GROUNDWATER MANAGEMENT: THE MOVEMENT TOWARD LOCAL, COMMUNITY-BASED, VOLUNTARY PROGRAMS

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Editor's Note: Much of the substance of this article is based on presentations made by the four authors on a panel at the annual meeting of the American Water Resources Association, November 13–17, 2016, in Orlando, Florida. The title of their panel session was "Groundwater Conservation Through Pumping Restrictions." The participants described a spectrum of types of programs, ranging from state-imposed pumping restrictions to voluntary restrictions employed by pumpers.

I. INTRODUCTION

A. *The Problem Stated*

Worldwide, groundwater aquifers are under stress.[1] Conflicts abound.[2]

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[1] *See* Somini Sengupta & Weiyi Cai, *A Quarter of Humanity Faces Looming Water Crisis*, N.Y. TIMES (Aug. 6, 2019), https://www.nytimes.com/interactive/2019/08/06/climate/world-water-stress.html [https://perma.cc/9YM6-UWTY]; *see also* Cheryl Katz, *As Groundwater Dwindles, a Global Food Shock Looms*, NAT'L GEOGRAPHIC (Dec. 22, 2016), http://news.nationalgeographic.com/2016/12/groundwater-depletion-global-food-supply/ [https://perma.cc/S5DV-J8FX] ("A 2015 study based on satellite observations showed that most of the world's largest aquifers—21 out of 37—are being drained faster than they can refill. 'A number of studies point to the overuse of groundwater and the tremendous risk that our water and food security are under,' says water scientist Jay Famiglietti of the NASA Jet Propulsion Laboratory, who led the satellite study."); Lucy Craymer, *China's Growing Thirst for Water Stirs Backlash Overseas*, WALL ST. J. (Sept. 5, 2019, 8:54 AM), https://www.wsj.com/articles/chinas-

The U.S. Geological Survey (USGS) reports this to be true in the United States as well.[3] For decades, American state governments facing the problem have attempted through legislation[4] and administrative action[5] to reduce the rate of depletion of groundwater aquifers. Some areas in Kansas[6] have been closed down completely to the issuance of new groundwater pumping permits. The judiciary has been active as well.[7] A court or administrative agency may force reduced pumping by some pumpers in a defined aquifer in an attempt to slow down groundwater mining.[8] Or, a court may order a single well owner to

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growing-thirst-for-bottled-water-stirs-backlash-overseas-11567675805 [https://perma.cc/3VMD-DMCC] (stating that New Zealand is complaining about China's withdrawing water from New Zealand aquifers to supply bottled water).

[2] *See* Laura Parker, *What You Need to Know About the World's Water Wars*, NAT'L GEOGRAPHIC (July 14, 2016), http://news.nationalgeographic.com/2016/07/world-aquifers-water-wars/ [https://perma.cc/53DH-AWQQ] ("Underground water is being pumped so aggressively around the globe that land is sinking, civil wars are being waged, and agriculture is being transformed.").

[3] *See Groundwater Decline and Depletion*, U.S. GEOLOGICAL SURV., https://water.usgs.gov/edu/gwdepletion.html [https://perma.cc/BJZ9-S6HK] ("Many areas of the United States are experiencing groundwater depletion.") (illustrating that groundwater depletion can cause lowering of the water table, increased costs to pumpers, land subsidence, and deterioration of water quality); Michael Sainato & Chelsea Skojec, *Bottled Water Is Sucking Florida Dry*, N.Y. TIMES (Sept. 15, 2019), https://www.nytimes.com/2019/09/15/opinion/bottled-water-is-sucking-florida-dry.html [https://perma.cc/PJ68-D5HB] (explaining over-pumping by corporations, especially Nestlé, is causing groundwater aquifers to shrink).

[4] *See, e.g.*, KAN. STAT. ANN. § 82a-1020 (West 1927); GROUNDWATER MGMT. DISTRICTS ASS'N, http://gmdausa.org [https://perma.cc/9V69-XVBG] (stating that GMDs in several states have formed an association, the Groundwater Management Districts Association (GMDA), with the mission: "To protect and preserve groundwater quality and quantity for future generations, GMDA promotes conservation and conjunctive use, public education and state sovereignty.") Members of the association include districts from Colorado, Kansas, Louisiana, Mississippi, Nebraska, New Mexico, Texas, and California. The five Kansas GMDs described in Section IV.B. below are members.

[5] Many sections of the administrative regulations of the Kansas Division of Water Resources are devoted to regulating groundwater use. *See, e.g.*, KAN. ADMIN. REGS. § 5-1-1 (2018). The Kansas Administrative Regulations feature the Equus Beds Groundwater Management District No. 2. *See* KAN. ADMIN. REGS. § 5-22-2 (2009) (describing well spacing); KAN. ADMIN. REGS. § 5-22-3 (2009) (describing waste); KAN. ADMIN. REGS. § 5-22-4 (2018) (describing flow meters); KAN. ADMIN. REGS. § 5-22-7 (2018) (describing safe yield).

[6] Kansas regulations contain several sections that close specific areas to new permits. *See, e.g.*, KAN. ADMIN. REGS. § 5-3-26 (2009) (including Pawnee and Buckner drainage basins).

[7] *See, e.g.*, Garetson Bros. v. Am. Warrior, Inc., 435 P.3d 1153 (Kan. Ct. App. 2019) (illustrating that a vested rights holder successfully enjoined pumping by several nearby wells held by appropriation right holders). Interstate disputes also arise over groundwater. *See, e.g.*, Kansas v. Colorado, 556 U.S. 98 (2009) (No. 105 Original of the U.S. Supreme Court); Hood *ex rel.* Mississippi v. City of Memphis, 570 F.3d 625, 627 (5th Cir. 2009).

[8] *See, e.g.*, Baker v. Ore-Ida Foods, Inc., 513 P.2d 627 (Idaho 1973); *see generally* DIV. OF WATER RES., KAN. STATE BD. OF AGRIC., IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES, KANSAS (1992) (stating that the Chief Engineer (1) recognized interrelationship between groundwater and surface water; (2) allowed vested rights to continue under their certificates; (3) divided appropriation rights into two large groups, "Senior Rights" (prior to October 1, 1965) and "Junior Rights" (after October 1, 1965); and (4) ordered pump restrictions in Senior Rights and much larger restrictions in Junior Rights).

reduce or curtail pumping altogether because of impairment of another well.[9]

This article treats various methods in which this problem is being addressed in the United States and the ways they have evolved over the last few decades. Water professionals commonly call the general approach to the problem "groundwater management." Some dictionary definitions of "manage" include the following: "handle or address with a degree of skill" and "treat with care,"[10] "control . . . something,"[11] "succeed in accomplishing,"[12] and "control the use or exploitation of."[13] Any person's answer to the question of whether any of these various methods are working "may depend . . . in part on the person's background, biases, perspective, and perhaps even present employment."[14]

B. *Some New Approaches*

These dropping aquifer levels across the world are challenging policy-makers to reevaluate approaches to groundwater governance. Surface water governance is often regulated by a central state authority applying a standard permitting system across the state.[15] Each river may have individual planning, limiting use to maintain minimum stream flows or other policies decided by the state government. Similarly, over-extraction of groundwater resources has historically been addressed using top-down regulation of individual users by state agencies. While this system may effectively prevent resource destruction, the results of this kind of regulation can be unpopular or even destructive to communities dependent on the resource.

Unlike surface water governance, groundwater governance appears to be evolving toward a focus on local planning and management. For groundwater, some states have implemented policies that attempt to limit aquifer use to sustainable annual yields (SAY)[16] or safe yield, or that designate special areas of additional groundwater regulations.[17] Even these terms are controversial, are often undefined, and according to some hydrologists not objectively

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[9] *E.g.*, *Garetson Bros.*, 435 P.3d 1153 (illustrating such a conflict in a prior appropriation state).
[10] *Manage*, WEBSTER'S NEW COLLEGIATE DICTIONARY 691 (1981).
[11] *Manage*, CAMBRIDGE DICTIONARY (2019), https://dictionary.cambridge.org/us/dictionary/english/manage [https://perma.cc/M5DP-BCEH].
[12] *Manage*, MERRIAM-WEBSTER (2019), https://www.merriam-webster.com/dictionary/manage [https://perma.cc/L5F9-NVSK].
[13] *Manage*, LEXICO (2019), https://en.oxforddictionaries.com/definition/manage [https://perma.cc/D6UP-7ABU].
[14] John C. Peck, *Groundwater Management in Kansas: A Brief History and Assessment*, 15 KAN. J.L. & PUB. POL'Y 441, 454 (2006) [hereinafter Peck, *Groundwater Management in Kansas*].
[15] *See* Water Appropriation Act, KAN. STAT. ANN. §§ 82a-701–82a-773 (requiring permits for both surface water and groundwater); DAVID H. GETCHES ET AL., WATER LAW IN A NUTSHELL 3–4 (5th ed. 2015).
[16] Frans R.P. Kalf & Donald R. Woolley, *Applicability and Methodology of Determining Sustainable Yield in Groundwater Systems*, 13 HYDROGEOLOGICAL J. 295, 296 (2005); *see also* KAN. ADMIN. REGS. §§ 5-21-4, 5-22-7, 5-25-4 (2018).
[17] *See, e.g.*, KAN. STAT. ANN. § 82a-1036 (West 1978); *see infra* Section IV.B.

provable.[18] Yet, these terms have reached an iconic status, forming the basis for determining groundwater use levels in many states' water codes. Other states have used a "wait-and-see" approach, allowing the individual groundwater users to litigate their own rights as conflicts appear. Even with these varying state policy approaches, as described in this article, groundwater users in some areas are now seeking more local management of their underlying aquifers and in some cases have formed organizations to improve groundwater management in their aquifers.

C. *A Spectrum of Types of Pumping Restrictions*

Several states are promoting voluntary pumping reductions. These attempts are not restricted to educational programs that merely encourage pumpers to use more efficient systems. In some states, cooperation at the local level has resulted in novel management approaches. Kansas, for example, has adopted legislation that permits and encourages pumpers to enter into voluntary, binding agreements that result in less pumping. To put in context the move to voluntariness, we describe a spectrum of types of pumping restrictions, from the extremes of state-imposed pumping restrictions at one end to voluntary reductions at the other. Between these extremes lie variations and gradations of programs and actions. After we lay out the general spectrum, we describe specific programs: financial incentives used by the Edwards Aquifer Authority (EAA) in Texas to achieve pumping reductions; local grassroots efforts in Colorado, Oregon, and California that illustrate attempts at local community-based management; and moves to voluntary programs in Kansas.

Attempting to categorize pump restriction types based on "voluntariness" is difficult. That term itself is complex and has a variety of meanings and connotations. Related ideas such as motive, consent, and agreement are important in this context. One can picture a simple horizontal line representing a spectrum of types of pumping restrictions, with points along its path.

The point at the left end of the spectrum represents the extreme type of restriction in which a state court or legislature orders a curtailment of pumping of a water right based on a rationale not anticipated by the water right holder when the water right was first obtained. An example is the California Supreme Court's use of the Public Trust Doctrine in a 1983 surface water case in which plaintiff sought to enjoin diversions by Los Angeles in the Mono Lake region.[19] Future courts could follow the reasoning of a 2000 Hawaii case[20] and

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[18] *See* John Bredehoeft, *Safe Yield and the Water Budget Myth*, 35 GROUNDWATER 929, 929 (1997); *see also* John Bredehoeft, *It is the Discharge*, 45 GROUNDWATER 523, 523 (2007); S. L. DINGMAN, PHYSICAL HYDROLOGY 450 (3d ed. 2015) ("It is widely believed, even by many hydrologists and water-resource managers, that the sustainable rate of extraction—or 'safe yield'—of ground water from a basin equals the rate of natural recharge . . . It should be clear from the preceding discussion that this is not true . . . .").

[19] Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 732 (Cal. 1983) (en banc).

[20] *In re* Water Use Permit Application, 9 P.3d 409, 445, 447 (Haw. 2000) ("In Hawaii, this court

a recent California district court case[21] in applying the Public Trust Doctrine more broadly to include groundwater reserves.

The point next to the Public Trust reductions would be forced pumping restrictions or closures of wells to protect senior water rights. A Kansas court, for example, recently enjoined pumping of several neighboring junior groundwater appropriators in favor of a vested right.[22] In 1973, Idaho[23] and in 1989, Oregon[24] courts restricted pumping by imposing safe yield on a portion of, or on all of, an aquifer. Kansas followed in a 1992 administrative case by establishing the Walnut Creek Intensive Groundwater Use Control Area (IGUCA),[25] described in more detail in Section IV.B., below. These water right holders have voluntarily obtained their rights with knowledge of the state statutory system, which prescribes the shutting down of junior water pumpers that are impairing holders of more senior rights. But presumably they have not voluntarily assumed the aquifer safe yield restrictions later imposed by the court or administrative agency.

The third point of the spectrum represents cessation of pumping when a government takes a water right by eminent domain and pays the water right holder the value of the property taken. These are involuntary takings but are compensated. Water right holders, like other real property owners, know or should know that their property rights may be subject to condemnation.[26]

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has recognized, based on founding principles of law in this jurisdiction, a distinct public trust encompassing all the water resources of the state . . . Based on the plain language of our constitution and a reasoned modern view of the sovereign reservation, we confirm that the public trust doctrine applies to all water resources, unlimited by any surface-ground distinction."); Jack Tuholske, *Trusting the Public Trust: Application of the Public Trust Doctrine to Groundwater Resources*, 9 VT. J. ENVTL. L. 189, 236 (2008) (applying the public trust doctrine to groundwater offers "a new paradigm for using groundwater wisely"); *see also* John C. Peck & Doris K. Nagel, *Legal Aspects of Water Resources Planning*, 37 KAN. L. REV. 199, 264–73 (1989) (suggesting that the Kansas Legislature had laid the groundwork for applying the doctrine when it declared in 1945 that all waters were dedicated to the use of the public, but that further clarity could be provided if the legislature would add public trust language to the statute); *cf.* State *ex rel.* Meek v. Hays, 785 P.2d 1356 (Kan. 1990) (declining to adopt public trust doctrine in case involving ownership of beds of non-navigable stream).

[21] *See generally* Envtl. Law Found. v. State Water Res. Control, No. 34-2010-80000583, 2014 WL 8843074 (Cal. Super. Ct. July 15, 2014).

[22] Garetson Bros. v. Am. Warrior, Inc., 435 P.3d 1153 (Kan. Ct. App. 2019).

[23] Baker v. Ore-Ida Foods, Inc., 513 P.2d 627 (Idaho 1973).

[24] Doherty v. Ore. Water Res. Dir., 783 P.2d 519 (Or. 1989) (en banc).

[25] *See generally* DIV. OF WATER RES., KAN. STATE BD. OF AGRIC., IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES, KANSAS (1992) (stating that Chief Engineer (1) recognized interrelationship between groundwater and surface water; (2) allowed vested rights to continue under their certificates; (3) divided appropriation rights into two large groups, "Senior Rights" (prior to October 1, 1965) and "Junior Rights" (after October 1, 1965); and (4) ordered pump restrictions in Senior Rights and much larger restrictions in Junior Rights).

[26] *See, e.g.*, City of Thornton v. Farmers Reservoir & Irrigation Co., 575 P.2d 382 (Colo. 1983) (en banc) (allowing city to condemn water rights under its constitutionally-derived home rule power); KAN. STAT. ANN. § 42-315 (West 1923) (permitting condemnation of water and water rights; the Kansas Legislature enacted this provision in 1891 prior to the 1945 Kansas

The next point represents voluntary pump reduction methods that are clearly and directly financially-induced, such as the Voluntary Irrigation Suspension Program Option (VISPO) of the EAA in Texas,[27] federal programs such as Environmental Quality Incentives Program (EQIP),[28] Conservation Reserve Enhancement Program (CREP),[29] Agriculture Water Enhancement Program (AWEP),[30] Regional Conservation Partnership Program (RCPP);[31] Colorado's Rio Grande Water Conservation District (RGWCD) which uses CREP (discussed in Section III.B. below); state programs like the Water Transition Assistance Program (WTAP);[32] privately funded foundation

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Appropriation Act, and it's still applicable); *see generally* John C. Peck & Kent Weatherby, *Condemnation of Water and Water Rights in Kansas*, 42 KAN. L. REV. 827 (1994) (describing interests that can be condemned and entities with condemnation power under Kansas law).

[27] *See infra* Section II.

[28] *Environmental Quality Incentive Program*, U.S. DEP'T AGRIC. NAT. RESOURCES CONSERVATION SERV. KAN., https://www.nrcs.usda.gov/wps/portal/nrcs/main/ national/programs /financial/eqip/ [https://perma.cc/8ULM-4G8Q] (describing a voluntary, federal program that provides financial incentives to agricultural producers "to plan and implement . . . conservation practices" that improve water and related natural resources on agricultural land). The Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture makes payments to producers to implement approved conservation practices. *Id.*

[29] The CREP is a partnership between the federal government (NRCS) and Kansas. *See Conservation Reserve Enhancement Program*, U.S. DEP'T AGRIC. NAT. RESOURCES CONSERVATION SERV. KAN., https://www.nrcs.usda.gov/wps/ portal/nr cs/detail/ks/newsroom/stories/?cid=nrcs142p2_033621 [https://perma.cc/FM6V-DTK6]. The contracts generally provide an upfront cash payment of up to $62/acre from the state and 14-15 years of annual CRP-type payments from the Farm Service Agency (FSA) and an automatic permanent dismissal of the water right after two years to allow establishment of cover crops. Email from Mark Rude, Exec. Dir. of Sw. Kan. Groundwater Mgmt. Dist. No. 3, to John C. Peck (Mar. 29, 2016, 17:46 CST) (on file with author).

