UNCLOUDING ARIZONA'S WATER FUTURE

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ABSTRACT

A cloud hangs over the future of Arizona's water. The cloud has hung low and heavy for over forty years. The cloud is the ongoing adjudication of water rights in Arizona's courts, where the priority, amount, and use of virtually all non-Colorado River water in Arizona remain in dispute. Arizona's general stream adjudications cost the state, cities, towns, farms, mines, businesses, and citizens millions of dollars each year in legal costs. Those costs pale in comparison to the uncertainty that obscures Arizona's water future because the cases remain undecided. The last time such a cloud hung over Arizona's water future, the state enacted one of the most influential and innovative pieces of water law seen in world in last century—the Arizona Groundwater Management Act (GMA). Controversial legislation was recently proposed in the Arizona State Senate that would exempt certain communities from parts of the GMA, facilitating growth and increased groundwater withdrawals in these areas. This Article uses this recent controversy to explore the relationship between the GMA and the general stream adjudications, to explain why it is critical to invest in the efficient and equitable resolution of the adjudications, and propose reforms to Arizona's water law that have the promise of being Arizona's next great innovative contribution to water law and policy. These reforms include the creation of a state water escrow and regional water augmentation authorities to facilitate the resolution of Arizona's water rights disputes and disperse the cloud obscuring an otherwise bright water future.

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INTRODUCTION

The desert is the great incubator of human ingenuity.[1] The need for cooperation and adaptation to secure our most essential natural resource in a land of scarcity led to our earliest civilizations, which were effectively a combination of social, legal, political, and scientific innovations.[2] Arizona's past has been defined by its ability to innovatively respond to the greatest challenge inherent in any desert society—a cloudy future arising from water scarcity.[3] Arizona's history can be defined by four distinct eras in which the state dispersed clouds of water scarcity from obscuring its otherwise bright future through legal and technological innovation.

The first era of Arizona's water policy involved laying the foundation for water resource development. In its earliest days, before becoming a state, Arizona met the challenge of attracting an industrious citizenry to an inhospitable desert.[4] Arizona met that challenge by adopting prior appropriation as its water rights regime.[5] Additionally, Arizona, with the assistance of the U.S. Bureau of Reclamation, developed dams to improve drought resiliency.[6] How do you get smart, industrious people to run into the middle of the desert and invest in desert communities? You promise the fastest that they will win the most valuable resource in the desert—water. And that is exactly what prior appropriation does—promise superior priority to water rights to the first to put the water to beneficial use.[7] And how do you assure the winners that the water will be there? You have them pledge their

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1. *See generally* STEVEN SOLOMON, WATER: THE EPIC STRUGGLE FOR WEALTH, POWER, AND CIVILIZATION (2011) (providing an overview of the role water plays in human civilization).

2. *See, e.g.*, JEAN BOTTÉRO, MESOPOTAMIA: WRITING, REASONING, AND THE GODS (Zainab Bahrani & Marc Van De Mieroop trans., 1992) (discussing the role of the Tigris and Euphrates Rivers in the rise of early Mesopotamian civilizations); BARRY J. KEMP, ANCIENT EGYPT: ANATOMY OF A CIVILIZATION (2d ed. 2006) (discussing the role of the Nile River in the rise of the ancient Egyptian civilizations).

3. *See generally* DOUGLAS E. KUPEL, FUEL FOR GROWTH: WATER AND ARIZONA'S URBAN ENVIRONMENT (2003) (discussing the history and importance of water policy in fueling the growth and development of Arizona).

4. *Id.* at 54; *see also* Rhett Larson & Kelly Kennedy, *Bankrupt Rivers*, 49 U.C. DAVIS L. REV. 1335, 1344 (2016).

5. Mark A. McGinnis & R. Jeffrey Heilman, *Don't Be Left Out to Dry: Recognizing and Addressing Water Supply Issues in Arizona Real Estate Transactions*, 46 ARIZ. ST. L.J. 577, 579 (2014).

6. James M. Holway, *Urban Growth and Water Supply*, *in* ARIZONA WATER POLICY: MANAGEMENT INNOVATIONS IN AN URBANIZING, ARID REGION 157, 182 (Bonnie G. Colby & Katherine L. Jacobs eds., 2006).

