management. \(^{138}\) Harm to interconnected systems caused by groundwater pumping and an increasingly sophisticated scientific understanding of the connection between groundwater and surface water dictate that legal reforms are required to cohesively manage the resource. At the same time, decisions like *Day* demonstrate the difficulties courts have with integrating these concerns into common law doctrine.

The term “conjunctive management” can be used to describe a range of


\(^{135}\) Active groundwater management includes “planned and coordinated monitoring, operation, and administration” of groundwater basins to advance particular policy goals. See Cal. Dep’t of Water Res., *California’s Groundwater—Bulletin 118, Update 2003* 32 (2003), available at http://www.water.ca.gov/groundwater/bulletin118/bulletin118update2003.cfm [hereinafter BULLETIN 118]; Smith, *supra* note 64, at 264 (noting that management schemes that include “government controls of type and rate of extraction” “are those that are most likely to have the tools necessary to actively manage groundwater (by doing things such as setting up recharge systems, importing and injecting water or regulating pumping”).


\(^{137}\) See, e.g., Templer, *supra* note 5, at 39 (“It is generally agreed, considering the substantial interconnections between the phases of the hydrologic cycle, that conjunctive management is a desirable objective, especially where it can be demonstrated that unregulated water use in one phase has appreciable effects on established water rights and opportunities for water use in other phases.”).

management strategies and projects. In essence, however, it means optimizing the use of multiple water sources over time in response to changing conditions. At a basic level, water users can turn to groundwater supplies when surface water runs short in a dry year, with reliance on surface water increasing during wetter years. More complex strategies include injecting excess surface water into aquifer formations for later storage (“aquifer storage and recovery” or “water banking”). Conjunctive management also has the potential to make water resource supply planning more comprehensive while addressing supply uncertainty by integrating understanding of all available resources within a single basin, although it also requires more extensive data collection and analysis than nonintegrated planning.

The chief benefit of conjunctive management for water authorities is that it allows for the production of the most water at the lowest cost, because users can take advantage of wet conditions while avoiding costs associated with surface water supply construction. Particularly in aquifers with significant surface recharge potential, relatively slow inflow allows water users to take advantage of the aquifer’s natural capacity to store surface runoff in wet years. In addition to saving runoff that might otherwise be wasted, the system benefits from reduced evaporation compared with surface storage strategies. The potential for enhanced production is especially important to

139. A. Sahuquillo & M. Lluria, Conjunctive Use as Potential Solution for Stressed Aquifers: Social Constraints, in INTENSIVE USE OF GROUNDWATER: CHALLENGES AND OPPORTUNITIES 159 (Ramón Llamas & Emilio Custodio eds., 2003). However, Sahuquillo and Lluria also note that “[s]urprisingly enough, this obvious possibility of regularly using more surface water in wetter periods has not been applied very often,” perhaps because the differing legal regimes applied to each stage impede this flexibility. Id. at 160.
140. Id. at 167–68.
141. See id. at 171–72.
142. See id.
143. See, e.g., Douglas L. Grant, The Complexities of Managing Hydrologically Connected Surface Water and Groundwater Under the Appropriation Doctrine, 22 LAND & WATER L. REV. 63, 64 n.4 (1987). This is true even when accounting for increased monitoring and data collection costs, since those investments allow managers to avoid costs associated with uncertainty and unnecessary water supply project construction. See Sahuquillo & Lluria, supra note 139, at 172.
144. Political difficulties, a lack of suitable sites, construction expenses, and difficulties obtaining water rights associated with surface water storage construction can make these projects very expensive. See Miguel A. Maríño, Conjunctive Management of Surface Water and Groundwater, in REGIONAL MANAGEMENT OF WATER RESOURCES: PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM (SYMPOSIUM S2) HELD DURING THE SIXTH SCIENTIFIC ASSEMBLY OF THE INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES (IAHS) 165 (A. H. Schumann ed., 2001); J. David Aiken, Commentary, The National Water Policy Review and Western Water Rights Law Reform: An Overview, 59 NEB. L. REV. 327, 343 (1980). Cost savings from avoided surface water storage construction is “especially valuable” when it avoids construction “that would be used only occasionally to meet peak or emergency demands.” Blomquist et al., supra note 71, at 657. These cost savings can extend beyond storage site construction to include savings from reduced water treatment (owing to “natural, biological, physical, and chemical processes” within the aquifer that can improve water quality), and “natural water conveyance to wells.” Sahuquillo & Lluria, supra note 139, at 167.
145. Bittinger, supra note 82, at 38.
146. Smith, supra note 9, at 670.
managers attempting to address population growth and seasonal water demands that are not compatible with water supply availability.  