[30] Similar in purpose to EQIP and CREP, the AWEP "is a voluntary conservation initiative that provides financial . . . assistance to agricultural producers to implement agricultural water enhancement activities on agricultural land for the purposes of conserving surface and ground water . . . ." It is "not a grant program . . . [but is] a program whereby approved, eligible partners will enter into multi-year agreements with NRCS to promote ground and surface water conservation . . . ." *Agricultural Water Enhancement Program – Farm Bill 2008 Archive*, U.S. DEP'T AGRIC. NAT. RESOURCES CONSERVATION SERV. KAN., https://www.nrcs.usda.gov/ wps/portal/nrcs/detail/ks/programs/financial/?cid=nrcs142p2_032841 [https://perma.cc/E9PB-MQHK]. Funding for AWEP was repealed in 2014 and "went by the wayside." Email from Steve Frost, Admin. Manager of the Kan. Dep't of Agric., Div. of Conservation, to John C. Peck (July 31, 2017, 11:19 CST) (on file with author). However, the NRCS still supports and honors contracts entered into prior to repeal. *Agricultural Water Enhancement Program (AWEP)*, U.S. DEP'T AGRIC. NAT. RESOURCES CONSERVATION SERV., https://www.nrcs.usda.gov/wps/ portal/nrcs/detail/national/programs/?cid=nrcs144p2_068627 [https://perma.cc/2CEA-JYUU].

[31] *Regional Conservation Partnership Program*, U.S. DEP'T AGRIC. NAT. RESOURCES CONSERVATION SERV. KAN., https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/ financial/rcpp/ [https://perma.cc/2QSZ-QCU8] (describing RCPP, which connects partners with producers and private landowners to design and implement voluntary conservation solutions that benefit natural resources, agriculture, and the economy projects may address concerns such as excess/insufficient water/drought).

[32] *Water Conservation Programs*, KAN. DEP'T OF AGRIC. (Aug. 14, 2019), http://agriculture.ks.g ov/.divisions-programs/division-of-conservation/water-conservation-programs [https://perma.cc/6 UHV-L9F3] (describing the WTAP which "is a voluntary, incentive-based program that

programs like the Northwest Kansas Groundwater Conservation Foundation;[33] and "covenants not to sue" or "dry-year agreements"[34] by neighboring water right holders. Water right holders in these various programs voluntarily enter into pumping restriction agreements and are paid to reduce pumping.

Sometimes just the recognition and fear that the state may impose restrictions will lead to "voluntary" action by water right holders, illustrated at the next point. For them, trite phrases such as "the writing is on the wall," and "the storm clouds are rising" describe their predicament. The pigs' situation in George Orwell's *Animal Farm* comes to mind: " . . . Napoleon announced that there would be work on Sunday afternoons as well. This work was strictly *voluntary*, but any animal who absented himself from it would have his rations reduced in half."[35]

An example in Kansas is the Rattlesnake Creek agreement of 1994.[36] That agreement followed the order of the Kansas Chief Engineer in the Walnut Creek IGUCA case in 1992, which forced restrictions on alluvial, groundwater pumpers to achieve safe yield in a neighboring river basin.[37] Perhaps the examples of grassroots programs to manage groundwater in the three case studies, described below in Section III, also illustrate this situation.[38] Similarly, threats of boycotts of products can lead to "voluntary" restrictions.[39]

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permanently retires privately held irrigation water rights in exchange for payment by the State of Kansas" with an intent to help restore aquifers and recover stream flows).

[33] Northwest Kansas Groundwater Management District No. 4 established the NW Kansas Groundwater Conservation Foundation in 2003 to provide funds for voluntary retirements or set asides. Email from Ray Luhman, Dist. Manager, Nw. Kan. Groundwater Mgmt. Dist. No. 4, to John C. Peck (July 31, 2017, 11:19 CST) (on file with author). The foundation has been funded entirely by GMD4, although the GMD has unsuccessfully sought entities for grants. *Id.* At one time the foundation had over $500,000 and currently has about $370,000. *Id.* Money from the foundation and other programs like WTAP, AWEP, and EQIP has been used to partially fund buy-outs of approximately forty water rights. *Id.* After an economic study done for GMD4 that indicated that "completely buying up a right was most harmful to the local value-added economy . . . ." *Id.* The board modified its bylaws to allow for things other than buy-outs, and GMD4 currently funds cost share projects on soil probes. Email from Ray Luhman, Dist. Manager, Nw. Kan. Groundwater Mgmt. Dist. No. 4, to John C. Peck (July 31, 2017, 09:30 CST) (on file with author).

[34] An example is the "dry-year water reliability contract" or "reliability contract" in Arizona. *See* MICHAEL O'DONNELL & BONNIE COLBY, DRY-YEAR WATER SUPPLY RELIABILITY CONTRACTS: A TOOL FOR WATER MANAGERS (2009), https://cals.arizona.edu/arec/sites/cals.arizona.edu.arec/files/publications/ewsr-dyo-Final-5-12-10.pdf [https://perma.cc/XRR6-FDVB].

[35] GEORGE ORWELL, ANIMAL FARM 51 (Harcourt, Brace & Co. 1945) (emphasis added).

[36] *See* Peck, *Groundwater Management in Kansas*, *supra* note 14, at 452; *see also infra* Section IV.B.

[37] *See infra* Section IV.B.

[38] *See infra* Section III.

[39] *See, e.g.*, Vanmala Subramaniam, *A Look into Nestle's Controversial Water Bottling Business in Canada*, VICE (Sept. 30, 2016, 9:39 AM), https://www.vice.com/en_ca/article/zn85qw/a-look-into-nestles-controversial-water-bottling-business-in-canada [https://perma.cc/DBD8-C6DR] (reporting that the bottling company, in disputes with several Canadian town regarding groundwater withdrawals competing with other users during drought periods, "voluntarily reduced their water extraction by 20 percent").

Next on the spectrum is the sixth position, illustrated by Kansas's new program for local enhanced management areas (LEMAs). This program contains a "voluntary" element, but primarily in the sense that the impetus for creating a LEMA comes from a groundwater management district (GMD), which is a type of local special district the members of which are mostly irrigators, and not from the state government.[40]

At the right end of the spectrum is the final point: voluntary pump reduction programs in which irrigators, either individually or collectively—like in the new Kansas water conservation areas (WCAs)[41]—try to preserve the aquifer for altruistic, conservation, or other reasons. Stated another way: These pumpers are voluntarily agreeing to reduce pumping the annual quantity of water permitted under their water right, a property right, for the period of their agreement but without changing the basic elements of their water rights. They may seek, for example, intergenerational equity and the conservation of water for future generations. Or, they might instead be guided, as are other pumpers, with the "writing is on the wall" syndrome.

The concept of voluntariness in giving up one's property is found in other arenas such as moral philosophy,[42] religion,[43] psychology,[44] sociobiology,[45]

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[40] *See infra* Section IV.C.

[41] *See infra* Section IV.D.

[42] Carol M. Rose, *The Moral Subject of Property*, 48 WM. & MARY L. REV. 1897, 1913 (2007) ("Philanthropy is not so far removed from involuntary redistribution, either, at least for . . . a practitioner of Middling Morality. She would like to give away something to alleviate the troubles of the less fortunate, but she does not want to be a sucker about it and be the only one. If others feel the same way, a requirement of mandated redistribution reassures the participants and becomes an entirely plausible outcome in a regime that protects private property."); *Voluntarism,* ENCYCLOPAEDIA BRITTANICA, https://www.britannica.com/topic/voluntarism-philosophy [https://perma.cc/8869-SRNK] ("Voluntarism . . . [is] any metaphysical or psychological system that assigns to the will (Latin: voluntas) a more predominant role than that attributed to the intellect.").

[43] *See, e.g.*, MARJO KAARTINEN, RELIGIOUS LIFE AND ENGLISH CULTURE IN THE REFORMATION 51–52, 62 (Palgrave 2002) ("In the case of individual religious, however, the ideal of poverty was total, at least in theory. A monk, nun, canon, or friar was not allowed to own anything . . . Voluntary poverty was seen as an effective remedy for the sin of avarice . . . For everyone, land held essential symbolic value: more than anything else, land symbolized bread and life itself . . . If land was so important, why did people donate portions of their own share of the land to the monasteries? The answer is simple: people wanted security in their life after death."); *see generally* MIRIAM FRENKEL & YAACOV LEV, CHARITY AND GIVING IN MONOTHEISTIC RELIGIONS (2009) (describing medieval charity practices in the Christian, Islamic, and Jewish worlds).

[44] *See, e.g.*, David J. Linden, *This Is Your Brain on Charitable Giving*, PSYCHOL. TODAY (Aug. 31, 2011), https://www.psychologytoday.com/us/blog/the-compass-pleasure/201108/is-your-brain-charitable-giving [https://perma.cc/SLY9-34ZZ] (stating three theories on "how the brain's pleasure circuit responded to differing approaches to giving and paying taxes," altruism—the pleasure in making one's own decision to give—and enhanced social status).

[45] *See, e.g.*, Thomas Dixon, *Altruism: Social Psychology, Sociobiology, and Altruism Since the 1960s*, SCI. ENCYCLOPEDIA, https://science.jrank.org/pages/8255/Altruism-Social-Psychology-Sociobiology-Altruism-since-1960s.html [https://perma.cc/4H3Y-LY7D] (describing various views on "how self-sacrificing individuals could ever have been successful in the merciless struggle for existence").

political science and public administration,[46] and economics.[47] Integrating those wider ideas into a discussion of groundwater pumping restrictions is beyond the scope of this article and are for the most part left to other authors and articles. Moreover, while voluntary attempts to reducing groundwater pumping can be found elsewhere, such as India,[48] we limit ourselves here to some examples found in the United States.

II. THE EDWARDS AQUIFER VISPO PROGRAM IN TEXAS

A. *Introduction*

From 1950-1956, the Edwards Aquifer region in Texas, shown in Figure 1, experienced its most severe drought in recorded time.[49] As a result, Comal Springs, the largest natural discharge point in the system, ceased flowing from June 13 to November 3 of 1956.[50] For the next sixty years, unresolved conflict over the management of the Aquifer persisted and was made more complicated with the Congressional passage of the Endangered Species Act (ESA),[51] the listing of several aquatic species at Comal Springs and San Marcos Springs,

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[46] *See generally* ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1st ed. 1990) [hereinafter OSTROM, GOVERNING THE COMMONS].

[47] *See, e.g.*, Markus Pasche, *What Can be Learned from Behavioral Economics for Environmental Policy?*, *in* NEW PERSPECTIVES FOR ENVIRONMENTAL POLICIES THROUGH BEHAVIORAL ECONOMICS 109, 109–26 (Frank Beckenbach & Walter Kahlenborn eds., 2016).

[48] *See, e.g.*, V. Ratna Reddy et al., *Groundwater Governance: A Tale of Three Participatory Models in Andhra Pradesh, India*, 7 WATER ALTERNATIVES 275, 293 (2014), http://www.water-alternatives.org/index.php/alldoc/articles/vol7/v7issue2/247-a7-2-1/ [https://perma.cc/ZJ9U-F385] (discussing programs of the Andhra Pradesh Farmer-Managed Ground-water Systems (APFAMGS), Social regulations in Water Management at the Community Level (SRWM), and the Andhra Pradesh Drought Adaption Initiative Project (APDAI), and concludes that "[while the] 'do-it-yourself' approach with relatively better scientific or technical inputs has clearly improved the awareness of the well owners . . . and has helped in checking further expansion of groundwater development among the existing well owners, it has failed to check the growth of new bore wells . . . [and] . . . has also failed to encourage other conservation practices . . . [due in part] . . .because the regulations are informal in the form of peer pressure and voluntary. . . ."). The APFAMGS claims to have achieved voluntary cuts in groundwater use by farmers through farmer groundwater schools in several villages, though studies show that the achievement was just limited to farmers doing groundwater monitoring. *Id.*; E-mail from Dr. Dinesh Kumar, Exec. Dir., Institute for Resource Analysis and Policy (IRA), Hyderabad, India, to John C. Peck (May 8, 2016, 20:13 CST) (on file with author). Dr. Tushaar Shah of the International Water Management Institute (IWMI), stated, "[n]o, I have scouted but found no evidence on voluntary reduction in groundwater abstractions in India or elsewhere . . . [and, while] . . . [i]n Andhra Pradesh, a World Bank-FAO program has organized farmers in 700 villages for voluntary reduction in pumping . . . [that was] . . . much talked about for some years . . . a study we had conducted two years after the funders withdrew concluded that there was really no change." E-mail from Dr. Shah, Senior Fellow, Int'l Water Mgmt. Inst., to John C. Peck (May 3, 2016, 06:39 CST) (on file with author).

[49] RECON ENVTL., INC. ET AL., EDWARDS AQUIFER RECOVERY IMPLEMENTATION PROGRAM: HABITAT CONSERVATION PLAN 3-12 (2012) [hereinafter HABITAT CONSERVATION PLAN], https://www.edwardsaquifer.net/pdf/Final_HCP.pdf [perma.cc/3PQT-3338].

[50] *Id.* at 3-47.

[51] Endangered Species Act, 16 U.S.C.A. §§ 1531–1544 (West 1973).

which are fed by water naturally emanating from the Aquifer, and a confusing framework of water law governing groundwater.

To deal with management problems in the Edwards Aquifer, in 1993, the Texas legislature created the Edwards Aquifer Authority (EAA) to control pumping and achieve ESA compliance. In turn, the EAA has developed two springflow-protection programs: the VISPO and the Aquifer Storage and Recovery (ASR) leasing program.[52] This part of the article provides information on the hydrology of the Edwards Aquifer, briefly summarizes some historical aspects of Texas groundwater law, shows how the ideas for the programs evolved, and describes the VISPO program.

B. *The Edwards Aquifer–Like No Other*

Unlike the aquifers of Kansas, which for the most part consist of "unconsolidated deposits of sand, gravel, silt, and clay . . . formed by the sediments . . . deposited by streams in bedrock valleys,"[53] the Edwards Aquifer in south central Texas is a karst limestone aquifer with many unique qualities.[54] The USGS explains that "karst hydrogeology is typified by a network of interconnected fissures, fractures and conduits emplaced in a relatively low-permeability rock matrix."[55] In general, one could say that a karst aquifer is more free-flowing through rock, while the Kansas aquifers are located in sand and gravel deposits. The highly transmissive Edwards Aquifer discharges water through springs.[56] In contrast, if the Kansas aquifer is associated with a river or stream (an alluvial aquifer), the aquifer can discharge into the stream in periods of low flow.[57]

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[52] HABITAT CONSERVATION PLAN, *supra* note 49, at 3-14.
[53] *Ground-Water Occurrence*, KAN. GEOLOGICAL SURV. (Jan. 2005), http://www.kgs.ku.edu/Publications/Bulletins/ED10/04_occur.html [https://perma.cc/8HQ7-GAKC].
[54] HABITAT CONSERVATION PLAN, *supra* note 49, at 3-32.
[55] *Karst*, BROADCAST AUDUBON, https://www.thesustainabilitycouncil.org/karst.html (last updated Feb. 10, 2014) [https://perma.cc/M4RC-8942] (quoting the USGS).
[56] *Edwards (Balcones Fault Zone) Aquifer*, TEX. WATER DEV. BOARD, http://www.twdb.texas.gov/groundwater/aquifer/majors/edwards-bfz.asp [https://perma.cc/9HSY-EDKG].
[57] KAN. GEOLOGICAL SURV., *Ground-Water Occurrence*, *supra* note 53.

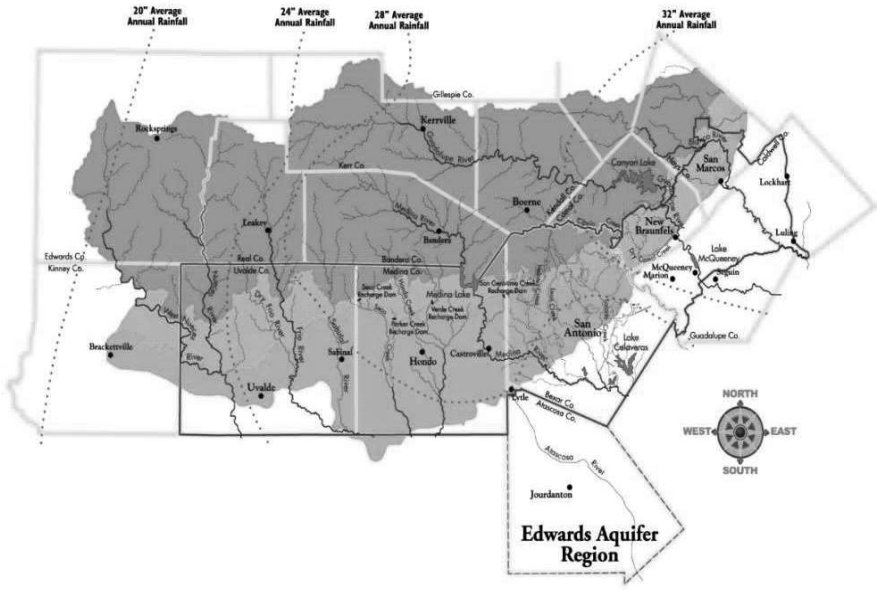

Figure 1 – The Edwards Aquifer Region

The Edwards Aquifer (hereinafter, the "Aquifer") is approximately 180 miles long (east to west) and has a width varying from five to forty miles (north to south). The Aquifer is bounded both to the east and the west by subsurface groundwater divides. To the north, the Aquifer begins where formations outcrop into the recharge zone within the Edwards Plateau. The southern extent of the Aquifer is marked by the "bad water line," also referred to as the saline-water line or fresh-water/saline-water interface, a best estimate of a line marking the interface where total dissolved solids concentrations reach 1,000 milligrams per liter.[58] The flow in the Aquifer is generally west to east and north.[59] The Aquifer could be an icon for karst aquifers with its numerous sinkholes and solution cavities visible on the surface, as well as phenomenal flow velocities in the subsurface. While sand and gravel aquifers vary in flow from one foot per year to one foot per day,[60] most karst aquifers flow from tens of meters per day to approximately 1,600 meters (~one mile) per day. Tracer tests by the EAA have confirmed flow velocities of 5,000 meters per day.[61]

The Aquifer is home to the largest reported artesian flowing well in the world, the Catfish Farm well, measured at a free-flowing rate of approximately

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[58] HABITAT CONSERVATION PLAN, *supra* note 49, at 3-37 to -38.
[59] *Id.* at 3-34.
[60] THOMAS CECH, PRINCIPLES OF WATER RESOURCES 126–28 (3d ed. 2010).
[61] STEVE JOHNSON ET AL., TRACING GROUNDWATER FLOW PATHS IN THE EDWARDS AQUIFER RECHARGE ZONE, PANTHER SPRINGS CREEK BASIN, NORTHERN BEXAR COUNTY TEXAS iii (2010), https://www.edwardsaquifer.org/wp-content/uploads/2019/02/2010_Johnson-etal_PantherSpringsFlowpaths.pdf [https://perma.cc/HJG8-TG7L].