7. Robin Kundis Craig, *A Comparative Guide to Western States' Public Trust Doctrines: Public Values, Private Rights, and the Evolution Toward an Ecological Public Trust*, 37 ECOLOGY L.Q. 53, 57 (2010).

land as collateral for the construction of large dams and related infrastructure to store and transport water.[8]

The second era of Arizona water policy involved the sharing of its most important water source—the Colorado River.[9] Arizona negotiated with its neighbors to support federal financing for the Central Arizona Project (CAP) to bring Arizona's Colorado River allocation into central Arizona in exchange for accepting junior priority on the river.[10] The CAP allowed Arizona to bring critical water supplies to its largest cities and the Colorado River Compact, Supreme Court decisions, federal legislation, and U.S. Department of the Interior guidelines resolved uncertainty around how states would share the river in times of shortage.[11]

The third era of Arizona water policy focused on perhaps the next most important water source in the state after the Colorado River—groundwater.[12] A legal dispute between Arizona's cities, mines, and farms led to an innovative legislation on groundwater management.[13] That innovation—the Arizona Groundwater Management Act—tied development to available water supply in Arizona's population centers, placed limits on groundwater pumping in those areas, and created incentives for the development and implementation of artificial groundwater recharge facilities.[14] Importantly, part of these incentives for groundwater recharge included taking Colorado River water from the CAP and using it to recharge central Arizona aquifers.[15]

The fourth and current era of Arizona water policy involves the attempted resolution of water rights disputes in the state. This includes the

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8. *See, e.g.*, KATHLEEN GARCIA, IMAGES OF AMERICA: ROOSEVELT DAM 7–9 (2009); *see also* Mark A. McGinnis, *Creating a "New" Class of Water—Regulation of Municipal Effluent,* Arizona Public Service Co. v. Long, *160 Ariz. 429, 773 P.2d 988 (1989)*, 22 ARIZ. ST. L.J. 987, 990 (1990).

9. For an overview of interstate water law governing the Colorado River, see David H. Getches, *Colorado River Governance: Sharing Federal Authority as an Incentive to Create a New Institution*, 68 U. COLO. L. REV. 573, 573 (1997).

10. Rhett Larson, *Augmented Water Law*, 48 TEX. TECH. L. REV. 757, 761 (2016); Charles J. Meyers, *The Colorado River*, 19 STAN. L. REV. 1, 73–75 (1966).

11. Rhett B. Larson, *Interstitial Federalism*, 62 UCLA L. REV. 908, 923–26 (2015).

12. For an overview of the importance of groundwater to Arizona's water supply portfolio and the impact of Arizona legal reforms on groundwater management, see generally Chris Avery et al., *Good Intentions, Unintended Consequences: The Central Arizona Groundwater Replenishment District*, 49 ARIZ. L. REV. 339 (2007).

13. For an overview of the history and details of the enactment of the Arizona Groundwater Management Act, see generally Jon L. Kyl, *The 1980 Arizona Groundwater Management Act: From Inception to Current Constitutional Challenge*, 53 U. COLO. L. REV. 471 (1982).

14. Sharon Megdal et al., *The Forgotten Sector: Arizona Water Law and the Environment*, 1 ARIZ. J. ENVTL. L. & POL'Y 243, 279–81 (2011).

15. Avery et al., *supra* note 12, at 347–48.

quantification or settlement of tribal water rights, as well as the resolution of decades-long disputes over the priorities and quantities of Arizona's surface water rights.[16] Much of the work involved in resolving these disputes is conducted within the framework of Arizona's two general stream adjudications (GSAs).[17] Arizona's GSAs are intended to resolve all surface water rights to the Little Colorado River and the Gila River, which comprise tens of thousands of parties, including Native American tribes, large cities, small towns, mines, farms, utilities, and federal land management agencies.[18] The two GSAs have been languishing for decades, resulting in legal uncertainty that prevent effective water planning and efficient water markets needed to adapt to climate change, protect environmental flows, and facilitate sustainable growth.[19]