Conjunctive management also allows managers to address legal, economic, and environmental problems that arise from intensive use of hydrologically connected water systems. Groundwater pumping can interfere with surface water flow, produce land subsidence, and destroy aquatic habitat. By changing the direction of water flow between aquifers and surface water sources, groundwater pumping can turn “gaining streams” (which gain flow from groundwater discharge) into “losing streams” (from which surface water is drawn into groundwater formations). Examples of harms to surface water resources from groundwater pumping abound, including the elimination of base flow from Arizona’s Santa Cruz River and the Cosumnes River in Sacramento. Similarly, surface water use can diminish groundwater recharge. A legal framework that facilitates conjunctive management is a necessary foundation for planning and organizational functions of comprehensive management systems for these resources.

2. Benefits for Texas and the Edwards

Texas’s rapidly growing population is putting increasing pressure on the state’s water supplies, particularly in its more arid central and western regions. This increased pressure has led to groundwater overdraft in many parts of the state, including the Edwards basin. The state’s current drought has focused the entire state’s attention on water supply, leading lawmakers to advocate for everything from increased conservation to the development of an extensive desalination infrastructure. However, Texas has also systematically underfunded proposed water supply projects.

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147. Blonquist et al., supra note 71, at 655–56.
148. See Sahuquillo & Lluria, supra note 139, at 158, 172.
149. Id. at 158; Bittinger, supra note 82, at 36; Young & Bredehoeft, supra note 136, at 535.
151. See Glennon, supra note 93, at 45–50.
152. See Jan Fleckstein et al., Managing Surface Water-Groundwater to Restore Fall Flows in the Cosumnes River, 130 J. WATER RESOURCES PLAN. & MGMT. 301 (2004).
153. Sahuquillo & Lluria, supra note 139, at 158.
154. See id.
155. See TEX. WATER DEV. BD., WATER FOR TEXAS: 2012 STATE WATER PLAN 130, 135–42 (2012).
156. See Kaiser & Skillern, supra note 6, at 261.
159. See Farzad Mashhood, Is the State Water Plan Unfunded? No, AUSTIN AM.-STATESMAN SALSA VERDE BLOG (Jan. 5, 2012, 12:51 PM), http://www.statesman.com/blogs/content/shared-
demonstrating the state’s historic failure to appropriate consistent funding for water infrastructure.160 More recently, efforts to fund the state’s $53 billion water plan have gained momentum in the state legislature, with key lawmakers drafting comprehensive legislation to create a state water infrastructure bank and fund conservation projects.161 The extensive water supply issues facing the state argue for the most comprehensive management possible of the state’s limited water resources, especially as the state appears poised to make significant investments in water supply infrastructure.

Karst aquifers like the Edwards are especially suited for conjunctive management because their relatively high recharge rate and dynamic flow means that they generally have significant hydrologic connection to surface water sources.162 Like the Edwards Aquifer system’s San Marcos, Comal, and Barton Springs.163 Importantly for the Edwards Aquifer, one of the benefits of conjunctive management is “enhanced protection of aquatic life and habitat,” since managers are more able to control the amount of water available at

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160. See TEX. COMPTROLLER OF PUB. ACCOUNTS, LIQUID ASSETS: THE STATE OF TEXAS’ WATER RESOURCES 59–62 (2009), available at http://www.window.state.tx.us/specialpr/Water/PDF/96-1360-LiquidAssets.pdf (discussing a series of one-time state expenditures for bonds to finance water infrastructure projects and noting that the Legislature “has considered establishing a dedicated funding mechanism for water programs” since 1997, but that no such program currently exists). As of 2008, the TWDB had authority to issue nearly $5 billion in general obligation bonds to fund a projected $30.7 billion in need (as identified by the 2007 State Water Plan). Id. at 59. However, because the TWDB relies on the Legislature to fund debt service on issued bonds, only $2.5 billion had been issued as of August 2008, with another $10.7 million in debt service approved for fiscal years 2008 and 2009. Id.


163. See, e.g., Larry F. Land et al., Hydrologic Connection of the Edwards Aquifer between San Marcos Springs and Barton Springs, Texas, 60 GULF COAST ASS’N OF GEOLOGICAL SOCIETIES TRANSACTIONS 401 (2010).
different parts of the system. Water managers relying on Edwards Aquifer water have recognized the potential benefits of conjunctive management and have begun to develop innovative conjunctive supply projects in the basin.

B. The Limits of Common Law Adjudication

Although Texas’s rule of capture produces particularly harsh results, ultimately other common law doctrines also require statutory intervention to address modern management goals such as conjunctive management. Texas provides an example of the ways in which courts have wrestled with the ignorant roots of groundwater common law. However, as demonstrated by California’s experience, even when courts have recognized the effects of groundwater pumping on surface water resources, their institutional expertise does not encompass the development of a comprehensive management regime. Common law also fails to provide adequate guidance for merging the divergent legal regimes governing groundwater and surface water, leading to uncertainty that undermines conjunctive management efforts.