37,000 gallons per minute (g.p.m.). When the operation was closed in 1991 due to discharge of massive levels of fecal coliform into the adjacent Medina River, the effect was remarkable; despite very minimal rainfall in the San Antonio area, the water level in the J-17 index well, nearly eighteen miles away, rose approximately three feet in a week and continued to rise.[62]

Average annual rainfall in San Antonio from 1871 to 2010, was 29.12 inches; from 1981 to 2010, it was 32.22 inches per year.[63] On an annual basis, rainfall varies widely. The porous nature of the Aquifer allows water to recharge and to drain quickly. Annual recharge to the Aquifer since the 1930s ranges from a low of 43,700 acre-feet in 1956 to a high of 2,485,700 acre-feet in 1992.[64] The long-term, from 1934 to 2014, median value for annual recharge is 556,100 acre-feet.[65] Due to drought years between 2005 and 2014, however, the annual recharge median during that period was 508,000 acre-feet.[66]

C. *Development of Texas Groundwater Law and Creation of the EAA*

Water regulation in Texas is fragmented. Surface water is subject to the Appropriation Doctrine[67] and governed by the State. Groundwater regulation is quite different. Texas is the last bastion of the Rule of Capture.[68] Early in the twentieth Century, the Texas Supreme Court decided the tort case *Houston and T.C. Railroad Co. v. East*.[69] East, a resident of Denison, Texas, furnished water to his home from a small domestic well on his property.[70] The company owned nearby property and needed water for its steam locomotives, so the company drilled a well with significantly more capacity than the East well.[71] Production in the East well began to decline.[72] East sued for damages.[73] The Supreme Court found for the company and established the Rule of Capture for Texas.[74] The court's decision was based on two basic principles: the court didn't

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[62] Rick Illgner, The Edwards Aquifer: Political Prisoner, Address at the 89th Annual Meeting of the Association of American Geographers (Apr. 1993).

[63] *Austin/San Antonio, TX*, NAT'L WEATHER SERV. FORECAST OFF., https://w2.weather.gov/climate/index.php?wfo=ewx [perma.cc/5RC3-JXLE].

[64] *See* ROBIN L. TREMALLO ET AL., EDWARDS AQUIFER AUTHORITY HYDROLOGIC DATA REPORT FOR 2014 24–25 (2015), https://www.edwardsaquifer.org/wp-content/ uploads/2014/04/2015_2014_HydroReport.pdf [https://perma.cc/U5GY-XNUA].

[65] *Id.*

[66] *Id.*

[67] TEX. UTIL. CODE ANN. § 11.002 (West 1999) (establishing that right is acquired by appropriation); TEX. UTIL. CODE ANN. § 11.027 (West 1977) (establishing priority rule).

[68] TEX. WATER CODE ANN. § 36.002 (West 1997) ("The legislature recognizes that a landowner owns the water beneath the surface of the landowner's land as real property.").

[69] Houston & Tex. Cent. Ry. Co. v. East, 81 S.W. 279 (Tex. 1904).

[70] TEX. WATER DEV. BD., 100 YEARS OF RULE OF CAPTURE: FROM EAST TO GROUNDWATER MANAGEMENT REPORT 63 (William F. Mullican, III & Suzanne Schwartz eds., 2004), https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R361/R361.pdf [perma.cc/R93R-SLBP]; *East*, 81 S.W. at 280.

[71] *See East*, 81 S.W. at 280.

[72] *Id.*

[73] *Id.*

[74] *Id.* at 281–82.

understand, nor did the judges think anyone could make sense of, what happens beneath the surface of the earth, and the court didn't want to impede development.[75] More recently, the Texas Supreme Court has again upheld the Rule of Capture.[76]

The *East* court, however, offered a small measure of hope by inviting the Legislature to act: "*[i]n the absence . . . of positive authorized legislation*, as between proprietors of adjoining lands, the law recognizes no correlative rights in respect to underground waters percolating, oozing, or filtrating through the earth . . . ."[77] From 1905 through 1917, Texas experienced several intermittent severe droughts, the most severe being in 1917.[78] As a result, the legislature accepted the invitation of the *East* court in 1917 by enacting the Conservation Amendment of the Constitution.[79] The amendment dedicated all natural resources to the state and declared that the "[l]egislature shall pass all such laws as may be appropriate thereto."[80] Thirty years later, the legislature passed the Texas Underground Water Conservation Act of 1949,[81] which enabled the creation of local groundwater conservation districts (GCDs), which could adopt and enforce rules regarding the management and regulation of groundwater.[82] Thus, "GCDs are the preferred method of regulating groundwater in Texas," [83] and management of groundwater is left to locally created groundwater districts.

Texas shares a common trait with other states regarding water policy: droughts are drivers of water actions, or reactions. For south-central Texas, the drought of the 1950s is the drought of record. In response to the cessation of measured flow at Comal Springs for several months in 1956, the legislature acted with a bill creating the Edwards Underground Water District (EUWD), the fourth GCD created in Texas.[84] However, it was unique in the fact that it was the first GCD created without the authority to promulgate and enforce rules—a shortcoming that would ultimately lead to its demise.[85] Nearly three decades after its establishment in 1987, the legislature gave the EUWD two regulatory powers: to regulate water produced from the Aquifer and transported out of the district and implement a drought conservation plan.[86]

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[75] *Id.*
[76] *See* Sipriano v. Great Springs Water of Am., 1 S.W.3d 75, 75 (Tex. 1999).
[77] *East*, 81 S.W. at 280 (quoting Frazier v. Brown, 12 Ohio St. 294 (Ohio 1861)) (emphasis added); *see also* TEX. WATER DEV. BD., *supra* note 70, at 65 (including more information about the Texas history of the Rule of Capture).
[78] TEX. WATER DEV. BD., *supra* note 70, at 2, 8.
[79] TEX. CONST. art. XVI, § 59.
[80] *Id.*
[81] 1949 Tex. Gen. Laws 559.
[82] *Id.*
[83] Mary Sahs, Water Rights: Law Attorney, Presentation of "Groundwater 101" (2009); *see* TEX. WATER CODE ANN. § 36.0015 (West 2015).
[84] Illgner, *supra* note 62.
[85] *Id.*
[86] 1987 Tex. Gen. Laws 241. Western agricultural interests in Medina and Uvalde Counties were leery about the consequences of drought rules; consequently, these counties managed to negotiate

Congressional passage of the ES) in 1973,[87] although an indirect action, has played a very significant role in management of the Aquifer. Soon after Congress enacted the ESA, aquatic species in both Comal Springs and San Marcos Springs were listed as endangered.[88] More species were added over time.[89] In early May 1991, the citizens of San Antonio voted to halt construction on the Applewhite Reservoir, the first alternative water source for the City other than the Aquifer.[90] In a suit filed by the Sierra Club regarding lack of protection for endangered species at Comal and San Marcos springs, a federal district judge warned in his findings for the plaintiff that, if the legislature failed to act in the 1993 session and pass meaningful legislation for the regulation of the Aquifer that would lead to protection for the species, he would allow the plaintiffs to come back to the court for additional relief.[91]

In a seismic paradigm shift in Texas groundwater management, the Texas Legislature responded by passing the EAA Act in 1993,[92] which enabled creation of a new entity—the EAA—to replace the EUWD. The enabling legislation included the following aspects and directives: (1) the total volume (in acre-feet) of permits that can be issued; (2) guaranteed minimums for each permit category; (3) a requirement that permits be based on historical use with a defined historical period; (4) a filing deadline for permit claims and applications of six months from the start-up date of the EAA; (5) a requirement that all permitted wells be metered; (6) requirements that the EAA have lifetime responsibility for meter costs for irrigation wells, a drought plan, and a conservation plan; and (7) the appointment of a watchdog group representing the interests on the Guadalupe River.[93] The Act abolished the EUWD, and it drew distinctions between the EUWD and the new EAA.[94]

The EAA is unique. The Texas Legislature created the EAA in 1993 to

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an option to vote themselves out of the district, which resulted in these counties withdrawing in 1989. *See id.*

[87] 16 U.S.C.A. §§ 1531–1541 (West 1973).

[88] *Species by County Report*, U.S. FISH & WILDLIFE SERV., https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48091 [perma.cc/2F64-N287].

[89] *Id.*

[90] Bruce Davidson, *Applewhite Project Controversy Not Over Despite Voter Mandate*, SAN ANTONIO EXPRESS-NEWS (May 6, 1991), http://nl.newsbank.com/nl-search/we/Archives?p_product=SAEC&p_theme=saec&p_action=search&p_maxdocs=200&s_dispstring=applewhite%20AND%20date(5/1/1991%20to%205/6/1991)&p_field_date-0=YMD_date&p_params_date-0=date:B,E&p_text_date-0=5/1/1991%20to%205/6/1991)&p_field_advanced-0=&p_text_advanced-0=(applewhite)&xcal_numdocs=50&p_perpage=25&p_sort=YMD_date:D&xcal_useweights=no [https://perma.cc/G3CT-Z4GD].

[91] *See* Sierra Club v. Lujan, No. MO–91–CA–069, 1993 WL 151353, at *34 (W.D. Tex. Feb. 1, 1993).

[92] 1993 Tex. Gen. Laws 2350.

[93] 1993 Tex. Gen. Laws 2358–2370.

[94] 1993 Tex. Gen. Laws 2368. For example, the EUWD received revenue from ad valorem property taxes, whereas the EAA's revenue is derived from user fees paid by permit holders. *See id.* The EUWD was governed by a twelve-member elected board, while the EAA is governed by a nine-member appointed board. *See id.* Legal issues raised by the Texas Department of Justice led to a legislative change for the EAA in 1995–a 15-member elected board. *See id.*

manage the Aquifer through a permitting system to control pumping and achieve ESA compliance, thereby avoiding federal intervention.[95] Start-up of the EAA was delayed because of United States Department of Justice concerns regarding replacing an elected board with an appointed board until the issue could be remedied during the 1995 Legislative Session.[96]

However, before the legislation became effective on September 1, 1995, several parties representing conventional conservative groundwater rights interests filed a lawsuit, *Barshop v. Medina Underground Water Conservation District*, against the EAA.[97] The plaintiffs challenged the constitutional legitimacy of the EAA based on some of the directives listed above, specifically those that the permitted groundwater withdrawals would be limited and would be based on documented historical use.[98] They alleged that the permit limits would be consumed by the historical claims, meaning that the remainder of landowners would be eliminated from obtaining water use permits, unless such uses were acquired from holders of initial permits.[99] In June 1996, the Texas Supreme Court held that "[t]he specific provisions of the Act, such as the grandfathering of existing users, the caps on water withdrawals, and the regional powers of the Authority, are all rationally related to legitimate state purposes in managing and regulating this vital resource."[100] The original act stipulated that the maximum quantity of water held by the initial regular permits could not exceed 450,000 acre-feet through December 31, 2007 and was to be reduced to 400,000 acre-feet beginning on January 1, 2008.[101]

The volume of water requested in the original claims for permits following the filing deadline of December 30, 1996, was greater than 830,000 acre-feet,[102] the first clue that the legislative 450,000 acre-feet limit was problematic. Under the enabling act, the EAA was responsible for any expenses related to achieving a total permit quantity to 450,000 acre-feet. Within a few years of processing permit applications, it was thus clear that there were at least 100,000 acre-feet of permits that qualified for water rights above the 450,000 acre-feet cap. The EAA was looking at a one-time expense of more than $200 million and a thirty-year total bond payment of twice that amount.[103] Furthermore, funds to pay for a massive condemnation had to come

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[95] *See generally Sierra Club*, 1993 WL 151353; Joe N. Patoski, *The Edwards Aquifer & the EAA*, EDWARDS AQUIFER AUTHORITY, https://www.edwardsaquifer.org/eaa/history [https://perma.cc/Y9B9-XDNH].

[96] Gregg Eckhardt, *Laws and Regulations Applicable to the Edwards Aquifer*, EDWARDS AQUIFER WEBSITE, https://www.edwardsaquifer.net/rules.html [https://perma.cc/L7HE-5LN9].

[97] Barshop v. Medina Underground Water Conservation Dist., 925 S.W.2d 618, 623 (Tex. 1996).

[98] *Id.* at 630.

[99] *Id.*

[100] *Id.* at 633.

[101] 1993 Tex. Gen. Laws 2364.

[102] Interview by Rick Illgner with Steve Walthour, Program Manager Permits Team, Edwards Aquifer Auth. (Nov. 2003).

[103] *Id.*

only from the people who would lose their water rights.[104] In short, the region would be paying over $400 million (the approximate total payout over the thirty-year period) to affect pumping restrictions on water rights established by documented use and then have to fork over much more than that to replace the water just lost.[105]

In 2007, the legislature passed the most significant changes to the EAA since passage of the original legislation in 1993. The legislature (1) permanently raised the permit cap to 572,000 acre-feet; (2) made drought restrictions part of the Act, rather than being subject to implementation through adoption and enforcement of rules; and (3) directed the EAA to participate in a "recovery implementation program" (RIP) with several other interested parties to develop a resolution to the pending ESA issue by December 2012.[106] In March 2013, the U.S. Fish & Wildlife Service (USFWS) approved the Edwards Aquifer Habitat Conservation Plan (EAHCP), which consists of two components: (1) Restoration, Minimization, and Mitigation measures–activities to enhance and protect the habitats and species–and (2) Flow Protection measures to maintain minimum springflows.[107]

One of the Flow Protection measures is the VISPO, a program in which the EAA compensates irrigations for participating in the program and provides additional compensation for suspending irrigation during certain severe drought conditions.[108] The second Flow Protection measure is the ASR leasing program, which involves acquiring water rights and either using the water to fill the ASR facility operated by the San Antonio Water System (SAWS), or forbearing use of the rights during certain drought conditions.[109] While the ASR leasing program is the keystone of the springflow protection measures of the Habitat Conservation Plan,[110] only VISPO is described in this article.

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[104] *Id.* The only means of funding for the EAA is a permit fee charged to permit holders. The agency receives no state funding and cannot levy a tax. Consequently, funds for the condemnation, or retirement, would come only from the permit holders. This situation is completely different than the normal condemnation process carried out in a city when widening a street, in which the funds for the civil works project are not the burden solely of the persons along the designated stretch of road.

[105] *Id.* In 2006, EAA water rights were selling for $5,000/acre-foot. So, if a small municipality was going to have 100 acre-feet of water rights retired, the EAA would have to come up with $500,000 to compensate that municipality (100 acre-feet x $5,000/acre-foot). However, a State Water Planning initiative that was proceeding concurrently with the EAA adjudication process and charged with following a rigorous analytical process to insure the water needs of all water user groups (excepting irrigators) were met had evaluated many water management strategies for the municipal and industrial users, and the very cheapest was over $1,000/acre-foot for a 30-year bond-payment term. This meant that the same municipality that was compensated $5,000 for water it lost had to replace it with water that cost $30,000, at a minimum. So, this was a good example of "lose/lose."

[106] 2007 Tex. Gen. Laws 5902.

[107] HABITAT CONSERVATION PLAN, *supra* note 49, at 2-16.

[108] *Id.* at 5-3 to -5.

[109] *Id.* at 5-37.

[110] *Id.* at 5-38. It is the keystone for two reasons. *Id.* First, when water stored in the ASR is recovered, direct withdrawals from the Edwards Aquifer are reduced. *Id.* Second, when water is

D. *The VISPO Program*

The concept of the VISPO is simple: provide financial incentives to reduce pumping.[111] "Voluntary" and "suspension" are key words in the program name. Voluntary is paramount; the reductions in usage required for the program are completely voluntary and come with financial incentives. Suspension describes the nature of the reduction; it is a suspension rather than a lease. The difference is significant because of the nature of EAA water rights. Of the three permit categories—municipal, industrial, and irrigation—municipal and industrial water rights are considered "unrestricted," which means that there are no restrictions on the marketing of the rights. Irrigators have generally received a water right for two acre-feet/acre on a maximum number of acres irrigated in any single year.[112] However, the EAA Act stipulates that irrigation rights are divided in two: one-half is unrestricted and can be marketed just like municipal or industrial water rights; the other half is referred to as a "base irrigation right," which must be conveyed with the sale of the land.[113] It can be leased for a term not to exceed ten years but only for irrigation.[114] Demand for unrestricted water rights is significantly greater than demand for base irrigation rights, which results in a marked difference in their marketing value. Consequently, paying an irrigator to suspend use of the irrigator's water rights to aid in springflow allows enrollment of both irrigation water right categories.