Just as with past eras of Arizona's water policy development, this current era must be met with both legal and technical innovations. Unlike past eras, this era's challenges integrate virtually every aspect of Arizona water law and management, including prior appropriation rights, Colorado River rights, and groundwater rights. The scope and depth of this challenge is illustrated most effectively by the recent, and in many ways ongoing, controversy revolving around the town of Sierra Vista and the availability of water for some of its proposed developments.[20] This controversy within the San Pedro River, a tributary to the Gila River, implicates groundwater management, the effective and efficient resolution of Gila River GSA, the rights of federal and tribal parties, and the role of the Colorado River in providing groundwater recharge and alternative water supplies to communities.[21] This Article examines the looming clouds over Arizona's water policy through the example of the Sierra Vista controversy, and proposes three innovations to disperse these clouds.

This Article proceeds in three parts. Part I provides necessary background on Arizona's surface water laws, its GSAs, and the Arizona Groundwater Management Act. Part II describes the Sierra Vista controversy, the

16. Larson & Kennedy, *supra* note 4, at 1348–55.

17. *Id.*

18. *Id.*

19. *Id.*

20. Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 2 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/law-suit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

21. *Id.*; *see also* Caitlin McGlade, *Fate of Arizona's Only Free-Flowing River Now in Judges' Hands*, ARIZ. REPUBLIC (Apr. 29, 2016), http://www.azcentral.com/story/news/local/arizona-water/2016/04/29/fate-of-san-pedro-river-judges-hands/83628430/.

surrounding litigation and resultant proposed legislation, and the reason why this controversy represents deep, long-term issues for Arizona's water policy that must be addressed through innovation. Part III proposes three reforms to Arizona's water law. First, Arizona should create a state water escrow to encourage water conservation and facilitate water transfers, as a means of ameliorating water disputes. Second, Arizona should establish regional water mitigation authorities as a mechanism to resolve the GSAs. Third, Arizona should establish specialized water courts to expedite resolution of litigation involving Arizona's water rights. These three reforms will help disperse the clouds hanging over Arizona's water future, illustrated by the Sierra Vista controversy, and thereby illuminate Arizona's bright water future.

I. ARIZONA'S GROUNDWATER LAW AND GENERAL STREAM ADJUDICATIONS

Population growth and climate change place increasing stress on Arizona's water management institutions and laws, with attendant implications for Arizona's environmental integrity, public health, and economic vitality.[22] Currently, groundwater provides around 43% of Arizona's total water supply in its largest population centers, the Colorado River provides around 32%, other surface water bodies provide around 21%, and wastewater effluent provides around 4% of Arizona's relatively diverse and resilient water portfolio.[23] Agriculture consumes around 70% of that water, municipal uses around 22%, and industrial uses around 8% of water supplies in Arizona's main population centers.[24] Some legal and historical background is necessary to fully grasp the interrelated nature of groundwater management, surface water rights and adjudications, and Colorado River allocations. This Part lays the requisite foundation in Arizona water law to fully describe the interconnectedness of Arizona's groundwater management and surface water rights adjudications.

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22. *See* Janet C. Neuman, *Drought Proofing Water Law*, 7 U. DENV. WATER L. REV. 92, 96 (2003); *see also* Robert W. Adler, *Climate Change and the Hegemony of State Water Law*, 29 STAN. ENVTL. L.J. 1, 43 (2010).

23. *Active Management Area Water Supply—Central Arizona Project Water*, ARIZ. DEP'T OF WATER RES., http://www.azwater.gov/AzDWR/StatewidePlanning/WaterAtlas/ActiveManagementAreas/PlanningAreaOverview/WaterSupply.htm (last visited May 2, 2017).

24. *Securing Arizona's Water Future*, ARIZ. DEP'T OF WATER RES., http://www.azwater.gov/AzDWR/PublicInformationOfficer/documents/supplydemand.pdf (last visited May 26, 2017).