I. Struggles With Science: The Day Court’s Oil and Gas Analogy

By further reinforcing the unfortunate legal dichotomy between groundwater and surface water, the Day decision demonstrates the difficulties

164. Blomquist et al., supra note 71, at 654; see also Kaiser & Skillern, supra note 6, at 262 (identifying harms to “ecological resources,” including river, spring, and wetland habitats, as an effect of groundwater pumping).


166. See Bittinger, supra note 82, at 37 (demonstrating that even if common law integrates surface water and groundwater rights, regulatory management is still required to achieve maximum beneficial use of the resource); Kaiser & Skillern, supra note 6, at 270 (“Experiences from other states indicate that one or a combination of these four [common law] allocation rules cannot resolve all groundwater problems. Instead, states . . . have adopted critical area legislation to supplement state allocation rules.”).

167. See Joseph L. Sax, We Don’t Do Groundwater: A Morsel of California Legal History, 6 U. DENV. WATER L. REV. 269, 305 (2003) (opining that the California Legislature “designed [1913 groundwater] legislation to create an impact test (impact of pumping on surface stream flows), and to extend the Board’s jurisdiction to pumping that has an appreciable and direct impact upon a surface stream” and that “any such line drawing represents a policy judgment, not a technical one” because “any test intended to separate one part of the groundwater from another inescapably requires a judgment that reflects a purposive goal!”).

courts have incorporating increasingly sophisticated scientific knowledge into outdated common law frameworks. Despite the court’s assertion that the differences between oil and gas and groundwater provide “no basis . . . to conclude that the common law allows ownership of oil and gas in place but not groundwater,” the hydrologic connection between groundwater and surface water undermines the court’s oil and gas analogy. While the court acknowledged that groundwater is recharged from surface sources, it failed to discuss effects of groundwater pumping on surface water discharge, even though it recognized that the legislature had seen fit to address this issue by statute. Oil and water do share a transient nature, and may flow from under one landowner’s land to another part of the reservoir though drainage. However, a single property law scheme governs oil and gas through all stages of development. This feature of oil and gas law stands in stark contrast to water, which may flow from a stream or surface precipitation into the ground, and exit again as a surface spring, transitioning between distinct bodies of law at each step. The artificial legal division of the water cycle serves as a significant barrier to “more unified and efficient” water management and has been “perceptively described . . . as ‘a lawyer’s paradise and a logician’s nightmare.’” However maligned this division, the court’s failure to address it demonstrates the court’s struggle with the scientific principles that should underlie water management.

The state’s extensive experience with oil and gas regulation likely convinced the court that a similar common law foundation would not undermine groundwater regulation, providing the court with a legal scheme that

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170. Id. (“Unlike oil and gas, groundwater in an aquifer is often being replenished from the surface . . . .”).
171. The court did make a vague reference to “environmental impacts” of groundwater pumping, which it could have intended to reference surface discharge, but also characterized these impacts as “unrelated to use.” Id.
172. See id. at 835. The court’s failure to more thoroughly analyze hydrologic connections in the Edwards is particularly surprising in light of the court’s opinion in Barshop, in which it acknowledged that “[t]he Edwards Aquifer is a unique underground system of water-bearing formations in Central Texas. Water enters the aquifer through the ground as surface water and rainfall and leaves the aquifer through well withdrawals and springflow.” Barshop v. Medina Cnty. Underground Water Conservation Dist., 925 S.W.2d 618, 623 (Tex. 1996).
175. Templer, supra note 5, at 30, 36–37 (quoting H.E. THOMAS, WATER RIGHTS IN AREAS OF GROUND-WATER MINING, U.S. GEOLOGICAL SURVEY, CIRCULAR NO. 347 (1955)); see also Rossmann & Steel, supra note 21, at 905.
176. Andrew Sansom, the executive director of the River Systems Institute at Texas State University and former director of the Texas Parks and Wildlife Department, has suggested that the “irreconcilable disconnect” between hydrology and the court’s oil and gas analogy may force the state Legislature to overhaul the state’s water management laws in light of the Day decision. See Buchele, supra note 7.
protected landowners’ property rights while giving the state room to develop the regulatory regime for which Justice Hecht has long advocated. Indeed, commentators have suggested that oil and gas regulation could provide some foundation for groundwater regulation. However, the necessary coherent legal basis for managing interacting groundwater and surface water is absent from this scheme, demonstrating that the court failed to appreciate the significance of scientific differences between oil and water. The failure to adequately grapple with water science and the consequent flaws with the court’s oil and gas analogy demonstrate the difficulties courts face when confronted with deeply ingrained common law rules that do not reflect scientific reality.