Because irrigators are besieged with variables and elements out of their control, it was imperative that the basic VISPO concept be clear and unambiguous. Deciding on a trigger index and the date of the trigger event were first order events. Choosing an index that would trigger suspension was straight forward; it was the J-17 index well in San Antonio.[115] For decades it has been generally considered (except by residents of Uvalde County) to be the index well for the Aquifer. It tracts with flow at Comal Springs and is mentioned on nearly every TV news cast and in the daily paper. The two paramount factors for the date of the trigger event were to give the irrigator sufficient notice to make alternative plans for the upcoming crop year, but not to trigger too soon, only to have substantial rainfall after the event, which would complicate the issue. October 1 ended up as the best choice, and a level

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recovered under the ASR program, the SAWS has agreed to reduce its authorized amount in an amount equal to the recovered amount. *Id.* For example, if SAWS is authorized 100,000 acre-feet and 10,000 acre-feet of Habitat Conservation Plan water is withdrawn during a year in which the annual drought reduction is twenty-five percent, SAWS would be allowed to use only 65,000 acre-feet of its permitted amount (100,000 acre-feet minus twenty-five percent of 100,000 acre-feet minus 10,000 acre-feet = 65,000 acre-feet)). *Id.*

[111] RECON ENVTL., INC. ET AL., EDWARDS AQUIFER RECOVERY IMPLEMENTATION PROGRAM: HABITAT CONSERVATION PLAN: APPENDIX O 3 (2012) [hereinafter HABITAT CONSERVATION PLAN: APPENDIX O].

[112] 1993 Tex. Gen. Laws 2361.

[113] 1993 Tex. Gen. Laws 2366.

[114] 1993 Tex. Gen. Laws 2362.

[115] HABITAT CONSERVATION PLAN: APPENDIX O, *supra* note 111, at 8.

of 635 feet above mean sea level (msl) was the trigger.[116] In summary, if the Aquifer level at J-17 on October 1 was at or below 635 feet msl, a VISPO participant would have to suspend pumping all the water enrolled for the following calendar year.

The remaining program elements requiring determination were how much to enroll, for what periods, and what price to pay. The EAA initially chose 20,000 acre-feet to enroll, then later doubled the goal to 40,000 acre-feet.[117] The next step was developing the terms and rates. One of the principles that factored in the decision to set terms was confidence that something would happen—the USFWS required that the action be "reasonably certain to occur." Consequently, five- and ten-year options were chosen.[118] Regarding rates, one irrigator said we needed "shock and aw" on rates to assure meaningful participation.[119] The schedule developed included an annual "stand-by" rate just for being in the program and a "suspension" rate if irrigators had to forego pumping.[120] As the following rate table demonstrates, the payment schedule is skewed in favor of the ten-year program; enrolling in the five-year program for consecutive terms would yield less money than enrolling in a single ten-year term, assuming equal aquifer conditions. The icing on the cake is that during a suspension year when enrollees give up their water, they receive both payments.

Term	**Fee**	**1 ($)/AF**	**2 ($)/AF**	**3 ($)/AF**	**4 ($)/AF**	**5 ($)/AF**
5-Yr	Stand-by	50.00	50.75	51.51	52.28	53.06
	Suspension	150.00	152.25	154.53	156.84	159.18
10-Yr	Stand-by	57.50	57.50	57.50	57.50	57.50
	Suspension	172.50	172.50	172.50	172.50	172.50

[116] *Id.* at 10.
[117] *Id.*
[118] *Id.*
[119] Rick Illgner, Edwards Aquifer Recovery Implementation Program VISPO Workgroup (Apr. 1993).
[120] HABITAT CONSERVATION PLAN: APPENDIX O, *supra* note 111, at 6.

Term	Fee	6 ($)/AF	7 ($)/AF	8 ($)/AF	9 ($)/AF	10 ($)/AF
5-Yr	Stand-by					
	Suspension					
10-Yr	Stand-by	70.20	70.20	70.20	70.20	70.20
	Suspension	210.60	210.60	210.60	210.60	210.60

Figure 2 – Payment Schedules for the 5- and 10-Year VISPO Enrollment

The payment schedules were significant enough to promote optimism towards the program.[121] It was always the intent of the work group that, except when suspension is required, VISPO should not interfere in any way with irrigators going about their business. Consequently, a few bonuses were added to the slate: (1) irrigators could enroll any portion of their permit and weren't required to enroll the full permit; (2) if an irrigator enrolled a portion of the permit and then realized the possibility of over-pumping the remaining portion, the necessary water could be transferred to cover the shortage; and (3) in a non-suspension year, participants could lease out their enrolled water and still get a stand-by payment.[122]

The following is an example of how the program and finances work. In this example, two hypothetical irrigators are illustrated. Irrigator A has a 200-acre-foot water right and 100 acre-feet enrolled in VISPO. Irrigator B has a 175-acre-foot water right and 100 acre-feet enrolled in VISPO. The table below shows what each irrigator would receive financially for the first year in the VISPO program.

[121] *Id.*
[122] *Id.* at 10.

Irrigator	Term	Fee	Payment (Year 1)	No Trigger	Trigger
A	5-year	Stand-by	$50.00	$5,000.00	$5,000.00
		Suspension	$150.00		$15,000.00
		Total		$5,000.00	$20,000.00
B	10-year	Stand-by	$57.50	$5,750.00	$5,750.00
		Suspension	$172.50		$17,250.00
		Total		$5,750.00	$23,000.00

Figure 3 – Illustration of the VISPO Program

In the example, if VIPSO were not triggered, Irrigator A would receive $5,000, while Irrigator B would receive $5,750, and both parties would retain access to their full water rights (A – 200 acre-feet, B – 175 acre-feet). If VISPO were triggered, Irrigator A would receive $20,000, while Irrigator B would receive $23,000. However, in this instance, Irrigator A has access to the remaining 100 acre-feet of the water right and Irrigator B has access to the remaining seventy-five acre-feet of the water right.

The Service approved the EAHCP in March 2013, and enrollment solicitation began.[123] Activity was brisk in 2013 and 2014, with a final enrollment figure by the end of 2014 of 40,921 acre-feet, 900 acre-feet over the original goal, this additional quantity estimated to increase spring flow of more than one cubic feet per second.[124] Over this two-year period, enrollment numbers were influenced by drought and commodity prices.[125] The economic impact of VISPO since inception has been rather remarkable as evidenced by Figure 4 below. Payments from 2014 to 2019 totaled more than $18.8 million.

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[123] *Edwards Aquifer Habitat Conservation Plan (EAHCP)*, CITY NEW BRAUNFELS, https://www.nbtexas.org/1867/Habitat-Conservation-Plan [https://perma.cc/PT6V-AKAU]; SHAUN PAYNE & BOB HALL, UPDATE ON THE EDWARDS AQUIFER HABITAT CONSERVATION PLAN: GUADALUPE RIVER BASIN 2015 CLEAN RIVERS PROGRAM STEERING COMMITTEE MEETING 2 (2015), https://www.gbra.org/documents/crp/meetings/2015/EdwardsAquiferHabitatConservationPlan.pdf [https://perma.cc/NEC9-EFLD].

[124] *EAA Timeline*, EDWARDS AQUIFER AUTHORITY, https://www.edwardsaquifer.org/eaa/history/eaa-timeline/ [https://perma.cc/9XL9-EWPW].

[125] RICK ILLGNER, USING FINANCIAL INCENTIVE$ FOR AQUIFER MITIGATION: TEXAS ALLIANCE OF GROUNDWATER DISTRICTS 13 (2015), http://www.iemshows.com/wp-content/uploads/2015/03/2015-TGS-Presentation-Rick-Illgner.pdf [https://perma.cc/Y8XY-ZQQN]; EDWARDS AQUIFER HABITAT CONSERVATION PLAN: 2018 ANNUAL REPORT 36–37 (2019), https://www.edwardsaquifer.org/wp-content/uploads/2019/10/EAHCP_Annual_Report_2018.pdf [https://perma.cc/VL9V-Y4GW].

Year	Enrollment (acre-feet)	Payment
2014	22,378	$1,201,938
2015	40,921	$8,677,262
2016	40,921	$2,188,500
2017	40,921	$2,208,723
2018	40,921	$2,228,300
2019	39,646	$2,320,309
Total		**$18,825,032**

Figure 4 – VISPO Enrollment and Payments 2014-2019

E. *Summary*

In summary, the history of the EAA has been a long and winding road, beginning with a lawsuit involving the ESA and a constitutional challenge to the enabling act, moving through years of developing on-the-fly rules and administrative protocol, ultimately concluding with an EAHCP complicated by physical and political circumstances. Through the process, permit holders have evolved from considering the EAA as an adversary, to considering the EAA warily, and ultimately to viewing the EAA as a partner. The utilization of financial incentives to reach the biologic goals of the EAHCP is a major reason.

III. LOCAL COOPERATIVE PROGRAMS IN THE WEST: THREE CASE STUDIES

A. *Introduction*

In response to the threat of state curtailments, several western communities have sought new options for groundwater governance and used novel approaches to address issues in their aquifers. This portion of the paper will describe three examples, one successful, one not yet successful and the third still in its formative stages, from the western United States of new groundwater governance structures using voluntary, participatory methods: the RGWCD in Colorado, the Umatilla Basin Water Commission (UBWC) in Oregon, and the Sustainable Groundwater Management Act (SGMA) in California modeled after the voluntary Orange County Water District (OCWD).

Unlike surface water governance in the West, some groundwater governance models appear to be developing with a focus on local planning and management. Surface water governance is often regulated by a central state

authority applying a standard permitting system across the state.[126] Each river may have individual planning, limiting use to maintain minimum stream flows, or other policies decided by the state agency. For groundwater, some states have implemented a similar approach by limiting aquifer use to SAYs[127] or designating special areas of additional groundwater regulation. Other states have used a "wait-and-see" approach, allowing the individual groundwater users to litigate their own rights as conflicts appear. Even with these varying state policy approaches, groundwater users have sought to have local management of their underlying aquifers and formed organizations to improve groundwater management in their aquifers.

In the three examples that follow, a common narrative emerges—placing more control and decision making at the local level. Some key features may represent an emerging trend in groundwater governance. Each case began with a groundwater and availability issue preventing the existing level of use to continue. Next, local communities voluntarily, or by necessity, come together to address the challenges groundwater users face collectively. Next, the local community attempts to achieve legal changes to enable a certain level of local control. Finally, a local groundwater resource management organization forms and attempts to carry out a plan developed by that organization. These factors can be seen in the three case studies, but they vary by the differing legal pressure to address groundwater overuse imposed by state law. These regulatory environments limit how voluntarily and independently the groundwater users organize and manage groundwater in their basin.

The lowest level of state pressure creates an organizational environment of theoretical, unused, or threatened state administrative restrictions. This level represents the more voluntary governance environment, which can be seen in the Rio Grande Water Conservation District. The next level of state pressure takes the form of an official government recognition of a groundwater problem and imposed restrictions in individual uses in a region, but without mandating water use planning or collective aquifer management, illustrated by Oregon's Umatilla Basin Water Commission. The final, least voluntary level is one in which the state mandates planning and the creation of a groundwater organization and sets a target consumption level. The final level is represented by the yet-to-be-created groundwater agencies created in California's SGMA. The case studies show differing levels of state pressure and illustrate how voluntarily the local community created the organization.

Often groundwater issues describe how aquifers represent an archetypal example of the tragedy of the commons, which suggests that rational maximizers with access to a common-pool resource will eventually destroy the resource. Since each user has unlimited access to the resource, as the resource becomes scarcer, the users are incentivized to use the resource before it is

[126] GETCHES ET AL., *supra* note 15.
[127] Kalf & Woolley, *supra* note 16 at 296–97.

totally gone.[128] Attempts at collective effort would be undone by the problem of free-riders that would benefit without contributing to the common effort.[129] With the uneven incentive both to use as much as possible and disincentive to cooperate, theoretically aquifer organizations should never form. The typical solutions offered to solve the tragedy of the commons are additional regulation (requiring a mandatory reduction in access to the resource) or outright privatization of the resource (legally challenging depending on the resource). Less commonly suggested middle paths are "common" or "collective" property regimes, whereby ownership is severed from the actual use of the resources, which disrupts the public-private dichotomy.[130] For groundwater, a choice between potential takings claims[131] on one hand and unconstitutional privatization[132] on the other is the source of heated debates.

Somewhere between the two extremes is collective management of shared groundwater resources. Ostrom's solution has similarities to the groundwater organizations in the West Basin aquifer systems in the Los Angeles area that were the topic of her doctoral dissertation.[133] Ostrom's explanation for aquifer collective organization comes from a modification of the underlying assumption of the tragedy of the commons: the rational maximizer.[134] Instead of a rational maximizer, Ostrom suggests that sharing information among resource users through agreements could produce better resource governance than regulating through central agencies.[135] The users of a common resource can arrange for their own private enforcement mechanisms through private agreements.[136] These agreements determine both the allowable appropriation and the incentives to achieve stable use of the common resource.[137] Successful common pool resource organizations share some common principles identified by Ostrom:[138] participating in rules created by members, practicing self-monitoring, adopting conflict resolution mechanisms, and obtaining approval of government authorities to allow local rulemaking.[139]

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[128] *See* Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1244 (1968).
[129] OSTROM, GOVERNING THE COMMONS, *supra* note 46, at 6.
[130] *See generally* EDWARD BARBANELL, COMMON-PROPERTY ARRANGEMENTS AND SCARCE RESOURCES WATER IN THE AMERICAN WEST (2001); *see also* Ana M. Peredo et al., *Common Property: Uncommon Forms of Prosocial Organizing*, 33 J. BUS. VENTURING 591, 592 (2018).
[131] *See* Micah Green, *Rough Waters: Assessing the Fifth Amendment Implications of California's Sustainable Groundwater Management Act*, 47 U. PAC. L. REV. 25, 41–43 (2015).
[132] Tuholske, *supra* note 20, at 227 (stating a fiduciary obligation may exist for states to regulate groundwater for the benefit of the public).
[133] *See generally* ELINOR OSTROM, PUBLIC ENTREPRENEURSHIP: A CASE STUDY IN GROUND WATER BASIN MANAGEMENT (1965) [hereinafter OSTROM, PUBLIC ENTREPRENEURSHIP] (unpublished Ph.D. dissertation, University of California, Los Angeles) (on file with Indiana Digital Library of the Commons), http://dlc.dlib.indiana.edu/dlc/handle/10535/3581 [https://perma.cc/F3KG-DDUF].
[134] OSTROM, GOVERNING THE COMMONS, *supra* note 46, at 6–7.
[135] *Id.* at 8–10, 12–18.
[136] *Id.* at 16.
[137] *Id.* at 55–56.
[138] *Id.* at 89–90.
[139] *Id.* at 100–01.

This final principle, government recognition of local rules closely resembles the need for governance to be voluntary. The "minimal recognition of rights to organize" by the state can be the factor that decides if resource governance will be successful.[140] In the three following case studies, the local groundwater users have created the legal tools that would eventually lead to their groundwater organizations. For the first case study, the RGWCD in Colorado lobbied the legislature to enable the creation of the district. A novel use of intergovernmental agreements in the second case study provided the legal authority for the creation of the UBWC in Oregon. In the final case study, locally inspired legislation in California empowering the OCWD eventually inspired the new SGMA's statewide-mandated organizations.

B. *The RGWCD in Colorado*

The voluntary efforts by irrigators to conserve groundwater in the San Luis Valley of Colorado represents example organization with the least legal pressure to organize included in this paper. The San Luis Valley is located in the headwaters of the Rio Grande River. Groundwater in the valley provides an important source of baseflow to the Rio Grande River, making groundwater regulation in the San Luis Basin an important factor in meeting downstream water users' rights and obligations to other downstream states.

The history of groundwater law in Colorado is typical of arid western states using prior appropriation. The main influences on water use in the San Luis Valley began in 1938, when the Rio Grande Compact attempted to resolve disputes between Colorado, New Mexico, Texas, and Mexico.[141] The compact resolved surface water allocations between these parties.[142] While the compact did not address groundwater directly, the advent of modern pumping technology in the 1940s radically changed irrigation in the region.[143] Soon after groundwater pumping became widespread, conflicts developed between senior surface water users and junior groundwater pumpers.[144] In 1957, Colorado passed the Ground Water Law, which required permits to drill new wells, created the first groundwater commission, and tasked the commission with regulating the declining groundwater resources.[145] Conflicts between surface and groundwater users continued after the implementation of the new law, leading to further revisions of the groundwater code. In 1965, Colorado passed the Groundwater Management Act, which protected some areas from claims that groundwater users were depleting surface allocations, separating "tributary" groundwater from groundwater that does not interact with surface

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[140] OSTROM, GOVERNING THE COMMONS, *supra* note 46, at 101, 178–81.
[141] William A. Paddock, *Rio Grande Compact of 1938*, 5 U. DENV. WATER L. REV. 1, 3 (2001).
[142] *Id.* at 34.
[143] Ari J. Stiller-Schulman, *No Seat at the Water Table: Colorado's New Groundwater Basin Statute Leaves Senior Surface Rights in the Lurch*, 84 U. COLO. L. REV. 819, 829 (2013) (citing Fellhauer v. People, 447 P.2d 986, 991 (Colo. 1968).
[144] *Id.* at 829–30.
[145] *Id.* at 829.

waters.[146] The presumption of non-injury in these regions could be overcome if actual harm to surface users could be shown.[147] Unfortunately for many of the groundwater users in the San Luis Valley, contributions from the aquifer provided significant amounts of water to the baseflow of the Rio Grande River.