A. Arizona's Surface Water Law

Arizona, like most western states, bases its water rights allocations on the doctrine of prior appropriation.[25] Also called "first in time, first in right," prior appropriation allocates the relative priority of water rights based on the date a user first put an amount of water to beneficial use.[26] With the western U.S. being a sparsely populated region in the nineteenth and early twentieth centuries, "prior appropriation proved to be a useful, utility-maximizing principle that promoted the productive development of vast amounts of land."[27] The doctrine encouraged the beneficial development of scarce western water resources without waste.[28]

Under prior appropriation, when stream flows are inadequate to meet the quantities allocated to all right holders, a senior right holder may place a "call on the river."[29] The call forces junior right holders to stop diverting until the senior's right is satisfied.[30] However, under the "futile call doctrine," a state will decline to cut off a junior right holder if the forgone water would not reach the senior right holder downstream.[31]

The quantity, use, and relative priority date of each water right can be difficult to establish with adequate certainty in some cases.[32] In the early days of the state, a surface water diverter could claim a prior appropriation right in Arizona simply by intending to divert water, actually diverting the water, and then putting the water to a beneficial use.[33] It was not until 1919 that surface water right holders were required to file notices of intent with the state and receive certificates of water rights.[34] As such, many of the earliest, and thus

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25. Peter L. Reich, *The "Hispanic" Roots of Prior Appropriation in Arizona*, 27 ARIZ. ST. L.J. 649, 649 (1995).

26. Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63, 86 (2011).

27. Michael Toll, Comment, *Reimagining Western Water Law: Time-Limited Water Rights Permits Based on a Comprehensive Beneficial Use Doctrine*, 82 U. COLO. L. REV. 595, 607 (2011).

28. Larson & Kennedy, *supra* note 4, at 1344.

29. Brian E. Gray, *No Holier Temples: Protecting the National Parks Through Wild and Scenic River Designation*, 58 U. COLO. L. REV. 551, 579 (1988).

30. *Id.*; *see also* Eli Feldman, *Death Penalty for Water Thieves*, 8 U. DENV. WATER L. REV. 1, 3 (2004).

31. A. Dan Tarlock, *The Law of Equitable Apportionment Revisited, Updated, and Restated*, 56 U. COLO. L. REV. 381, 406 (1985).

32. Michael McIntire, *The Disparity Between State Water Rights Records and Actual Water Use Patterns: "I Wonder Where the Water Went?"*, 5 LAND & WATER L. REV. 23, 25 (1970).

33. Larson & Kennedy, *supra* note 4, at 1350; *see also* Sean E. O'Day, San Carlos Apache Tribe v. Superior Court*: Rejecting Legislative Favoritism in Water Rights Allocations*, 4 U. DENV. WATER L. REV. 29, 35 (2000).

34. Larson & Kennedy, *supra* note 4, at 1350; O'Day, *supra* note 33, at 49–50.

highest priority water rights, in Arizona lack adequate records, both because of the "paperless" nature of those early rights and because of a lack of funding for the agency with the responsibility to maintain those records—the Arizona Department of Water Resources (ADWR).[35]

Furthermore, a right's priority date relates back to the date of the filing of the notice of intent, or to the date the diversion project first began in cases before 1919, so long as the appropriator was "diligent" in completing the diversion project.[36] For example, imagine a man who filed a notice of intent to divert surface water with the state of Arizona on December 1, 1941, and began to dig a ditch to divert water to irrigate his farm. Shortly thereafter, he is drafted into the military and is away from his farm for three years. In those three years, several other parties file notices of intent and divert water for irrigation. Has our soldier lost his place in line, or does his priority date "relate back" to December 1, 1941? His priority date is December 1, 1941 only if he is considered to have been "diligent" during those years. Answering the question of diligence is a difficult, fact-specific inquiry, and introduces another layer of uncertainty with respect to priority dates, quantities, and uses for surface water rights.[37]

These administrative and evidentiary challenges, along with the overall challenge of encouraging water conservation while avoiding waste, were somewhat mitigated by Arizona's 1919 water code. Under that code, those with water rights in Arizona must put water to a beneficial use, without wasting the water. Beneficial use is the "basis, measure and limit to the use of the water in the state."[38] Beneficial use includes domestic, municipal, irrigation, stock watering, recreation, wildlife, water storage, and mining uses.[39] To perfect a surface water right one must apply for a permit[40] and if approved must begin construction of the diversion within two years and put the water to beneficial use within five years.[41] A person may then apply for a certificate of water right and upon "satisfaction of the director that an

35. Larson & Kennedy, *supra* note 4, at 1345; O'Day, *supra* note 33, at 50; *see also* Kathleen Ferris, *Like Water? Then Don't Leave Agency in a Drought*, ARIZ. REPUBLIC (Jan. 25, 2015), http://www.azcentral.com/story/opinion/op-ed/2015/01/25/arizona-department-water-resources-funding/22250083/.