Even if the court had attempted a more sophisticated scientific analysis, however, its lack of institutional competence would limit its effectiveness. Policy decisions regarding how much water should be used from Texas’s variety of water sources are so closely linked to scientific information; thus, scientific expertise is a necessary component of competent management. Although courts can appoint watermasters to administer decisions and consider scientific testimony from party experts, these avenues are inadequate from a management perspective because they do not develop expertise within a standing institutional body. Adequate scientific information about resource conditions is particularly important in highly complex ecosystems like the Edwards that serve large populations, where multiple institutions need to cooperate. The Edwards and Ogallala Aquifers demonstrate the significant

177. See Sipriano v. Great Spring Waters of Am., Inc., 1 S.W.3d 75, 82 (Tex. 1998) (Hecht, J., concurring) (“The extensive regulation of oil and gas production proves that effective regulation of migrant substances far below the surface is not only possible but necessary and effective.”). Justice Hecht also authored the Day opinion. Day, 369 S.W.3d 814 (Tex. 2012).


179. See, e.g., Templer, supra note 5, at 41; Opiela, supra note 15, at 102–03 n.102; Young & Bredehoeft, supra note 136, at 538–39.

180. A thorough analysis of the problems arising from judicial consideration of scientific information is beyond the scope of this Note. Groundwater management is but one instance in which the issue arises. See, e.g., KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS (1997).


182. See, e.g., Charles J. Taylor & William M. Alley, U.S. GEOLOGICAL SURVEY, CIRCULAR 1217, GROUND-WATER-LEVEL MONITORING AND THE IMPORTANCE OF LONG-TERM WATER-LEVEL DATA 16 (2001) (“Long-term data are fundamental to the resolution of many of the most complex problems dealing with ground-water availability and stability.”) (internal citations omitted).

183. See Tanya Heikkila & Andrea K. Gerlak, The Formation of Large-Scale Collaborative Resource Management Institutions: Clarifying the Roles of Stakeholders, Science, and Institutions, 33 POL’Y STUD. J. 583, 585 (2005) (explaining that better information about a particular resource can
hydrogeological variability that would make fashioning a scientifically rigorous general rule difficult for a court.184 The Edwards Aquifer is a high-recharge, fast-flowing aquifer that can be consistently pumped in limited amounts without reducing future supplies, but heavy use can harm hydrologically connected surface water sources.185 In contrast, the fossilized groundwater in the West Texas Ogallala Aquifer generally recharges very little, meaning that current drawdown is limiting future use, but has less interaction with surface water.186 The ongoing management needs of these two basins are highly context-dependent and require local, institutional expertise. Judicial decisions cannot be expected to generate the scientific foundation required for these policy decisions.187

2. Struggles With Efficiency: The California Experience

In contrast with the Texas courts, California courts have been attempting to integrate groundwater and surface water rights since 1904.188 The California Legislature also recognized the connection between groundwater and surface water in 1913, when it drafted the precursor to the state’s current governing increase the likelihood that cooperative institutional arrangements will form to manage common pool resources).


185. See supra notes 84–91 and accompanying text.

186. See Scanlon et al., supra note 91, at 3–4. The Ogallala does have some interaction with surface water sources, including the Cimarron and Canadian Rivers as well as various creeks. See ALAN R. DUTTON, ROBERT C. REEDY & ROBERT E. MACE, SATURATED THICKNESS IN THE OGALLALA AQUIFER IN THE PANHANDLE WATER PLANNING AREA—SIMULATION OF 2000 THROUGH 2050 WITHDRAWAL PROJECTIONS 28 (2001), available at http://www.twdb.state.tx.us/publications/reports/contracted_reports/doc/2001483392.pdf. However, surface recharge and discharge are both significantly less than in the Edwards system. Compare id. at 17 (Ogallala recharge estimates range between 0.01 and six inches per year), and DUTTON ET AL., supra, at 20 (the Ogallala provides baseflow in the 30 to 60 cubic feet per second (cfs) range to four surface water sources), with MACLAY, supra note 84, at 39 (Edwards surface recharge averaged 635,500 acre-feet per year between 1934 and 1988), and MACLAY, supra note 84, at 45 (the Edwards provides baseflow in the 100 to 500 cfs range to multiple springs).

187. The Texas Supreme Court has recognized its own institutional limitations in the groundwater context. See Friendswood Dev. Co. v. Smith-Sw. Indus., 576 S.W.2d 21, 30 (Tex. 1978) (“It is well that the Legislature has assumed its proper role, because our courts are not equipped to regulate ground water uses and subsidence on a suit-by-suit basis.”). But see Sipriano v. Great Spring Waters of Am., Inc., 1 S.W.3d 75, 83 (Tex. 1998) (Hecht, J., concurring) (arguing that “the Court entered the area of water regulation in East when it adopted the rule of capture” and that “[i]t is hard to see how maintaining the rule of capture can be justified as deference to the Legislature’s constitutional province when the rule is contrary to the local regulation that is the Legislature’s preferred method of groundwater management”).

188. See Cohen v. La Canada Land & Water Co., 76 P. 47, 48–49 (Cal. 1904) (protecting a surface right holder from harm caused by pumping of tributary groundwater); Sax, supra note 167, at 313–15 (discussing the Cohen case and arguing that “it may be that the determination of the California Supreme Court to integrate groundwater and surface water rights in litigation explains, at least in part, how California law has been able to endure the ‘non-administration’ of groundwater . . . for so many decades”).
However, the legislature ultimately decided to regulate only surface water, retaining artificial legal divisions that its supreme court had been attempting to discard. Commentators have since continued to criticize the state for failing to "bring its water law into line with contemporary knowledge."