In 1966, Texas and New Mexico sued Colorado for failing to meet obligations in the compact.[148] The State Engineer began curtailing groundwater pumping in the San Luis Valley to provide adequate baseflow in the river.[149] Another attempt to compensate for baseflow losses, the Closed Basin Project, hoped to capture evaporative losses but was ultimately unsatisfactory.[150] In response to the dispute, the state legislature created the RGWCD in 1967 as a "self-directed administrative unit."[151] Among other responsibilities, the district could levy taxes, contract with federal agencies, and represent the agricultural water users in litigation.[152] Further, landowners that wish to coordinate water management may form a "special improvement district."[153]

Drought conditions during the 2002 irrigation season increased pumping in the region to offset losses from surface conditions.[154] During this time, storage in the aquifer fell 1 million acre feet.[155] The loss of stored water was also associated with losses of well yield and other aquifer production issues.[156] The increase in pumping also reduced the baseflow into the Rio Grande River, furthering the issues with meeting downstream interstate obligations under the Rio Grande Compact, suggesting the State Engineer (administrator regulating water resources in the state) would impose pumping reductions to meet the obligations under the compact. With the groundwater situation becoming a crisis, local irrigators turned to their state legislature to assist to provide legal tools to help manage the situation and prevent the damage that would come from state regulation of wells.[157]

Irrigators needed a tool to collectively manage the aquifer, reduce groundwater consumption, and prevent management disruption by unplanned state curtailments. In 2004, a local farmer and state senator, Lewis Entz,

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[146] *Id.* at 831.
[147] *Id.* at 832.
[148] Peter C. Johnson, *The "Third Act" in Colorado Water Law: The Colorado Supreme Court Affirms the Concept of Sustainable Optimum Use in Simson v. Cotton Creek Circles, LLC*, 12 U. DENV. WATER L. REV. 241, 244 (2008).
[149] *Id.*
[150] *Id.* at 245.
[151] Kelsey C. Cody et al., *Emergence of Collective Action in a Groundwater Commons: Irrigators in the San Luis Valley of Colorado*, 28 SOC'Y & NAT. RES. 405, 414 (2015).
[152] *Id.*
[153] COLO. REV. STAT. ANN. § 37-48-123(1) (West 2007).
[154] *See* Cody et al., *supra* note 151, at 407.
[155] *Id.*
[156] RIO GRANDE WATER CONSERVATION DIST., PROPOSED PLAN OF WATER MANAGEMENT: SPECIAL IMPROVEMENT DISTRICT NO. 1 OF THE RIO GRANDE WATER CONSERVATION DISTRICT 5 (2009), http://www.rgwcd.org/attachments/File/service_plan-Amended_Plan_ Water_ Management_Adopted_15Jun09_-BOD_date_of_approval.pdf [https://perma.cc/5HJX-VXKR].
[157] *See* Cody et al., *supra* note 151, at 417.

introduced Senate Bill 04-222.[158] The law prevented the State Engineer from shutting down wells as long as those farmers were within a subdistrict and under a management plan.[159] In 2006, a majority of the local irrigators voted to voluntarily create Subdistrict No. 1, which formed the governing body for the aquifer.[160] Achieving a majority was a struggle and included a few staunch opponents, but the subdistrict represents an uncommon attempt by a region to secure a voluntary, regional, comprehensive groundwater governance organization.[161]

The first task of the subdistrict was to create a management plan to sustainably provide water in the future and meet legal obligations in the Rio Grande Compact.[162] Management plans must be approved by the State Engineer[163] and a local court after a hearing of objections.[164] Through this process, the plan is amended until its ultimate approval.[165] The State Engineer uses specific factors to approve these plans, including maintaining the aquifer at a sustainable level, accounting for fluctuations, and preventing interference with the Rio Grande Compact.[166] As long as the plan is approved and the subdistrict follows the plan, the State Engineer cannot curtail groundwater pumping.[167] After review by the State Engineer and revisions suggested by the trial court, the Subdistrict No. 1's management plan was approved by Judge Kuenhold in 2010[168] and later affirmed by the Supreme Court of Colorado.[169]

The plan's goal is to form an alternative to state regulation of groundwater wells and the self-regulation of the aquifer basin using economic-based incentives.[170] Specifically, the plan hopes to restore hydrologic conditions in the aquifer basin, prevent interference with surface water users, and avoid violating the Rio Grande Compact.[171] These goals would be

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[158] *Id.*
[159] *Id.*
[160] San Antonio, Los Pinos & Conejos River Acequia Pres. Ass'n v. Special Improvement Dist. No. 1 of Rio Grande Water Conservation Dist., 270 P.3d 927, 933 (Colo. 2011).
[161] *See* Cody et al., *supra* note 151, at 417.
[162] COLO. REV. STAT. ANN. § 37-92-501(4)(a) (West 2004).
[163] *See id.*
[164] COLO. REV. STAT. ANN. § 37-48-126(3)(b) (West 2007).
[165] COLO. REV. STAT. ANN. § 37-48-126(4) (West 2007).
[166] COLO. REV. STAT. ANN. § 37-92-501(4)(a)(I)–(V) (West 2004).
[167] COLO. REV. STAT. ANN. § 37-92-501(4)(c) (West 2004).
[168] RIO GRANDE WATER CONSERVATION DIST., PLAN OF WATER MANAGEMENT: SPECIAL IMPROVEMENT DISTRICT NO. 1 OF THE RIO GRANDE WATER CONSERVATION DISTRICT 1 (2017), https://rgwcd.org/attachments/subdistrict1/Plan%20Revisions/Plan%20Water%20Management%20AMENDED%20%28efficiency%29%20Clean.pdf [https://perma.cc/444R-WSQV]; Matt Hildner, *San Luis Valley's Chief Judge to Step Down*, PUEBLO CHIEFTAIN (June 4, 2011, 12:01 AM), https://www.chieftain.com/875bbb7c-8e60-11e0-aa92-001cc4c002e0.html [https://perma.cc/8QS5-QCAF].
[169] San Antonio, Los Pinos & Conejos River Acequia Pres. Ass'n v. Special Improvement Dist. No. 1 of Rio Grande Water Conservation Dist., 270 P.3d 927, 935 (Colo. 2011).
[170] *Id.* at 941; *see also* RIO GRANDE WATER CONSERVATION DIST., PROPOSED PLAN OF WATER MANAGEMENT, *supra* note 156, at 8.
[171] *See San Antonio, Los Pinos & Conejos River*, 270 P.3d at 941.

accomplished using financial incentives (abstraction taxes) to reduce pumping, temporary fallowing of land, replacing stream depletions, and complete retirement of some irrigated lands in the basin using the CREP with supplemental payments derived from pumping fees.[172] An annual replacement plan is submitted to the State Engineer at the beginning of the irrigation season, including forecasted streamflows, predicted loss of streamflows from the previous year's pumping, total subdistrict depletions, and aquifer modeling information.[173] The court retains jurisdiction for review of these annual replacement plans in case any party wishes to challenge the terms of these plans.[174]

The plan initially imposed a forty-five dollar/acre-foot pumping tax in 2011, which was increased to seventy-five dollars after 2012.[175] The imposition of the tax is associated with a thirty-two percent reduction in groundwater consumption within the subdistrict.[176] By 2015, 5,854 acres had entered long-term fallowing contracts with CREP subsidized by the subdistrict.[177] Local farmers, however, indicate that compensation is less than the forgone profits from planting their crops.[178] However, the positive results may represent more than economic decisions and actually represent a shift in social norms within the community.[179]

Whether the reductions were due to the self-imposed tax or the voluntary reduction in consumption to meet the goals of the subdistrict, this case study provides evidence that these kinds of organizations can be effective alternatives to state regulation. The key feature that the subdistrict represents a self-imposed reduction in groundwater consumption, without top-down coercion by a state agency.

C. *Umatilla Basin Water Commission*

The UBWC represents another example of a local, voluntary attempt to regulate groundwater and curb unsustainable use with a moderate amount of legal pressure to organize management. Umatilla, Oregon is located in the northern portion of the state bordering the Columbia and Umatilla Rivers.[180] The region contains two distinct aquifers: a deeper basalt aquifer and a shallower alluvial aquifer.[181] The alluvial aquifer saw problematic drops in

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[172] *Id.*
[173] *Id.* at 943.
[174] *Id.* at 944.
[175] Steven M. Smith et al., *Responding to a Groundwater Crisis: The Effects of Self-Imposed Economic Incentives*, 4 J. ASS'N ENVTL. & RESOURCE ECONOMISTS 985, 990 (2017).
[176] *Id*. at 1007.
[177] *Id.* at 1009.
[178] *Id.*
[179] *Id.* at 1010.
[180] FED. EMERGENCY MGMT. AGENCY, FLOOD INSURANCE STUDY 9 (2009), http://www.co.umatilla.or.us/planning/FIS/Umatilla%20County%20FIS%20PRELIM%20Vol1.pdf [https://perma.cc/UE5Q-GJM5].
[181] OR. WATER RES. DEP'T GROUND WATER SECTION, GROUND WATER SUPPLIES IN THE

water table levels in the 1970s, but was partially recovered after implementation of surface infiltration project.[182] The deeper basalt aquifer was more productive but also suffered from unsustainable depletions.[183] Because of the declining groundwater levels, the Oregon Water Resources Department (OWRD) passed "hotly contested" regulations designating parts of the region as a "critical ground water area."[184] These designations allow OWRD to suspend issuance of new water right permits in the area and restrict pumping.[185] Groundwater pumping restrictions eliminated 127,000 acre feet of permitted pumping to achieve the "SAY" in the basin.[186] Because of the region's dependence on groundwater, the restrictions would slow or halt future growth in the area.

In the 1980s, the community sought new options and flexibility to address its groundwater issues. Governor Atiyeh created the Umatilla Basin Groundwater Taskforce ("Taskforce") composed of citizens to provide policy suggestions to address the groundwater issues in the area.[187] The Taskforce suggested legal changes to enable artificial recharge of the aquifer, water basin planning, and to create an organization to implement those recommendations.[188] Matters came to a head in 2004, when the local planning commission debated creating an overlay zone prohibiting any new domestic groundwater development in the area.[189] Responding to the public outcry and resistance, the planning commission and county commissioners created a new taskforce, the Umatilla County Critical Groundwater Taskforce, to provide options to address the county's groundwater crisis.[190] By 2007, the new taskforce had suggestions, including additional planning, an ASR project, and regulatory changes to assist in that effort.[191]

The proposed aquifer storage project would store winter flows of the Columbia River in the aquifers for use in the summer months, assisting to restore the aquifer storage levels and allow further well development.[192]

UMATILLA BASIN 4 (2003), https://www.oregon.gov/OWRD/wrdreports/umatillagwwkshprptapril2003.pdf [https://perma.cc/89LZ-HQZF].

[182] *Id.* at 7.

[183] *Id.* at 7–8.

[184] LAURA SCHROEDER, INNOVATIVE PARTNERSHIPS: AN ANSWER TO THE TRAGEDY OF THE COMMONS 3 (2016), http://www.icid.org/wif2_full_papers/wif2_w.1.3.02.pdf [https://perma.cc/66B5-XXBJ].

[185] *See* OR. REV. STAT. ANN. § 537.742(2)(a)–(f) (West 1991).

[186] MARTHA PAGEL, OREGON'S UMATILLA BASIN AQUIFER RECHARGE AND BASALT BANK: A CASE STUDY FOR THE POLITICAL ECONOMY OF WATER MARKETS PROJECT 5 (2016), https://static1.squarespace.com/static/56d1e36d59827e6585c0b336/t/5805466815d5dbb1ab59a238/1476740731982/Oregon-Groundwater-Pagel.pdf [https://perma.cc/VB4P-97SW].

[187] UMATILLA COUNTY CRITICAL GROUNDWATER TASK FORCE, UMATILLA SUB-BASIN 2050 WATER MANAGEMENT PLAN 15 (2008) [hereinafter 2050 PLAN], http://www.co.umatilla.or.us/planning/pdf/2050%20Plan%20Final.pdf [https://perma.cc/47ZM-HGYV] .

[188] *Id.*

[189] *Id.* at x.

[190] *Id.*

[191] PAGEL, *supra* note 186, at 6; *see* 2050 PLAN, *supra* note 187, at 50–53.

[192] *See* Martha Pagel et al., *New Water Management Model*, WATER REP., May 2011, at 1, 2

Infiltration basins would be utilized to partially clean the water entering the alluvial aquifers, which could be later injected into the deeper basalt aquifers.[193] The storage project hoped to increase flows in the Umatilla River, improve salmon habitat, and meet treaty obligations of the Umatilla Tribes.[194] In 2008, OWRD and a private consulting agency conducted a preliminary study of the aquifer's utility for water storage.[195] After seeing promise for the project, support grew for further investigation of the project.

In 2009, the Oregon State Legislature authorized House Bill 3369[196] to fund a further, more detailed study of the storage project in the Umatilla basin, but also required that twenty-five percent of all water stored under the program be dedicated to "net environmental benefits."[197] The UBWC formed the same year to serve as the central organization managing the project.[198] The UBWC was the result of an IGA between Umatilla and Marrow Counties, the Westland Water District, and the Umatilla Tribes of the Umatilla Indian Reservation.[199] ICAs can be formed under Oregon law between local governments, tribes, and water districts.[200] Oregon law allows the IGA to form a new entity with representatives from the participating agencies and governments.[201] Under the IGA for the UBWC, it was able to manage "Stage 1" of the feasibility study and the funding provided by H.B. 3369.[202] An IGA allowed the UBWC to refine the project management plan and develop further infrastructure as needed. By 2011, the UBWC had made significant progress on studying the aquifer, acquiring licenses, and determining if the project would be successful including meeting the critical twenty-five percent requirement imposed on the grants provided in H.B. 3369.[203]

Unfortunately, the project was not successful. The studies showed a smaller amount of available aquifer storage than expected and increased costs for infrastructure development.[204] Additionally, legal inflexibility of the UBWC and internal conflicts between UBWC members contributed to the project's downfall.[205] Further, the dedication of twenty-five percent of stored water to environmental benefits amounted to a tax on all water development

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[hereinafter Pagel et al., *Management Model*].
[193] *Id.* at 3.
[194] PAGEL, *supra* note 186, at 5–7.
[195] *Id.* at 6–7.
[196] H.R. 3369, 75th Leg. Assemb., Reg. Sess. (Or. 2009).
[197] Pagel et al., *Management Model*, *supra* note 192, at 7.
[198] *Id.* at 3.
[199] Pagel et al., *Management Model*, *supra* note 192, at 7; *see also* Shonee D. Langford, *Full Steam Ahead for the Umatilla Basin Aquifer Restoration Project*, W. WATER L. & POL'Y REP. 67, 70 (2010).
[200] Pagel et al., *Management Model*, *supra* note 192, at 1–2.
[201] *Id.* at 2.
[202] *Id.* at 4.
[203] *Id.* at 6.
[204] PAGEL, *supra* note 186, at 1; *id.* at 8.
[205] PAGEL, *supra* note 186, at 8.

under the grant, limiting the possible benefits without reducing costs.[206] The study showed that the hoped-for groundwater baseflow discharges to the Umatilla River (a central environmental benefit) were small and most discharges would likely end up in the Columbia River.[207] With these restrictions and conditions, the project was scrapped in 2013.[208]

While the project proved to be unsuccessful, it represents an example of a voluntary effort to address local groundwater depletions using novel legal tools and grassroots efforts. Pushed to find a solution, the local governments and interests were able to make significant progress towards restoring and expanding their aquifer's potential.

D. *The SGMA and the OCWD in California*

Unlike the previous case studies, the California SGMA case study begins as a state mandate to form local organizations with similar characteristics to those mentioned above. At first glance, these Groundwater Sustainability Agencies (GSAs) appear to be entirely involuntary and outside the scope of the topic of voluntary groundwater organizations. However, the newly created GSAs are inspired by voluntary groundwater organizations in California's history, and the locally controlled GSAs will have significant control over the *means* of achieving sustainability (including a somewhat locally defined interpretation of sustainability itself). Additionally, the new GSAs will have many components of an otherwise voluntary organization described in the previous two examples. The GSAs will be selected by the local governments and will have considerable independence in project development, and they could potentially allow for a considerably locally-controlled groundwater management system. The GSAs are the least voluntary case study of the three discussed in this part of the article, since California's legislature mandated their existence,[209] and their plans must meet the sustainability standards outlined in the SGMA. The voluntary components of the SGMA are the ability of the GSAs to define *how* sustainability will be achieved at a local level, much like the above examples in which they were able to determine the means of managing groundwater locally.

The origin of the SGMA was the historic drought in 2012-2014, dramatically limiting water availability in the state. As evidenced by tree-rings, the drought was the worst to hit California in 1200 years.[210] Combined with extreme heat, the drought's effects showed the California legislature that unprecedented changes needed to be made to water management in the state. Groundwater pumping created dramatic subsidence and plummeting water

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[206] *Id.* at 9.
[207] *Id.* at 8.
[208] *Id.*
[209] A.B. 2712, 2013 Leg., Reg. Sess. (Cal. 2013).
[210] Daniel Griffin & Kevin J. Anchukaitis, *How unusual is the 2012–2014 California drought?*, 41 GEOPHYSICAL RES. LETTERS 9017, 9021 (2014).

tables.[211] In some cases, the ground levels subsided one inch per month.[212] Before the SGMA, groundwater regulation was relatively limited, allowing users to withdraw as much water as needed leaving a "'fair and just proportion'" to other groundwater users.[213] No permit was required to withdraw groundwater.[214] The only recourse for groundwater users would be a slow and expensive adjudication.[215] Attempts to regulate groundwater have been voluntary and rarely used, with only few exceptions.