36. Dennett L. Hutchinson, *Determining Priority of Federal Reserved Rights*, 48 U. COLO. L. REV. 547, 554 (1977).

37. *See* Barton H. Thompson, Jr., *Uncertainty and Markets in Water Resources*, 36 MCGEORGE L. REV. 117, 118 (2005).

38. ARIZ. REV. STAT. ANN. § 45-141(B).

39. *Id.* § 45-151(A).

40. *Id.* § 45-152(A).

41. *Id.* § 45-160.

appropriation has been perfected and a beneficial use completed" must receive a certificate.[42]

A water right holder might not only lose their place in line, but lose their right entirely, through forfeiture.[43] In most western states, including in Arizona, the failure to use your surface water for a period of time (five years in Arizona) results in losing your water right entirely.[44] The concept of forfeiture encourages the full development and use of an appropriative water right, but can create perverse incentives to conserve water; for fear that conserved water will be forfeited.[45] The risk of forfeiture, and the potential to allege forfeiture, further complicates the administration of a water rights regime and the incentives to encourage water conservation.[46]

There are two types of Arizona surface water rights that do not fit solely within the framework of prior appropriation. First, surface water rights held by Native American tribes and reservations of federal land (like national parks or wildlife refuges) function in part within this framework, but with important supplemental federal law.[47] In the western U.S., the federal government and Native American tribes hold significant claims to water rights. The federal government owns nearly 50% of the eleven coterminous western states[48] and the majority of the fifty-six million acres of Native American tribal land is located within those states as well.[49]

When the U.S. reserves public land for any reason, including Indian reservations and national parks, it implicitly reserves water rights.[50] These rights are called federally-reserved rights or *Winters* rights—after the Supreme Court case *Winters v. United States*[51] which established the doctrine of federal reserved water rights. The amount of water reserved is the minimum amount of water sufficient to meet the primary purpose of the

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42. *Id.* § 45-162(A).

43. *See generally* Janet C. Neuman & Keither Hirokawa, *How Good is an Old Water Right? The Application of Statutory Forfeiture Provisions to Pre-Code Water Rights*, 4 U. DENV. WATER L. REV. 1, 2–3 (2000) ("A central tenet of the prior appropriation system is 'use it or lose it.'").

44. *Id.* at 14.

45. Megdal et al., *supra* note 14, at 289.

46. Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919, 928–29 (1998).

47. Kobi Webb, *Federal vs. State Authority to Regulate Groundwater: Concerns Raised over U.S. Forest Service Proposed Directive*, 19 U. DENV. WATER L. REV. 297, 301 (2016).

48. CONG. RESEARCH SERV., FEDERAL LAND OWNERSHIP: OVERVIEW AND DATA 18 (2012), http://fas.org:8080/sgp/crs/misc/R42346.pdf.

49. U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., MAJOR USES OF LAND IN THE UNITED STATES 35–36 (2002).

50. Arizona v. California, 373 U.S. 546, 601 (1963); Winters v. United States, 207 U.S. 564, 577 (1908).

51. *Winters*, 207 U.S. at 577–78.

reservation.[52] The "primary purpose" of Indian reservations is to establish a permanent homeland.[53] To quantify the amount of water necessary to achieve this purpose, courts have generally used the Indian reservation's practicably irrigable acreage or PIA.[54] However, as part of the Gila River GSA, the Arizona Supreme Court refused to use PIA as the only quantification method and included consideration of reservation-specific factors like tribal culture, population, and water use plans.[55] Despite these important federal laws regarding use and quantity, priority remains part of the question of even federally-reserved rights, and such rights generally fit within the prior appropriation regime based on priority date. The priority date for reserved rights is time immemorial for reserved aboriginal tribal lands[56] or the date the reservation was established for other reservations.[57]

The second type of surface water rights within Arizona that do not fit neatly or completely within the prior appropriation regime are rights associated with the Colorado River and the CAP. Individual and institutional users in Arizona may have appropriative rights to the main stem of the Colorado River.[58] However, all Colorado River rights in Arizona function within the context of the "Law of the River."[59] The Law of the River is a complex set of international treaties, inter-state compacts, federal legislation, federal department guidelines, and contracts between water users and water delivery entities like CAP.[60] While a thorough exploration of the Law of the River is outside the scope of this Article, a basic understanding is necessary in order to understand the role of CAP in addressing Arizona's water challenges.