Although California follows a progressive common law doctrine that allows courts to protect all landowners in individual adjudications, its lack of comprehensive management legislation makes groundwater management in the state piecemeal and inefficient. California and Texas are often lumped together by commentators because neither state has a statewide permitting system, especially in comparison to states like New Mexico that have centralized state officers who oversee groundwater management. However, a closer look reveals significant differences. California follows its own common law doctrine, known as correlative rights, which provides each landowner overlying an aquifer equal rights to reasonable and beneficial use of the water that is reduced pro rata if shortage occurs. California’s correlative rights doctrine provides a common law enforcement mechanism against unrestrained pumping by any one individual, which, unlike the rule of capture, supplies a judicial remedy against the worst offenders. However, this

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189. Sax, supra note 167, at 291.
190. Id. at 282–83, 297. Interestingly, Professor Sax argues that concern about the constitutionality of restricting groundwater pumping may have been at the heart of the California Legislature’s decision to abandon groundwater permitting in the 1913 legislation. Id. at 293–97.
191. Id. at 270; see also id. at 300–04 (noting that “[a]lmost as soon as the [1913] Water Commission law was enacted, proposals emerged to revise it and create an integrated management system for surface and groundwater” and describing subsequent criticisms and attempts to reform the law); M. RHEAD ENION, UNDER WATER: MONITORING AND REGULATING GROUNDWATER IN CALIFORNIA 14–17 (2011), available at http://cdn.law.ucla.edu/SiteCollectionDocuments/Centers%20and%20Programs/Emmett%20Center%20on%20Climate%20Change%20and%20the%20Environment/Pritzker_01_Under_Water.pdf.
192. See supra notes 23–24 and accompanying text.
193. See, e.g., BULLETIN 118, supra note 135, at 33–34 (noting that more than twenty types of local agencies have statutory authority to deliver water, “[m]any” of which can also “institute some form of groundwater management,” and that “[g]reater authority to manage groundwater has been granted to a small number of agencies or districts created through special acts of the Legislature” with varying types and levels of authority).
194. See, e.g., Smith, supra note 64, at 261.
195. See Smith, supra note 9, at 684 (describing the New Mexico state engineer’s role in groundwater management).
196. Rossmann & Steel, supra note 21, at 908. However, California courts do take historical use into account during groundwater adjudications, reasoning that equity requires consideration of historical use if these uses are not unreasonable. City of Barstow v. Mojave Water Agency, 23 Cal. 4th 1224, 1250–51 (2000). All water in California is owned by the state, so groundwater rights are usufructuary only. See id. at 1240.
197. See Sax, supra note 167, at 282 (“Katz essentially determined the resolution of conflict between contending water users should be based upon the impact of one use upon another, rather than upon some ex-ante classification of the source.”).
mechanism is inadequate to support comprehensive management.198

California’s adjudication-based strategy199 undermines conjunctive management in a variety of ways. It limits management authority for stressed basins prior to adjudication,200 which causes unnecessary degradation of groundwater basins.201 A near-complete reliance202 on adjudication also increases transaction costs for would-be project developers.203 Significant inefficiency and unclear rights based on confusing case law204 disincentivize project development.205 Further, adjudication limits the scope of decision making to an individual controversy. Because each suit focuses on the particular parties at hand, the system fails to provide a central clearinghouse for information sharing among water managers,206 a critical component of an

198.  Rossmann & Steel, supra note 21, at 914 (noting that water regulation “can result in control superior to that achieved through piecemeal adjudication of individual rights,” and that “[t]he courts nor the State Board . . . has addressed groundwater management in terms of the entire state”); Foley-Gannon, supra note 168, at 1149–52 (concluding that it is “possible” for California water agencies to develop conjunctive use projects by relying on contracts, but suggesting numerous legal reforms).

199.  For a description of California’s groundwater adjudication process, see Foley-Gannon, supra note 168, at 1126–31.

200.  Deborah A. de Lambert, Note, District Management for California’s Groundwater, 11 ECOLOGY L.Q. 373, 387 (1984) (noting that the “general rule in California” has been that “[u]sers pump without restraint until overdraft occurs and then resort to the courts for allocation of an insufficient resource” because “until overdraft begins there is little else that can be done because there are generally no entities with pre-litigation management authority”).

201.  Foley-Glannon, supra note 168, at 1131.

202.  Although local agencies in California can develop groundwater management plans, their administrative authority is quite limited and many plans have never been implemented. See BULLETIN 118, supra note 135, at 35, 44. As of 2003, twenty-seven counties had passed local groundwater management ordinances under their police power, largely in reaction to groundwater export proposals. Id. at 36–39. Groundwater mining is rarely addressed. See id. at 39. This leaves adjudications as “one of the strongest forms of groundwater management in California.” Id. at 40.