One notable exception is the experience with groundwater depletions in the early 1900s to the 1930s in Orange County. As early as 1925, water engineers recommended that groundwater conservation measures be implemented after water tables had dropped 2.5 feet per year.[216] A local banker and legislator introduced Senate Bill 1201, which allowed for the creation of the OCWD with the goal of restoring groundwater levels and protecting water rights in the basin.[217] However, OCWD was unable to prevent further depletions.[218] Faced with further losses of groundwater, the local groups sought additional powers from the state legislature.[219]

In the 1950s, the OCWD wished to impose a pumping fee based on the quantity of water withdrawn from the aquifer and use the funds to locate surface water to offset the use within the district.[220] In 1953, the state legislature granted their request in Senate Bill 91, which allowed OCWD to impose the pump tax, measure withdrawals, estimate the sustainable yield of the basin, and create tools to enforce compliance.[221] In 1955, the state legislature allowed "Water Replenishment Districts" to be formed voluntarily in any part of the state with similar powers to the OCWD.[222] However, only one district, the Water Replenishment District of Southern California, took the path paved by the OCWD to form a groundwater district voluntarily.[223]

The GSAs to be formed by the SGMA will reproduce numerous aspects of the voluntary organizations in California's previous groundwater laws, but the SGMA requires their implementation across the state.[224] The GSAs are to be selected or formed by local government planning authorities, allowing cities and counties to nominate existing local agencies or districts to be the region's

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[211] Tina C. Leahy, *Desperate Times Call for Sensible Measures: The Making of The California Sustainable Groundwater Management Act*, 9 GOLDEN GATE U. ENVTL. L.J. 5, 18 (2015).
[212] *See* Michael Kiparsky, *Unanswered Questions for Implementation of the Sustainable Groundwater Management Act*, 70 CAL. AGRIC. 165, 165 (2016).
[213] Leahy, *supra* note 211, at 6 (quoting Katz v. Walkinshaw, 74 P. 766, 772 (Cal. 1903)).
[214] *Id.* at 9.
[215] *Id.* at 13.
[216] *Id.* at 11.
[217] *Id.* at 12.
[218] A.B. 2712, 2013 Leg., Reg. Sess. (Cal. 2013).
[219] Leahy, *supra* note 211, at 12.
[220] *Id.* at 13.
[221] *Id.* at 12.
[222] *Id.* at 13.
[223] *Id.*
[224] *Id.* at 36–39.

GSA.[225] GSAs are given broad powers to manage groundwater and operate water projects. GSAs have the authority to lease, purchase, and contract within their jurisdiction.[226] Programs for voluntary fallowing of agricultural land, replacing groundwater with surface appropriations, and forming water exchange agreements are among the tools in the GSA's toolbox.[227]

The GSAs are also responsible for creating the Groundwater Sustainability Plans (GSPs) that would achieve sustainable groundwater use by 2040.[228] The plans include geological information, monitoring plans, a description of other planning documents that relate to water use, and a way to eliminate "undesirable results" within that timeframe.[229] Undesirable results are statutorily outlined, and include chronic decreases in groundwater levels, significant and unreasonable loss of groundwater storage, saltwater intrusion, subsidence, and surface stream interference.[230] Each GSP will be required to describe minimum thresholds for "significant and unreasonable effects" developed by the GSA.[231] The GSP is also required to set numerical objectives tied to the minimum thresholds, with five-year interim milestones.[232]

The GSA submits the GSP to the California Department of Water Resources (CDWR).[233] The CDWR reviews the GSP's terms against the statutory mandates.[234] The CDWR may determine that the GSP is approved, incomplete, or inadequate.[235] For example, the GSPs must be "reasonable and supported by the best available information and best available science."[236] The GSPs must show that any projects or management actions are "feasible and likely to prevent undesirable results."[237] The central question of the CDWR's review is whether the GSP and the goals designated by the GSA will reasonably eliminate any "significant and unreasonable" undesirable effects caused by groundwater consumption.[238] Despite the new planning and management system, the SGMA allegedly makes no changes to pumpers' water rights.[239]

With the vast number of standards, reviews, and mandates, the GSAs (and their GSPs) formed by the SGMA will have considerable voluntary aspects. For example, the thresholds for "significant and unreasonable" effects are

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[225] CAL. WATER CODE § 10723 (West 2017); *see also* Leahy, *supra* note 211, at 36.
[226] CAL. WATER CODE § 10726.2(a) (West 2014).
[227] CAL. WATER CODE § 10726.2(b)–(d) (West 2014).
[228] CAL. WATER CODE § 10727.2(b)(1) (West 2014).
[229] *See* CAL. CODE REGS. tit. 23, § 354.24 (2016).
[230] CAL. WATER CODE § 10721(x)(1)–(6) (West 2018).
[231] *See* CAL. CODE REGS. tit. 23, § 354.28 (2019); *see also* CAL. CODE REGS. tit. 23, § 354.26 (2019).
[232] CAL. CODE REGS. tit. 23, § 354.30(c) (2019).
[233] CAL. WATER CODE § 10733.4(a) (West 2016).
[234] CAL. WATER CODE § 10733(a) (West 2014).
[235] CAL. CODE REGS. tit. 23, § 355.2(e) (2019).
[236] CAL. CODE REGS. tit. 23, § 355.4(b)(1) (2019).
[237] CAL. CODE REGS. tit. 23, § 355.4(b)(5) (2019).
[238] CAL. CODE REGS. tit. 23, §§ 354.26(a), 354.24, 355.4(b)(1)–(10) (2019).
[239] CAL. WATER CODE § 10720.5(a)–(c) (West 2016).

initially set out by the GSA.[240] The review of the CDWR requires only that the GSPs be reasonable and supported by scientific evidence.[241] These standards give wide latitude to determine the means of achieving their own goals and thresholds. While the SGMA is not a "bottom-up" example of voluntary groundwater management, implementation of the GSP will likely require support and voluntary efforts by agencies, cities, and individuals. The rights of individual water users have not been altered by the SGMA, meaning that the success of the SGMA will likely depend on decisions by pumpers to support the goals of the GSP. The history of the policy development of the SGMA was based on historic, purely-voluntary groundwater organizations in Orange County, but the SGMA has numerous mandates and state reviews. While local organizations will develop the GSPs, the fundamental sustainability goal of the GSP is not locally determined—the GSP is subjected to state review and revision.[242] On the other hand, the GSA has considerable authority to define the actual methods of achieving the state's goal. These aspects make it the least voluntary of the case studies included in this review, while still representing a limited form of a voluntary organization.

E. *Summary*

As seen in the above three examples, voluntary groundwater governance organizations may become a more common approach to solving the tragedy of the groundwater commons issue in the West. These examples show that groundwater organizations form despite the rules and agency pressures, and yet pressure from regulators can be the catalyst. Whether it is threatened future reductions, a mandated reduction, or forced planning, collective groundwater governance organizations are an emerging policy solution as well as community solution to the tragedy of the commons.

IV. THE MOVEMENT TO VOLUNTEER PROGRAMS IN KANSAS

A. *Introduction*

For many people across the country, any mention of Kansas triggers images of tornadoes and Oz. In his 2004 book, *What's the Matter with Kansas?* Thomas Frank described Kansas as a place where people inexplicably act against their own self-interests.[243] In contrast to Frank's book, which explored sociopolitical developments in Kansas, this portion of the article

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[240] CAL. WATER CODE § 10721(x)(1)–(6) (West 2015).
[241] *See* CAL. CODE REGS. tit. 23, § 355.4(b)(1)–(10) (2019).
[242] CAL. WATER CODE § 10733.4(d) (West 2016).
[243] THOMAS FRANK, WHAT'S THE MATTER WITH KANSAS?: HOW CONSERVATIVES WON THE HEART OF AMERICA 239 (2004) ("The title is derived from a Pulitzer Prize winning editorial by William Allen White published on August 16, 1896 in the Emporia (Kansas) Gazette newspaper in which he took Populist leaders to task for letting Kansas slip into economic stagnation and not keeping up economically with neighboring states because of Populist policies chasing away economic capital from the state.").

describes a group of Kansans taking action to protect their interests, specifically, the use of water, both for themselves and for future generations. The collaborative endeavor of these individuals and a number of governmental entities has resulted in new laws and management mechanisms called local enhanced management areas (LEMAs)[244] and water conservation areas (WCAs).[245] With the creation of these special areas, the local water users have set a precedent for extending the life of the aquifer on which their livelihoods and lives depend. In some respects, this movement in Kansas is similar to those described in the three case studies above.

B. *Background on Kansas Hydrology and Water Law*

Water availability and hydrology in Kansas differ greatly from the eastern to the western boundaries. The eastern third of Kansas receives on average as much as forty-five inches of rain each year, and most of its water is surface water, in rivers, streams, and runoff.[246] As one travels west across the state, the average rainfall drops to as low as fifteen inches per year in the far western swath,[247] where there is very little surface water; groundwater is the primary source of water in the western third of Kansas.[248]

When members of the Kansas Legislature passed the Kansas Water Appropriation Act (the Act) in 1945, they designed a regulatory system that would address both surface water and groundwater.[249] The Act, while recognizing vested rights for uses that existed when the law was enacted, established a permit system for acquiring a water right from that point on.[250] To determine which water right has the better priority in times of shortage, "first in time, first in right" determines the priority for which water rights have the better claim to use water.[251] The Act dedicated the use of the waters of the state to the people of the state, subject to control and regulation by the state.[252] Accordingly, under the Act, a water right does not bestow absolute ownership of the water,[253] but the right to use water (the details of which are spelled out in each permit).[254] The Act granted the Chief Engineer of the Division of Water Resources of the Kansas Department of Agriculture (DWR) broad discretion to

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[244] KAN. STAT. ANN. § 82a-1041 (West 2015).
[245] KAN. STAT. ANN. § 82a-745 (West 2017).
[246] DOUGLAS G. GOODWIN ET AL., CLIMATE AND WEATHER ATLAS OF KANSAS 4 (1995), https://www.k-state.edu/ksclimate/documents/kgsed.pdf [https://perma.cc/Y4AP-GXC5].
[247] *Id.*
[248] M. A. Sophocleus & B. B. Wilson, *Surface Water in Kansas and its Interactions with Groundwater*, KAN. GEOLOGICAL SURV. (Nov. 21, 2000), http://www.kgs.ku.edu/HighPlains/atlas/atswqn.htm [https://perma.cc/4R78-5ATM].
[249] KAN. STAT. ANN. § 82a-701 (West 2009).
[250] KAN. STAT. ANN. §§ 82a-701, -703, -704a, -705 (West 2009).
[251] Hawley v. Kan. Dep't of Agric., 132 P.3d 870, 879 (Kan. 2006) (citing J. Peck & Constance C. Owen, *Loss of Kansas Water Rights for Non-Use*, 43 KAN. L. REV. 801 (1995)).
[252] *Hawley*, 132 P.3d at 880; KAN. STAT. ANN. § 82a-702 (West 1945).
[253] KAN. STAT. ANN. § 82a-707(a) (West 2009).
[254] *Id.*; KAN. STAT. ANN. § 82a-701(g) (West 2009).

administer the Act in managing and regulating the use of water.[255] In 1957, the legislature amended the Act to state expressly that "a water right is a real property right, appurtenant to and severable from the land on or in connection with which the water is used."[256]

The Act mandated that permits to appropriate water be granted if they neither impaired an existing water right nor prejudicially and unreasonably affected the public interest.[257] In a perfect world, these two overarching principles would seemingly have secured a sustainable water supply into perpetuity. However, with the onset of technology that allowed for large-scale, center-pivot irrigation systems, the demand for permits to use groundwater in western Kansas skyrocketed. Using the scientific knowledge and data resources available at the time, DWR approved record numbers of applications for groundwater use in the West, mostly for irrigation.[258] By the early 1970s, with improved hydrologic technology and data collection and analysis, it became clear and more widely known that groundwater sources were being depleted faster than they could recharge.[259] DWR faced a dilemma. If the use of groundwater continued as authorized, water availability in those areas would inevitably end. But, the Act declared water rights to be real property rights,[260] which could be voluntarily conveyed by deed or will or involuntarily lost[261] through non-use or condemnation. The Act, however, did not authorize DWR to initiate termination or reduction proceedings against existing water rights for preservation of water for the future or for the reason that an area was now known to be over-appropriated.

Virtually all the south-central and western parts of Kansas rely on groundwater primarily supplied by the massive High Plains aquifer that extends from Texas to the South Dakota border.[262] Western Kansas relies mostly on the part of the High Plains aquifer known as the Ogallala aquifer. Groundwater reserves began to decrease in the 1950s and 1960s, and according to the Kansas Geological Survey, the availability of groundwater in the western Kansas Ogallala aquifer has today decreased since pre-development by at least thirty percent and, in significantly large areas within that region, by

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[255] KAN. STAT. ANN. § 82a-706 (West 2004).
[256] KAN. STAT. ANN. § 82a-701(g) (West 2009).
[257] KAN. STAT. ANN. § 82a-711(a) (West 1999).
[258] Peck, *Groundwater Management in Kansas*, *supra* note 14, at 442 ("From only 334 permit applications from 1945 to 1950, the number grew to 5,730 applications applied for in the decade of the 1950s, and to 6,433 applications in the 1960s.").
[259] OFFICE OF THE LIEUTENANT GOVERNOR OF KAN., INTERIM REPORT OF THE GOVERNOR'S TASK FORCE ON WATER RESOURCES 45 (1977).
[260] KAN. STAT. ANN. § 82a-701(g) (West 2009).
[261] KAN. STAT. ANN. § 82a-718(a) (West 2012) (determining a water right is lost for non-use over 5 years); *see also* Hawley v. Kan. Dep't of Agric., 132 P.3d 870, 885 (Kan. 2006) (holding intent is not a consideration in determining whether DWR may terminate the right for non-use); John Peck & Constance C. Owen, *Loss of Water Rights for Non-Use*, 43 KAN. L. REV. 801, 820–28 (1995).
[262] REX C. BUCHANAN ET AL., THE HIGH PLAINS AQUIFER 1 (2015), http://www.kgs.ku.edu/Publications/pic18/PIC18R2.pdf [https://perma.cc/HU9Y-M63P].

over sixty percent.[263]

To address the depletion of the Ogallala aquifer, the Kansas Legislature and DWR have employed a number of strategies. In 1972, the legislature passed the Groundwater Management District Act, which enables the creation of GMDs, run by locally-elected boards, to help manage and conserve the aquifer in their respective areas, generally subject to approval of the Chief Engineer.[264] Five GMDs were created in the 1970s. In 1978, the legislature added provisions allowing for the designation of intensive groundwater use control areas (IGUCAs) within GMDs.[265] Under these provisions, the Chief Engineer, either on his or her own initiative,[266] or by request from a GMD board (or by petition from water users in the GMD), is empowered to impose corrective control provisions in areas found to be suffering excessive groundwater level decline.[267] The process of ordering the establishment of an IGUCA by the Chief Engineer requires public hearings, but the ultimate terms are for the Chief Engineer to determine.[268] To date, the Chief Engineer has designated eight IGUCAs; although each is tailored to its own locale, all involve some measure of restriction on the exercise of existing water rights.[269]

The most important and significant IGUCA created was for the Cheyenne Bottoms Wildlife Area in 1992—the Walnut Creek IGUCA.[270] Upstream wells in the Walnut Creek alluvium were diminishing streamflows in Walnut Creek. The Chief Engineer's order generally protected vested rights in the basin.[271] But the order did not follow strict prior appropriation rules when it forced major pumping reductions on hundreds of groundwater users with appropriation rights, mostly irrigators, to protect the state's water right obtained in 1951 to supplement the water in the Cheyenne Bottoms Wildlife Area near Great Bend, Kansas.[272] Instead the order did a kind of mass pumping reduction by creating two large classes of water appropriation rights (with priority dates prior to and after October 1, 1965) and ordering much greater

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[263] *Kansas High Plains Aquifer Within Kansas*, KAN. GEOLOGICAL SURV., http://www.kgs.ku.edu/HighPlains/HPA_Atlas/Aquifer%20Basics/index.html [https://perma.cc/R4JN-VP6B].
[264] KAN. STAT. ANN. § 82a-1020 (West 1972).
[265] KAN. STAT. ANN. §§ 82a-1036–38 (West 2019).
[266] Kan. Att'y Gen. Op. No. 2002-24 (May 9, 2002).
[267] KAN. STAT. ANN. § 82a-1036 (West 1972).
[268] KAN. STAT. ANN. §§ 82a-1036–38 (West 2019).
[269] *Intensive Groundwater Use Control Areas (IGUCA)*, KAN. DEP'T OF AGRIC., https://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/intensive-groundwater-use-control-areas [https://perma.cc/NDP9-YWWK].
[270] *See* John C. Peck, *Property Rights in Groundwater–Some Lessons from the Kansas Experience*, 12 KAN. J.L. & PUB. POL'Y 493, 499–500, 504–05 (2003); *Walnut Creek IGUCA*, KAN. DEP'T OF AGRIC., https://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/intensive-groundwater-use-control-areas/walnut-creek-iguca [https://perma.cc/NTY6-HRME].
[271] *See generally* DIV. OF WATER RES., KAN. STATE BD. OF AGRIC., IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES, KANSAS (1992).
[272] *Id.*

pump reductions on rights created after the 1965 date.[273] However, each of these water right holders in the more junior group were cut in the same percentage, not according to strict priority. The affected irrigators filed an appeal in district court, in which they claimed an unconstitutional taking of property without compensation, but they settled the case before a district court heard the case.[274]

No water user wants water use to be cut involuntarily, and not surprisingly, water users following the 1992 IGUCA have not welcomed the designation of IGUCAs and the corresponding reduction in their use of water, reductions over which they have no control. Indeed, the fear of an IGUCA being imposed on them is what spurred local water users in several areas of Kansas to seek alternative approaches to reducing aquifer withdrawals.[275] One was the Rattlesnake Creek Basin/Quivira Partnership Agreement in 1994.[276] More recently has been the creation of LEMAs and WCAs.