The Colorado River Compact divides the river roughly equally between the upper basin states (areas residing above Lee Ferry in Arizona, including

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52. Cappaert v. United States, 426 U.S. 128, 141 (1976); *see also* United States v. New Mexico, 438 U.S. 696, 718 (1978).

53. *See Winters*, 207 U.S. at 576–77.

54. *Arizona*, 373 U.S. at 600–01. Included in calculating the PIA are total acreage, arability of the land, and engineering and economic feasibility. *In re* Gen. Adjudication of All Rights to Use Water in the Big Horn River Sys., 753 P.2d 76, 101 (Wyo. 1988), *aff'd by an equally divided court*, Wyoming v. United States, 492 U.S. 406 (1989).

55. *In re* Gen. Adjudication of All Rights to Use Water in the Gila River Sys. & Source, 35 P.3d 68, 78–80 (Ariz. 2001).

56. United States v. Adair, 723 F.2d 1394, 1414 (9th Cir. 1983).

57. *Cappaert*, 426 U.S. at 138.

58. *See* Gregory J. Hobbs, Jr., *Colorado River Compact Entitlements, Clearing Up Misconceptions*, 28 J. LAND, RESOURCES & ENVTL. L. 83, 97 (2008).

59. Jason A. Robison & Douglas S. Kenney, *Equity and the Colorado River Compact*, 42 ENVTL. L. 1157, 1159–60 (2012).

60. *Id.*

a small portion of northern Arizona, Utah, Wyoming, Colorado, and New Mexico) and the lower basin states (most of Arizona, California, and Nevada).[61] The upper and lower basins each receive 7.5 million acre-feet per year.[62] Under the 1944 Rivers Treaty between the U.S. and Mexico, Mexico received 1.5 million acre-feet per year.[63] The upper and lower basin allocations, when added to Mexico's allocation and the 1.5 million acre-feet per year lost to evapotranspiration equal an assumption of eighteen million acre-feet available in the river each year.[64] These assumptions were based on monitoring conducted in the early parts of the Twentieth Century during flood years.[65] However, studies, including tree ring analysis, indicate that the one-thousand-year average amount of annual water available in the Colorado River is closer to thirteen million acre-feet.[66] As such, the entire transboundary allocation framework of the Colorado River basin is based on potentially faulty assumptions about the quantity of water in the river. This would mean that the entire basin may be functioning perpetually in legal water shortage, regardless of drought-induced actual water shortage.[67]

Arizona refused to sign the Colorado River Compact until 1944, in part because it sought assurances that it would be able to put its Colorado River allocation to use in central Arizona, where most of the state's population resides.[68] California thereafter sought a legislative solution through the Boulder Canyon Project Act, which sought to divide the lower basin allocation with 4.4 million acre-feet to California, 2.8 million acre-feet to Arizona, and 0.3 million acre-feet to Nevada per year.[69] The U.S. Supreme Court's decision in *Arizona v. California* effectively implemented these allocations while excluding the Gila River and its tributaries from counting

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61. Douglas L. Grant, *Interstate Water Allocation Compacts: When the Virtue of Permanence Becomes the Vice of Inflexibility*, 74 U. COLO. L. REV. 105, 116 (2003).

62. *Id.*; *see also* Boulder Canyon Project Act of 1928, Pub. L. No. 642, 45 Stat. 1057, 1060, 1064 (1928) (codified as amended at 43 U.S.C. §§ 617–617(t) (1994)); Arizona v. California, 373 U.S. 546, 564–84 (1963).

63. Treaty Between the United States and Mexico Respecting Utilization of Water of the Colorado and Tijuana Rivers and of the Rio Grande, Mex.-U.S., Feb. 3, 1944, 59 Stat. 1219, 1265.