203.  Smith, supra note 64, at 266 (“[I]n some cases, notably California, the transaction costs of stable management . . . have been great and hence these situations cannot be recommended.”).

204.  TAYLOR, supra note 138, at 20 (identifying the fact that “[g]roundwater use and rights [are] unclear, leading to distribution and management issues” as a groundwater management problem).

205.  Blomquist et al., supra note 71, at 668 (noting that “California’s groundwater governance can hamper conjunctive management programs” because “overlying landowners and appropriators have insufficient assurance that the water they place in storage will be available for later pumping and delivery” and that the increased transaction costs imposed by California’s lack of statutory governance “help to explain why conjunctive management has not been implemented in many actively used groundwater basins, even where it would be physically feasible and arguably desirable”).

206.  TAYLOR, supra note 138, at 16, 20–21 (noting that “the state’s water planning efforts are impeded by weaknesses in the statewide management of groundwater,” such as data collection, and that “[t]he state needs, but now lacks, comprehensive data on groundwater extraction, groundwater levels, and groundwater quality”); REBECCA NELSON, UNCOMMON INNOVATION: DEVELOPMENTS IN GROUNDWATER MANAGEMENT PLANNING IN CALIFORNIA 10 (2011), available at http://www.stanford.edu/group/waterinthewest/cgi-bin/web/sites/default/files/RNelson%20Water%20Paper.pdf (noting that although some groundwater managers in California are pursuing innovative projects and management strategies, “few know about them” because “there is no comprehensive State-wide database” of management plans, and “information barriers sometimes prevent even neighboring agencies from finding out about planning activities”)

effective conjunctive use program.\textsuperscript{207} Although California was initially a conjunctive-management pioneer,\textsuperscript{208} these flaws have blunted its progress.

California state officials have long recognized the need for a more robust management approach,\textsuperscript{209} but the legislature thus far has been unable or unwilling to pass the required legislation.\textsuperscript{210} A lack of coordinated authority renders existing groundwater planning legislation inadequate and ineffectual.\textsuperscript{211} However, the state recently passed a legislative package to improve groundwater monitoring,\textsuperscript{212} which many see as a positive (if limited) step toward more cohesive management.\textsuperscript{213} Special districts may also have the power to regulate groundwater at the local level,\textsuperscript{214} and many of these districts have developed innovative management strategies and projects.\textsuperscript{215} However, California’s groundwater administration remains far behind other states.\textsuperscript{216}

\textbf{C. Benefits of a Management Doctrine}

A regulatory management system allows for needed innovation and

\begin{itemize}
\item\textsuperscript{207} See McClurg & Sudman, supra note 136, at 277.
\item\textsuperscript{208} Sahuquillo & Lluria, supra note 139, at 167.
\item\textsuperscript{209} See generally Governor’s Comm’n to Review California Water Rights Law, Final Report (1978) (concluding that California’s water is inadequately protected by law); see also Taylor, supra note 138, at 3 (recommending that the state “[e]stablish Active Management Areas . . . in circumstances where groundwater overdraft potential or the extent of pollution problems are the highest,” “modernize groundwater law to accurately reflect the physical interconnection of surface water and groundwater,” and “[c]onsider phasing in statewide groundwater permitting”).
\item\textsuperscript{210} See Rossmann & Steel, supra note 21, at 928–29; Smith, supra note 9, at 687; Sax, supra note 188, at 302–04. This is not to suggest that the state legislature has done nothing to address conjunctive management. For example, California has passed legislation to encourage conjunctive management by protecting existing surface water rights from forfeiture if certain groundwater sources are used to reduce reliance on surface supplies. See CAL. WATER CODE § 1011.5 (West 2012). However, political opposition to more cohesive regulation is often fierce, especially from the state’s powerful agriculture industry. See John Hedges, Currents in California Water Law: The Push to Integrate Groundwater and Surface Water Management through the Courts, 14 U. DENV. WATER L. REV. 375, 390–91 (2010) (describing the agriculture industry’s opposition to groundwater monitoring legislation).
\item\textsuperscript{211} Taylor, supra note 138, at 16 (noting that voluntary groundwater management plans “generally have not been used in state water planning” and “have largely . . . been of little practical use to the department”); BULLETIN 118, supra note 135, at 48 (listing “impediments to conjunctive management programs in California,” including “[l]ack of statewide leadership in the planning and development of conjunctive use programs as part of comprehensive water resources plans, which recognize local, regional, and other stakeholders’ interests”).
\item\textsuperscript{212} 2009 Cal. Stat. Ch. 1.
\item\textsuperscript{213} See, e.g., Enion, supra note 191, at 14 (noting that California’s passage of SBx7-6 “represents a good first step towards monitoring groundwater, but it is not nearly enough”).
\item\textsuperscript{215} See Nelson, supra note 206, at 25–30; McClurg & Sudman, supra note 136, at 276–77; BULLETIN 118, supra note 135, at 35–44. The State Department of Water Resources has also developed a program by which it offers technical and financial assistance to local authorities. See id. at 72–73.
\item\textsuperscript{216} See Taylor, supra note 138, at 16, 20–21.
\end{itemize}
flexibility while retaining the benefits of consistency. Management systems can better conserve and protect groundwater resources by capping withdrawals, while supporting economic efficiency by developing a market for pumping permits and internalizing costs. Regulation can also help lower costs and address scarcity by providing demand-side alternatives to expensive engineering solutions. Legislation may also allow management to better reflect hydrologic conditions by, for example, requiring more stringent management in areas facing particularly acute depletion risk. Technical competence is perhaps the most critical benefit, as a regulatory agency is more likely than a court to have the technical ability to determine the effect one water user is likely to have on others. Thus, even in a decentralized system, technical complexity produces an “unavoidable need to have a supra-individual authority dictating, or at least sanctioning” significant management decisions and collecting information about water use throughout the basin, which can incur political opposition. However, comprehensive management systems ultimately provide the most likely avenue for achieving robust conjunctive management.