C. *Local Leadership, Cooperation, and Trust: LEMAs*[277]

1. Initial Stages of Development

The problem of declining aquifer levels and recharging in certain areas of northwest Kansas became acute enough by 2008 for DWR and the Northwest Kansas Groundwater Management District No. 4 (GMD4) to explore options for action.[278] The most effective legal tool available to DWR was the IGUCA option, but staffs from both DWR and the GMD hoped to find a way to create consensus among the local water users, rather than the top-down imposition of restrictions under an IGUCA.[279]

DWR, led by Chief Engineer David Barfield, was interested in creating a flexible multi-year allocation scheme as part of a solution.[280] Every water right contains a limitation on the maximum amount of water that can be lawfully diverted each calendar year.[281] Some flexibility was already possible under legislation enacted in 2001, permitting "multi-year flex accounts."[282] This

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[273] *Id.*
[274] Peck, *Groundwater Management in Kansas*, *supra* note 14, at 452–53.
[275] Interviews by Constance Owen with staff members of DWR and GMD4.
[276] Peck, *Groundwater Management in Kansas*, *supra* note 14, at 452–53.
[277] The authors appreciate and acknowledge the generous contributions of information from Wayne Bossert, former District Manager of Northwest Kansas GMD4 (retired); Ray Luhman, former District Manager of Northwest Kansas GMD4 (retired); Scott Ross, former Water Commissioner of the DWR Stockton Field Office (retired); Burke Griggs, Professor, Washburn (Topeka) Law School and former Senior Legal Counsel for DWR; Shannon Kenyon, District Manager of Northwest Kansas GMD4 and former Environmental Technician for the DWR Stockton Field Office. These people have reviewed this section and suggested valuable comments and changes.
[278] Interviews by Constance Owen with staff members of DWR and GMD4.
[279] *Id.*
[280] *Id.*
[281] KAN. STAT. ANN. § 82a-701(d), (f) (West 2009).
[282] KAN. STAT. ANN. § 82a-736 (West 2018).

statute, for example, simply stated that a water right holder could be allowed to carry-over a portion of the authorized quantity that went unused in one year to the following year, but would be limited to a maximum amount over a five-year period.[283] This kind of plan could encourage efficient use, especially if tied to conservation measures and the water right is protected from the risk of being declared abandoned for non-use.[284] However, prior to 2001, DWR could not require or allow water users to employ a flexible scheme, or any other corrective controls, without doing so under the aegis of an IGUCA.

Meanwhile, GMD4 Executive Director Wayne Bossert sought ways to bring his local water users into the process, to get them engaged in solving their water availability problems. Bossert and his staff, including longtime expert Ray Luhman, knew the public needed to be motivated to take action.[285] Water users would need compelling reasons to reduce their own water use on a more voluntary basis. Simultaneous developments provided those reasons. One involved a request that had been submitted to DWR seeking administration of water.[286] Under the Act, when a senior water right is not receiving its full quantity of water due to use by a junior water right, the senior may file a complaint with DWR.[287] DWR will then investigate, and, if the junior right is found to be impairing the senior right, DWR can lawfully curtail the junior's use.[288] The pending request involved water right holders in GMD4 where the water supply had been over-appropriated (more permits had been granted than the system could sustain).[289] If the matter had proceeded to completion, a significant number of water rights would have to have been shut off. The juniors were spared this draconian result, however, because the complaint was withdrawn.[290] Nevertheless, this incident made two things strikingly clear to local water users: the fact of over-appropriation and the considerable independent power of DWR.

Bossert and his staff provided the other development that motivated water users to get involved: they initiated focused studies to gather geographically specific and accurate data regarding water use and availability in targeted areas of GMD4 to share with their board of directors and the public. GMD4 is governed by a board of directors, elected by water users within the district boundaries. GMD4 identified "High Priority Areas," (HPAs) where increasing aquifer depletion and decreasing aquifer recharge were of greatest concern and gathered large amounts of data about them.[291] One HPA was labeled Sheridan

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[283] 2001 Kan. Sess. Laws Ch. 160 (previously referred to as S.B. 237).
[284] KAN. STAT. ANN. § 82a-718 (West 2019) (describing a similar scheme seen in KAN. STAT. ANN. § 82a-736's authority for establishing "multi-year flex accounts").
[285] Interviews by Constance Owen with staff members of DWR and GMD4.
[286] *Id.*
[287] KAN. STAT. ANN. § 82a-706a (West 1977); KAN. ADMIN. REGS. § 5-4-1 (2010).
[288] KAN. STAT. ANN. § 82a-706a (West 1977); KAN. ADMIN. REGS. § 5-4-1 (2010).
[289] Interviews by Constance Owen with staff members of DWR and GMD4.
[290] *Id.*
[291] *Enhanced Mgmt.*, GROUNDWATER MGMT. DIST. 4, http://www.gmd4.org/EnhanceMgt.html [https://perma.cc/MWW4-D7XB].

6, for Sheridan County in which most of it was located, with a portion in Thomas County as well.[292] The data, compiled from GMD4, the Kansas Geological Survey, and the Kansas Water Office, was shared with the board and local water users in public GMD4 board meetings.[293]

The fact that this study was taking place and that GMD4 was taking it seriously sent a clear message to the local water users—they had a problem severe enough for the state to get involved. They faced the real threat of an IGUCA being declared in their area and their water rights being cut back, perhaps significantly. Bossert encouraged them to avoid this possibility by getting engaged and crafting a local solution.[294] The summary that the GMD4 provided at the public information meeting held on November 10, 2008, reflects this dynamic.[295] A member of the public asked, "What happens if the State independently addresses the problem?" The response: "No way to predict when or how the State might address the problem *in the absence of local efforts*."[296]

Local water right holders got the message. The GMD4 website contains the minutes from a series of thirteen public meetings that took place over the next three and a half years to seek a solution to the depletion problem.[297] The GMD4 provided data to the group of local users and urged them to propose reductions they themselves would implement.[298] GMD4 ran the locals' proposals through computer models, particularly models developed for use in litigation between Kansas and Nebraska over the Republican River Compact, to inform the locals of what impact their proposals would have on saturated thickness levels and recharge rates.[299] In April 2011, after a series of back-and-forth trials over two and half years, the locals and the GMD4 identified a proposal on which they agreed.[300] Important to this endeavor was the amount of time, effort, and patience invested by the GMD4 staff to communicate clearly to, and collaborate with, the local water users. The key to this endeavor was the creation of a partnership of trust.

The achievement of a cooperative locally-driven proposal notwithstanding, a number of significant obstacles remained. The most daunting was the lack of a mechanism for making the proposal legally binding. The local users did not want the Chief Engineer to declare an IGUCA, even if they received assurances from the Chief Engineer that their proposal would be

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[292] *Meeting of Sheridan HPA SD-6*, GROUNDWATER MGMT. DIST. 4 (Nov. 10, 2008), http://www.gmd4.org/SD6/SD6-Comments-01.pdf [https://perma.cc/4VBP-5GHP].
[293] *Sheridan County (SD-6)*, GROUNDWATER MGMT. DIST. 4 [hereinafter GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*], http://www.gmd4.org/SD6.html [https://perma.cc/6NFKB3KN].
[294] *Id.*
[295] *Id.*
[296] *Id.* (emphasis added).
[297] GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.
[298] *Id.*; Interviews by Constance Owen with staff members of DWR and GMD4.
[299] Interviews by Constance Owen with staff members of DWR and GMD4.
[300] GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.

implemented.[301] IGUCA procedures call for public hearings, at which evidence and comments may be presented. It was possible that evidence might show up persuading the Chief Engineer to modify or disregard the local users' proposal.[302] They wanted a guarantee that their proposal would either be accepted or rejected, as is, without modification.[303] This guarantee was not possible under the IGUCA statute. This kind of guarantee required a brand new law.

At the June 1, 2011 GMD4 board meeting, the board of directors instructed staff to begin working on new legislative authority for implementing the new proposal.[304] This effort would require another level of cooperation. It would take a united front of affected agencies and entities to convince the legislature to pass a new law, especially one that would need to pass without significant amendment. For example, if the legislature removed the "accept or reject as is" component, the law would be of no use in advancing this proposal. DWR legal counsel and staff, with assistance from GMD4 legal counsel and staff, drafted the statutory language for the bill to be introduced; both entities agreed on its content.[305] Before the start of the January 2012 legislative session, legislators were contacted and informed about the situation and the bill.[306]

Securing the legislature's cooperation would not be enough; the governor's office would also need to be brought on board. On July 21, 2011, the GMD4 board requested support for the proposed legislation from the governor's recently created Ogallala Aquifer Advisory Committee (OAAC).[307] Bossert presented the locally-created management concept at the OAAC's first meeting in August 2011; the OAAC agreed to support it.[308] At that meeting, a name emerged for the new concept, "Local Enhanced Management Area," or LEMA, for short.[309]

On January 19, 2012, the new LEMA bill, Senate Bill 310, was introduced in the legislature. The Kansas Legislature passed it without significant change, and the governor signed it into law on April 12, 2012.[310] The bill became law: section 82a-1041 of the Kansas Statutes Annotated. The key provisions of the law state that such a proposal must be locally-driven and within the boundaries of a GMD; the Chief Engineer may approve or reject it, but may not unilaterally modify it; and the Chief Engineer (DWR) is responsible for enforcing the terms of the proposal.[311] "In short, K.S.A. 82a-

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[301] Interviews by Constance Owen with staff members of DWR and GMD4.
[302] *Id.*
[303] *Id.*
[304] GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.
[305] Interviews by Constance Owen with staff members of DWR and GMD4.
[306] *Id.*
[307] GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.
[308] *Id.*
[309] *Id.*
[310] S.B. 310, 85th Leg., Reg. Sess. (Kan. 2012).
[311] KAN. STAT. ANN. § 82a-1041 (West 2015).

1041 combines local control over the particular details of a management plan to reduce groundwater use with the powers of the Chief Engineer to approve and enforce that plan."[312]

2. The New LEMA Law

The new LEMA statute, section 82a-1041 of the Kansas Statute Annotated, is largely procedural, but establishment of a LEMA has substantive effects. Other than requiring findings that corrective controls over groundwater use are needed, the LEMA law generally provides flexibility to address different specifics of any given proposal on a case-by-case basis. Fundamentally, the LEMA law applies only to water rights within a GMD, and a GMD board of directors must recommend a LEMA to initiate the process.[313] Some members of either an IGUCA or a LEMA may not wish to be subject to forced reduced pumping, but the LEMA statute, like the IGUCA, appears to allow a LEMA to be established over these objections and protests.

The LEMA law sets up a three-stage fact-finding and/or review process. When a GMD recommends a LEMA to the Chief Engineer, the Chief Engineer is required to review it to make sure it covers mandated topics, such as clear boundaries and an enforcement mechanism.[314] If the proposal contains the necessary provisions, the Chief Engineer conducts an initial public hearing to "resolve the following findings of fact": (1) whether one or more of the hydrologic circumstances necessitating an IGUCA exist; (2) whether the public interest requires adoption of any corrective control provisions; and (3) whether the proposed geographic boundaries are reasonable.[315] If all three issues of fact are found to exist, then the Chief Engineer holds a second public hearing at which evidence is taken, a record made, and the only subject matter is the LEMA, as originally proposed.[316] The Chief Engineer has only three options in response to the second hearing: approve the proposal, reject the proposal, or return the proposal to the GMD with an opportunity for revision within ninety days.[317] The law also indicates the kind of corrective control provisions the Chief Engineer may approve (in accordance with the proposal). It further allows the Chief Engineer to delegate enforcement authority to the specific GMD, upon written request by the GMD.[318] Finally, the LEMA law addresses effective dates, appeal procedures, and review timelines.[319]

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[312] KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6 LOCAL ENHANCED MANAGEMENT AREA WITHIN GROUNDWATER MANAGEMENT DISTRICT NO. 4 3 (2013) [hereinafter KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6], https://sftp.kda.ks.gov:4443/LEMAs/SD6/LEMA.SD6.OrderOfDesignation.20130417.pdf [https://perma.cc/MWT4T3LK].

[313] KAN. STAT. ANN. § 82a-1041(a) (West 2015).

[314] KAN. STAT. ANN. § 82a-1041(a)(1)–(6) (West 2015).

[315] KAN. STAT. ANN. § 82a-1041(b)(1)–(3) (West 2015).

[316] KAN. STAT. ANN. § 82a-1041(b)–(c) (West 2015).

[317] KAN. STAT. ANN. § 82a-1041(d)(1)–(3) (West 2015).

[318] KAN. STAT. ANN. § 82a-1041(f) (West 2015).

[319] KAN. STAT. ANN. § 82a-1041 (West 2015).

3. The Sheridan 6 LEMA

With the new law in place, GMD4 quickly began the process of submitting its proposal. On July 16, 2012, GMD4 submitted the final version of the proposed Sheridan 6 LEMA to the Chief Engineer.[320] The Chief Engineer began the statutory steps for evaluating the proposal, including a two-stage public hearing process, with hearings held in Hoxie, Kansas, on September 13, 2012 and November 28, 2012.[321] Upon completion of the hearings, the Chief Engineer issued the initial Order of Decision on December 31, 2012 and the final Order of Designation on April 17, 2013.[322] The new Sheridan 6 LEMA is small in size relative to the entire GMD4; it encompasses 101 sections lying in parts of six townships out of 155 townships in the entire GMD4 and involves 183 water rights covering 198 wells.[323] No appeals of the order were filed.

As the Chief Engineer summarized in his final Order of Designation Approving the Sheridan 6 LEMA,

> [g]roundwater levels in the area (of the proposed LEMA) are declining, in some cases precipitously; these levels have declined excessively; and the rate of withdrawal of groundwater there exceeds the rate of recharge. GMD4 and the stakeholders within the SD-6 HPA recognize that these declines are a long-term problem that requires a long-term solution.[324]

The key features of this sixty-page detailed LEMA order were as follows. Groundwater withdrawals would be reduced by twenty percent over the five-year period from January 1, 2013 to December 31, 2017;[325] irrigators would be restricted to a total of fifty-five inches of water over the stated five-year period (an average of eleven inches per year); and flexibility allowed for carry-over from year to year as long as the five-year diversion total did not exceed fifty-five inches.[326] Prior to the LEMA, the standard for annual diversions in this area had been eighteen inches per year,[327] meaning the reduction in use would be nearly thirty-nine percent. In support of the five-year fifty-five-inch allocation, the Chief Engineer stated,

> [t]he Proposal sets all irrigation water rights at a 55 inch allocation for five years, and several experienced irrigators within the Sheridan 6 LEMA gave oral testimony stating that this would be sufficient water for their needs, obviating the need for priority administration. . . . No one testified that 11 inches would be insufficient for their

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[320] *See* GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.
[321] *Id.*
[322] KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6, *supra* note 312, at 1.
[323] *Id.* at 47.
[324] *Id.* at 24.
[325] *Id.* at 25.
[326] *Id.*
[327] KAN. ADMIN. REGS. § 5-3-24 (2000).

> irrigation needs. Furthermore, the Proposal allows irrigators to move water around within their allocations, and to obtain water rights from others within the LEMA boundaries . . . And in the event that a senior water right is impaired as a result of direct well interference by a junior right, the GMD4 testimony makes clear that such a senior right will be entitled to request an impairment investigation by DWR.[328]

In addition, those guilty of violating the restrictions would face significantly higher penalties under the LEMA than they would under the Act. Under the Sheridan 6 LEMA, the penalty for diverting water in excess of one's allocation ranges from $1,000 per day of violation (exceeding one's allocation by less than four acre-feet) to a two-year suspension of the entire water right (exceeding one's allocation by more than four acre-feet).[329] Other penalties are described in the order.[330]

The Sheridan 6 LEMA limited its duration to a five-year period (2013 to 2017) with no provision for renewal.[331] The Order of Designation comments on the apparent ineffectiveness of a short-term approach to a long-term problem,

> K.S.A. 82a-1041(d) does not require a local enhanced management plan to establish a permanent reduction in groundwater use; it merely requires the plan to address the problem of declines. Nonetheless, unless this LEMA is renewed for a longer period, then the work and cooperation of GMD4, [Kansas Geological Survey] and DWR will be largely wasted, and remembered as little more than a gesture.[332]

But, the Sheridan 6 LEMA was renewed in November 2017, to run an additional five years through 2022,[333] at which time renewal may be addressed again.

a. *Has the Sheridan 6 LEMA worked?*

If pumped to the full extent of the water rights within the Sheridan 6 LEMA, 56,481 acre-feet annually could be diverted, or 282,405 acre-feet over a five-year period. During the pre-LEMA period 2008-2012, annual pumping averaged 27,800 acre-feet, for a total of 139,000 acre-feet over the period. The goal of the Sheridan 6 LEMA was to reduce the total groundwater withdrawals

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[328] KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6, *supra* note 312, at 18 (citations to record omitted).
[329] *Id.* at 37–38.
[330] *Id.*
[331] GROUNDWATER MGMT. DIST. 4, *Sheridan County (SD-6)*, *supra* note 293.
[332] KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6, *supra* note 312, at 24.
[333] *See generally* KAN. DEP'T OF AGRIC., ORDER OF DESIGNATION REGARDING THE SHERIDAN 6 LOCAL ENHANCED MANAGEMENT PLAN FOR 2018-2022, https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/sheridan6_lema_order_of_designation_20171107.pdf?sfvrsn=393583c1_4 [https://perma.cc/NYR7-JAPA].

in the designated area from 139,000 acre-feet to no more than 114,000 acre-feet over the five-year period. This would equate to an average annual reduction in water diversions from the 56,481 acre-feet represented on paper, and from 27,800 acre-feet pumped annually, to no more than 22,800 acre-feet annually. The usage records for the first five years of the LEMA (2013 through 2017) are available, revealing an average yearly use of 18,435 acre-feet, compared to the LEMA goal of 22,800 acre-feet, to the average annual amount of 27,800 acre-feet, and to the permitted amount of 56,481 acre-feet. Thus, the reduction in groundwater use within the LEMA boundaries exceeded the goal: less water was used than the target amounts.[334]

Another encouraging aspect of this LEMA was its apparent economic impact. According to a Kansas State University study, "producer-supplied data suggests that producers within the LEMA boundary have been able to reduce groundwater use with minimal impact on cash flow."[335] This study indicates that producers are able to implement strategies to maintain returns and apply less groundwater, but the report notes that "additional research on the risk associated with reduced groundwater use is needed."[336]

Not surprisingly, the local water users and GMD4 are actively working with DWR to continue this successful strategy. In early 2017, at the request of producers in the Sheridan 6 LEMA, GMD4 applied for renewal of the LEMA. In November 2017, DWR approved renewal.[337] The total use for the first year of the new period was 16,909 acre-feet.

b. *Reflections on the Sheridan 6 LEMA Story*

When one considers the potential for distrust or disagreement on the part of numerous governmental entities, various legislators, the governor, members of the local GMD board, and the local water users themselves, one would have predicted that a new law and this LEMA would have stood a slim chance of ever happening. Thus, the most important aspect of the Sheridan 6 LEMA story is cooperation. The explanation in this article describes what may appear to be an almost linear succession of events, in which one step enabled the next and so on.