Judicial review remains a check on agency permitting decisions under a management doctrine, although courts tend to defer to agencies where technically complex decisions are made by a centralized regulatory

217. See S. Burchi & M. Nanni, How Groundwater Ownership and Rights Influence Groundwater Intensive Use Management, in INTENSIVE USE OF GROUNDWATER: CHALLENGES AND OPPORTUNITIES 239 (Ramón Llamas & Emilio Custodio eds., 2003) (“Regulated rights in groundwater provide the regulator with the flexibility needed to adjust allocation patterns to changing circumstances, to restrain the mining of groundwater and to practise conjunctive use of surface and underground water, without detracting from the security of tenure which is desirable for investment decisions.”).

218. See Young & Bredehoeft, supra note 136, at 536–37 (noting that “[t]he traditional remedy” for “detrimental external effects” caused by “intensive unregulated exploitation” of groundwater in the West has been “to try to develop additional water supplies by new investments in storage and conveyance facilities,” but “because of increasing scarcity of water, the traditional large-scale intrabasin and interbasin transfer schemes are becoming increasingly expensive, and institutional changes for management and allocation must be developed,” such as “basin authority”).


220. See Young & Bredehoeft, supra note 136, at 550–51.

221. See Sahuquillo & Lluria, supra note 139, at 172.

222. See Burchi & Nanni, supra note 217, at 233.


225. Burchi & Nanni, supra note 217, at 232; see also Clark, supra note 64, at 480–81.

226. See, e.g., Young & Bredehoeft, supra note 136, at 536 (“There is strong resistance to regulatory innovation when free access has become an established tradition and when economic surplus is captured by common property resource users and becomes capitalized into land values.”).

227. See, e.g., Sax, supra note 167, at 317.
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authority. As common law has failed to mitigate aquifer mining in high-use areas, western states have consistently moved away from reliance on common law and toward legislatively adopted regulatory management schemes. As increasing demand on the West’s water systems and advancing scientific knowledge put additional pressure on courts to resolve complex groundwater management problems, legislatures will need to fill the gaps left by common law.

D. Addressing Political Opposition to Regulation

Political opposition is arguably the most significant barrier to water management reform, as demonstrated by California’s experience. The need for a centralized authority to address the technical and consistency requirements of a functioning management doctrine stands in tension with the benefits of decentralized decision making, particularly higher levels of political legitimacy and the resulting reduction in enforcement problems. Participation encourages adherence because it helps educate stakeholders about the problems arising from groundwater mining and empowers them as decision makers. Technical competence may have positive effects on politics as well as management outcomes, because competent groundwater management may actually result in higher net farm income, and agricultural interests are most often opposed to groundwater regulation. Competent management and consistent decision making may even enable more centralized management

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228. See Howe, supra note 223, at 66 (noting that in Utah and New Mexico, which have centralized permitting through the state engineer, courts almost always accept the engineer’s conclusions regarding potential adverse effects on other water users).

229. See, e.g., William Goldfarb, Water Law 46 (2d ed. 1988); Clark, supra note 64, at 481 (“In practically all of the other western states, there is a recognition in legislation and court decisions that there must be a management framework in the law which will enable the market mechanism to work effectively for all classes of users.”).

230. See Clark, supra note 64, at 484 (“It is clear that legislation plays a major role in ground water management and without legislation there is no adequate ground water management. Good management and the law are what make the market mechanism work. In the semi-arid West supply and demand in relation to water have never operated effectively without a framework of public control as is attested by the 90-year history of the permit system applied to surface water management, even though these systems are in need of improvement and expansion to include ground waters.”).

231. See Aiken, supra note 144, at 344 (“The primary obstacle to [reforms of western water law] is not the absence of legal models to obtain reform objectives, but social, economic, and political objections to those objectives.”); Sax, supra note 188, at 303 (quoting a 1962 California Assembly Interim Committee report noting robust political opposition to centralized management).

232. See supra note 224.


234. See id. at 235–36.

235. See id., supra note 144, at 334; Stephen E. Snyder, Comment, Ground Water Management: A Proposal for Texas, 51 Tex. L. Rev. 289, 298 (1973) (West Texans oppose groundwater regulation “because they fear that production controls would reduce their economic return.”).
systems to overcome political opposition. However, self-determination may justify less-centralized management, since different communities may have very different values regarding the importance of groundwater use in the short term versus long-range conservation. Regional governance of groundwater is also technically desirable, because hydrogeology varies dramatically, particularly within large states like Texas and California.

Nonetheless, decentralization can be risky if the authorizing legislation does not provide a strong enough conservation mandate. Most significantly, regionalism is subject to capture by powerful local interests that may undermine needed pumping controls. By allowing GCDs to permit significant overdraft through their adoption of locally determined DFCs, Texas’s system remains vulnerable to this problem, although the updated modeled available groundwater process should ameliorate its worst effects. Although underenforcement and capture will remain potential pitfalls of decentralized management, district-level management systems have the potential to work well if districts have adequate statutory authority and resources.

E. Texas’s Path Forward

Although Texas remains beset by an inflexible and outdated common law doctrine and a delayed start to developing a robust statutory framework for groundwater regulation, it has also recently taken significant steps to improve its statutory management scheme. In their current form, GCDs are instructed to base permits on groundwater withdrawal caps determined through the regulatory process, although made clear that they must consider the

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236. See Smith, supra note 9, at 685–86 (noting that a survey of New Mexico groundwater stakeholders, including major agricultural and mining interests, found “unanimous” support for the state’s centralized permitting system “because of the uniformity and consistency such administration provided,” but that “most respondents qualified their preference for centralized administration by indicating their preference could change quickly when [State Engineer Steve] Reynolds leaves office”).


238. See supra note 76; Smith, supra note 64, at 268 (noting that centralized permit systems can be “dysfunctional” if they are missing “the flexibility to take into consideration changing geological and social conditions” and “local stakeholder input”).

239. See Burchi & Nanni, supra note 217, at 229 (noting that, as of 2001, most of Texas’s GCDs “have deferred to the rule of capture and have not imposed mandatory restrictions on the affected landowners’ rights to pump and on the amount of water extracted. Most have opted, as a result, for voluntary self-restrain and educational programmes”).

240. Id.

241. See supra notes 57–64 and accompanying text. Statutory requirements to conserve and protect groundwater resources also restrain this behavior to a certain extent. See TEXAS WATER CODE ANN. § 36.108(d)(2) (West 2012).

242. Smith, supra note 64, at 268.


244. See supra notes 57–60 and accompanying text.
totality of the circumstances beyond mere historical use in making these decisions.\textsuperscript{245} Although decentralized aquifer management allows local interests hostile to groundwater conservation to promote more aggressive pumping,\textsuperscript{246} local managers have a consistent source of statutory authority. Furthermore, the legislature has acted to address conjunctive use and the effect of groundwater pumping on surface water right holders through legislation.\textsuperscript{247} Current efforts to promote conjunctive use still lack specificity and, because the system is so new, their enforcement has yet to be thoroughly tested. However, Texas is making progress that will hopefully continue as the DFC process begins to bear fruit.

\section*{CONCLUSION}

By embracing ownership in place and reinforcing its outdated rule of capture common-law system, the \textit{Day} court failed to advance Texas’s common law to reflect modern groundwater science. Greater understanding of groundwater-surface water connections has driven ongoing criticism of the fragmented, disparate legal systems that govern groundwater and surface water. However, common law need not serve as a barrier to a robust regulatory framework that provides managers with the tools to address modern management challenges like conjunctive use. Although Texas’s regulatory framework has weaknesses, most significantly vulnerability to local capture, it has improved considerably in recent years, both through strengthened statutory mandates to control groundwater pumping and increasing recognition of groundwater-surface water connections.

The rule of capture has been rightly criticized, but its obstinacy is not determinative of Texas’s ultimate ability regulate its groundwater successfully. Rather, it will be the extent to which the state embraces a cohesive statutory framework that grants water managers adequate regulatory authority to limit groundwater pumping and promote more sophisticated management strategies like conjunctive management. Despite the problems with its decision, by endorsing the state’s efforts to regulate groundwater, the \textit{Day} court affirmed the state’s ability to address these challenges through regulation.

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{245} See supra notes 123--28 and accompanying text.
\item \textsuperscript{246} See, e.g., Forrest Wilder, \textit{The End of the Hill Country}, TEX. OBSERVER (July 20, 2010), http://www.texasobserver.org/the-end-of-the-hill-country/.
\item \textsuperscript{247} See supra notes 65--71 and accompanying text.
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