One might describe the process as more akin to a three-ring circus in which most performers continually leapt from ring to ring and back again. The seemingly distinct steps often overlapped and blended, made unavoidable by simultaneously addressing regulatory, legal, hydrological, legislative and political concerns. This maelstrom of cooperation was made possible by

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[334] The data in this paragraph were obtained through interviews by Constance Owen with staff members of DWR and GMD4.

[335] BILL GOLDEN, MONITORING THE IMPACTS OF SHERIDAN COUNTY 6 LOCAL ENHANCED MANAGEMENT AREA: FINAL REPORT FOR 2013-2017 7 (2018), http://agmanager.info/ag-policy/water-policy/monitoring-impacts-sheridan-county-6-local-enhanced-management-area [https://perma.cc/8UD2-7Z32].

[336] *Id.*

[337] KAN. DEP'T OF AGRIC., ORDER APPROVING THE SHERIDAN 6, *supra* note 312.

numerous hours of effort expended, and often shared, by GMD staff[338] in Colby, GMD legal counsel in Goodland, DWR staff and attorneys in Topeka, staff in the DWR Stockton field office, Kansas Geological Survey staff in Lawrence, and Kansas Water Office staff in Topeka, not to mention the essential efforts of Bossert, Barfield, and the dedicated local water users who volunteered their time to find a workable solution.

4. Subsequent LEMA Proposals

The Sheridan 6 LEMA success has apparently inspired additional efforts toward more voluntary reductions of water use through the LEMA process, with varying degrees of success so far. In 2014, Western Kansas Groundwater Management District No. 1 (GMD1) explored the possibility of creating a LEMA, but a lack of public support led the board of directors to drop the idea.[339] However, GMD1 revisited the LEMA idea in 2018, listing it on its website as a topic for discussion at its board meeting in April and July.[340] As of November 2019, the GMD1 website included a draft plan for a LEMA that would go into effect in 2021.[341]

The board of Southwest Kansas Groundwater Management District No. 3 (GMD3) has also been exploring a possible LEMA, as noted in the minutes from board meetings as recent as May 2018.[342] No official proposal has yet been submitted to the Chief Engineer.

In 2017, GMD4 proposed a more geographically ambitious LEMA than the Sheridan 6, one that would cover the entirety of GMD4, which encompasses ninety-five townships, and would be in effect from January 2018 through December 2022.[343] This LEMA process also differed from Sheridan 6

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[338] Special recognition is due to the true leadership demonstrated by former GMD4 District Manager Wayne Bossert. He relentlessly pursued a collaborative approach, while insisting on a meaningful result supported by extensive data. He trusted his community and earned their trust in return. The Chief Engineer lauded this approach in his final Order of Designation for the Sheridan 6 LEMA, "The process by which GMD4 has produced the Proposal, and the purpose with which it has pursued this LEMA, deserve praise. As Mr. Bossert stated, '[i]n the end, the consensus was that consensus was the preferred approach.'" KAN. DEP'T OF AGRIC., FINDINGS AND ORDER ESTABLISHING THE INITIAL REQUIREMENTS FOR THE DESIGNATION OF A LOCAL ENHANCED MANAGEMENT AREA 10 https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/sd6_lema_orderexhibits_20170531.pdf [https://perma.cc/WNQ6-TGUN].

[339] GROUNDWATER MGMT. DIST. 1, DRAFT OF WICHITA COUNTY LEMA PROPOSAL, http://www.gmd1.org/documents/Draft-Wichita-County-Lema-Proposal.pdf [https://perma.cc/HGD9-257H].

[340] *LEMA Information*, GROUNDWATER MGMT. DIST. 1, http://www.gmd1.org/lema.html [https://perma.cc/LP8V-MMJZ].

[341] *Id.*

[342] GROUNDWATER MGMT. DIST. 3, MINUTES OF THE REGULAR MEETING OF THE BOARD OF DIRECTORS (2018), http://www.gmd3.org/wp-content/uploads/2018/06/Minutes-5-18.pdf [https://perma.cc/B9TQ-EF8N].

[343] *GMD4 District Wide LEMA*, KAN. DEP'T OF AGRIC., http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/gmd4-district-wide-lema [https://perma.cc/DXB3-29WC] [hereinafter KAN. DEP'T OF AGRIC., *GMD4 District Wide LEMA*].

in the level of public opposition. The initial hearing for the GMD4 District-Wide LEMA took place in August 2017; an order of first-stage approval was issued on September 23, 2017.[344] Shortly thereafter, intervenors entered the matter and filed a number of challenges to the proceedings, which were rejected.[345] The second hearing was held on December 11, 2017.[346] After modifications by the GMD4 board, the LEMA Order of Designation was ultimately issued on April 13, 2018.[347] The intervenors requested administrative review of the order, which the Secretary of Agriculture denied.[348] They then filed for judicial review in the District Court of Gove County, Kansas, making essentially the same arguments as they had in the other challenges. On October 15, 2019, the district court upheld the new LEMA.[349] On November 12, 2019, the intervenors filed a Motion to Alter or Amend and to Amend and Make Additional Findings.[350] In doing so, they sought relief by requesting that the court set aside the order establishing the LEMA.[351] The memorandum in support of the motion stated that the intervenors couldn't speak for other water users in the LEMA, and thus requested that the LEMA Plan to be set aside only "as applied to their lands."[352] In short, they argued that the Chief Engineer and the court had failed to apply the prior appropriation doctrine and to preserve Kansas water use doctrine, as required by Kansas statutes.[353] The matter remains pending at this time.

One other LEMA proposal has been submitted to the Chief Engineer. With a cover letter dated February 22, 2019, Big Bend Groundwater Management District No. 5 (GMD5) requested a Quivira National Wildlife

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[344] *Id.*

[345] KAN. DEP'T OF AGRIC., DECISION TO DENY INTERVENORS' MOTION FOR RECONSIDERATION (2017), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/gmd4lema_decision_re_motion_for_reconsideration_signed.pdf?sfvrsn=172583c1_0 [https://perma.cc/BS6M-9XTX].

[346] KAN. DEP'T OF AGRIC., *GMD4 District Wide LEMA*, *supra* note 343.

[347] KAN. DEP'T OF AGRIC., ORDER OF DESIGNATION REGARDING THE GROUNDWATER MANAGEMENT DISTRICT NO. 4 DISTRICT-WIDE LOCAL ENHANCED MANAGEMENT PLAN (2018), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/gmd4_lema_orderofdesignation.pdf?sfvrsn=30e981c1_4 [https://perma.cc/V48J-VMSH].

[348] KAN. DEP'T OF AGRIC., ORDER DECLINING PETITION FOR ADMINISTRATIVE REVIEW (2018), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/orderdecliningpetitionforadministrativereview_20180518.pdf?sfvrsn=906386c1_0 [https://perma.cc/2G87-JLLN].

[349] Friesen et al. v. Barfield, No. 2018-CV-000010 (Dist. Ct. of Gove Co. Kan. Oct. 15, 2019).

[350] Plaintiffs' Motion to Alter or Amend and to Amend and Make Additional Findings, Friesen et al. v. Barfield, No. 2018-CV-000010 (Dist. Ct. of Gove Co. Kan. Nov. 12, 2019). This information will appear on the following website: https://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/gmd4-district-wide-lema.

[351] *Id.*

[352] Memorandum in Support of Plantiffs' Motion to Alter or Amend and to Amend and Make Additional Findings, Friesen et al. v. Barfield, No. 2018-CV-000010 (Dist. Ct. of Gove Co. Kan. Nov. 12, 2019).

[353] *Id.* at 4-5, 19.

Refuge/Rattlesnake Creek LEMA.[354] This proposal was in part due to a request by the U.S. Fish and Wildlife Service for administration of its large surface water right out of the Rattlesnake Creek to supply the Quivira National Wildlife Refuge.[355] The Chief Engineer reviewed the proposal, and related modifications by the GMD5 in the spring of 2019. On July 30, 2019, the Chief Engineer wrote to the GMD5, rejecting the proposal and stating that, absent an acceptable LEMA proposal, he must carry out his statutory duty "to directly administer" the basin by administrative order.[356] On August 14, 2019, GMD5 filed a petition for review and for stay with the Secretary of Agriculture.[357] A diverse coalition of interested entities followed with a letter dated August 27, 2019, asking the chief engineer to reconsider his rejection of the LEMA.[358] On September 3, 2019, the Secretary of Agriculture denied the request for stay but granted the petition for review.[359] On October 25, 2019, the U.S. Fish and Wildlife Service announced that it would not make a request for water during FY 2020, but instead would work with local agencies to find "voluntary, collaborative, non-regulatory solutions to address the water needs of the community."[360] The matter remains pending at the time of this writing.

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[354] *Quivira NWR LEMA*, BIG BEND GROUND WATER MANAGEMENT DISTRICT 5, https://gmd5.org/proposed-rsc-lema [https://perma.cc/RH8R-B7U4]; *GMD 5 Rattlesnake/Quivira LEMA*, KAN. DEP'T OF AGRIC., http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/gmd5-rattlesnake-quivira-lema [https://perma.cc/8KKN-KQKV].

[355] *Quivira National Wildlife Refuge Impairment Complaint*, KAN. DEP'T OF AGRIC. [hereinafter KAN. DEP'T OF AGRIC., *Quivira National Wildlife Refuge Impairment Complaint*], https://agriculture.ks.gov/divisions-programs/dwr/water-appropriation/impairmentcomplaints/quivira-national-wildlife-refuge [https://perma.cc/T4AB-HTSD] .

[356] KAN. DEP'T OF AGRIC., REQUEST TO INITIATE LOCAL ENHANCEMENT MANAGEMENT AREA PROCEEDINGS (2019), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/2019-07-30formalresponsetofeb2019lema_request.pdf?sfvrsn=e5d688c1_0 [https://perma.cc/MZ67-T3MS].

[357] *GMD 5 Rattlesnake/Quivira LEMA*, KAN. DEP'T OF AGRIC., http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/gmd5-rattlesnake-quivira-lema [https://perma.cc/8KKN-KQKV].

[358] Letter from Matt Teagarden, CEO, Kansas Livestock Association, et al., to David Barfield, Chief Engineer, Kansas Department of Agriculture (Aug. 27, 2019).

[359] *See generally* KAN. DEP'T OF AGRIC., ORDER DENYING PETITION FOR STAY OF PROCEEDINGS AND GRANTING PETITION FOR ADMINISTRATIVE REVIEW SUBMITTED BY BIG BEND GROUNDWATER MANAGEMENT DISTRICT NO.5 AND NOTICE OF PREHEARING CONFERENCE (2019), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/20190830_19-water-16274---order-denying-petition-for-stay-and-granting-petition-for-review-and-notice-of-prehearing-conference.pdf?sfvrsn=ed4a89c1_0 [https://perma.cc/D55R-JPW7]; Letter from David W. Barfield, Chief Eng'r, Div. of Water Res., to Darrell Wood, President, Big Bend Groundwater Mgmt. Dist. No. 5 (July 30, 2019), https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/2019-07-30formalresponsetofeb2019lema_request.pdf?sfvrsn=e5d688c1_0 [https://perma.cc/MZ67-T3MS] (also requesting acknowledgement from DWR that the Audubon Society qualifies as a party under the Kansas Judicial Review Act and notification of all orders and decisions that are given to other parties to the proceeding).

[360] KAN. DEP'T OF AGRIC., *Quivira National Wildlife Refuge Impairment Complaint*, *supra* note 355.

D. ***Expanding on the LEMA Initiative: Water Conservation Areas (WCAs)***

The LEMA law, first employed by the Sheridan 6 LEMA, paved the way for another statutory scheme designed to slow depletion of the Ogallala aquifer in Kansas. In April 2015, the Kansas Legislature passed a bill to create WCAs.[361] WCAs share some fundamental aspects with LEMAs. As with LEMAs, the goal of WCAs is to reduce groundwater pumping.[362] WCAs also must be initiated by water users and contain certain types of provisions, such as corrective controls and enforcement mechanisms. DWR is charged with carrying out those enforcement actions.[363]

But WCAs also differ from LEMAs in several important aspects. Establishment involves a more streamlined adoption process. WCAs can be created either within or outside of GMDs.[364] If the terms of the WCA conflict with pre-existing rules, such as those imposed by a GMD or IGUCA, the Chief Engineer is authorized to modify the WCA to impose the stricter of the measures.[365] However, the most important distinction between the WCAs and LEMAs is the requirement that *all* members of a WCA agree to the plan and ensuing reductions in groundwater pumping. To initiate a WCA, water right owners submit a written plan, referred to as a consent agreement, directly to the Chief Engineer of DWR.[366] The statute empowering water right owners to establish WCAs contains no requirements for public hearings,[367] apparently because the plan reflects an agreement among water right holders. Ascribing motives to the water users who enter into these WCA voluntary agreements is difficult—they could range from fear of an IGUCA or a LEMA, the "writing is on the wall" syndrome, the need to preserve water for future generations,[368] maintenance of jobs and business opportunities in the future,[369] or pure altruism. Yet, as contracts law teaches us, in contract formation, motive is not to be confused with consent, and it is the outward expression of assent that governs, not secret intentions.[370]

To date, beginning in January 2016, fifty-three Water Conservation Area (WCA) consent decrees have been approved by DWR.[371] More than 86,000

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[361] KAN. STAT. ANN. § 82a-745 (West 2017).
[362] *Id.*
[363] KAN. STAT. ANN. § 82a-745(a) (West 2017); *Water Conservation Areas (WCAs)*, KAN. DEP'T OF AGRIC. [hereinafter KAN. DEP'T OF AGRIC., *Water Conservation Areas (WCAs)*], http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/wca [https://perma.cc/6RHE-UWXS].
[364] KAN. DEP'T OF AGRIC., *Water Conservation Areas (WCAs)*, *supra* note 363.
[365] KAN. STAT. ANN. § 82a-745(d) (West 2017).
[366] KAN. STAT. ANN. § 82a-745(a) (West 2017).
[367] KAN. STAT. ANN. § 82a-745 (West 2017).
[368] STEPHEN LAUER & MATTHEW R. SANDERSON, PRODUCER ATTITUDES TOWARD GROUND WATER CONSERVATION IN THE U.S. OGALLALA-HIGH PLAINS 3 (2019), https://ngwa.onlinelibrary.wiley.com/doi/abs/10.1111/gwat.12940 [https://perma.cc/S7QL-9GER].
[369] *Id.*
[370] First Nat'l Exch. Bank of Roanoke v. Roanoke Oil Co., 192 S.E. 764, 770 (Va. 1937); *see also* RESTATEMENT (SECOND) OF CONTRACTS § 81 (1981).
[371] KAN. DEP'T OF AGRIC., *Water Conservation Areas (WCAs)*, *supra* note 363.

acres have been approved under the WCA program, with water savings of approximately 12,000 acre-feet per year.[372] The WCA option seems to be more appealing to water users in that the agreement is totally voluntary. At least it avoids the imposition of restrictions deemed necessary by some governmental entity, whether a GMD or DWR. Granted, WCAs may not be voluntary in the purest sense, in that water users may not seek to restrict their own use absent the threat of governmental restrictions, but WCAs offer the most control over one's own destiny.

E. *Kansas Summary*

The two new Kansas strategies for extending the life of the Ogallala-High Plains aquifer represent innovative, collaborative, and apparently successful efforts in water management. The level of cooperation and leadership demonstrated in the creation of the Sheridan 6 LEMA set a precedent for what can be achieved when those in power and those affected by that power work together to solve a shared problem. The several WCAs that have been created show a desire of some groundwater users to band together for the common goal of reduced pumping. Still to be decided by an appellate court in Kansas, however, is the critical question of whether water users who wish not to participate can be forced to do so by the Chief Engineer in an IGUCA or by a GMD in a LEMA.

V. SUMMARY

This article began with a description of a spectrum of ways states have addressed the problem of groundwater depletion—from forced reductions without compensation, to financially-based incentive programs in which an entity pays groundwater users to give up their rights either temporarily or permanently, to the rare, totally voluntary reductions based purely on altruism. We have attempted to illustrate some novel attempts at solving the groundwater depletion problem with the employment of pump restrictions established with bottoms-up, community-based, voluntary programs instead of top-down, state regulatory, forced pump restrictions commonly used to date. These attempts at voluntarism could represent a trend. If so, other trends in water policy and law support these approaches: establishing water banks,[373] permitting more flexibility in seasonal and annual pumping, and encouraging water marketing programs, each of which add flexibility in the water right permitting systems. Programs based on financial incentives, like those of the federal government and the Texas VISPO program, will hopefully continue alongside these new community-based programs.

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[372] *Id.*; GROUNDWATER MGMT. DIST. 1, *supra* note 339.
[373] *See, e.g.*, The Kansas Water Banking Act, KAN. STAT. ANN § 82a-761 to -771 (West 2019).