64. *See* Stacy Tellinghuisen, *Water for Power Generation: What's the Value?*, 50 NAT. RESOURCES J. 683, 685 (2010).

65. Ludwik A. Teclaff, *The River Basin Concept and Global Climate Change*, 8 PACE ENVTL. L. REV. 355, 376 (1991).

66. *See* Gregory J. Hobbs, Jr., *The Role of Climate in Shaping Western Water Institutions*, 7 U. DENV. WATER L. REV. 1, 22 n.128 (2003).

67. *See id.*

68. Lawrence J. MacDonnell, Arizona v. California*: Its Meaning and Significance for the Colorado River and Beyond After Fifty Years*, 4 ARIZ. J. ENVTL. L. & POL'Y 88, 93–95 (2013).

69. Eric L. Garner & Michelle Ouellette, *Future Shock? The Law of the Colorado River in the Twenty-First Century*, 27 ARIZ. ST. L.J. 469, 473 (1995).

towards Arizona's allocation of the river.[70] Additionally, Arizona agreed to be the junior priority user in the lower basin (meaning it would take the brunt of shortage during a drought while California would face no reduction) in exchange for California's support in federal government financing of the CAP.[71] As will be discussed in more detail below, the CAP became a critical mechanism for Arizona to facilitate settlements of tribal water rights claims in the GSAs, as well as recharge central Arizona aquifers to meet the goals of the Groundwater Management Act.

In 2007, the U.S. Secretary of the Interior instituted shortage sharing guidelines.[72] Under this directive, shortage declarations are based on the elevation of Lake Mead, the largest reservoir for the Lower Basin states on the Colorado River, created by the Hoover Dam.[73] If Lake Mead falls below 1,075 feet on January 1 of any year, a light shortage is declared and Arizona loses 320,000 acre-feet.[74] If the level falls below 1,050 feet, a heavy shortage is declared and Arizona loses 400,000 acre-feet.[75] If the level falls below 1,025 feet, an extreme shortage is declared and Arizona loses 480,000 acre-feet.[76] Under these Department of the Interior shortage guidelines, California would not lose any Colorado River allocation.[77] Recent and ongoing developments may change how jurisdictions cooperate over shortages. For example, Mexico agreed to share in shortages and store some of its allocation in U.S. reservoirs under Minute 319.[78] Additionally, the lower basin states are

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70. Arizona v. California, 373 U.S. 546, 564–84 (1963).

71. *See, e.g.*, Karl Kohlhoff & David Roberts, *Beyond the Colorado River: Is an International Water Augmentation Consortium in Arizona's Future?*, 49 ARIZ. L. REV. 257, 262 (2007).

72. Bureau of Reclamation, Colorado River Interim Guidelines for the Operation of Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, 73 Fed. Reg. 19, 873 (Apr. 11, 2008); *see also* James H. Davenport, *Softening the Divides: The Seven Colorado River Basin States' Recommendation to the Secretary of the Interior Regarding Lower Basin Shortage Guidelines and the Operation of Lakes Mead and Powell in the Low Reservoir Conditions*, 10 U. DENV. WATER L. REV. 287, 288 (2007).

73. Bureau of Reclamation, Colorado River Interim Guidelines for the Operation of Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, 73 Fed. Reg. at 19,886.

74. *See* Davenport, *supra* note 72, at 306.

75. *Id.*

76. *Id.*

77. *Id.*

78. *See* Int'l Boundary & Water Comm'n [IBWC], *Minute 319: Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California* (Nov. 20, 2012) https://www.ibwc.gov/Files/Minutes/Min319.pdf [hereinafter Minute 319]; Jonathan S. King, Peter W. Culp & Carlos de la Parra, *Getting to the Right Side of the River: Lessons for Binational Cooperation on the Road to Minute 319*, 18 U. DENV. WATER L. REV. 36, 93 (2014).

in continuing talks regarding shortage sharing and conservation to address drought conditions.[79]

Despite all of these legal doctrines, compacts, treaties, court decisions, legislation, and administrative interventions, Arizona has experienced decades of legal disputes over the priorities, uses, and amounts of water associated with surface water rights in the state.[80] These disputes are called general stream adjudications (GSAs).

B. Arizona's General Stream Adjudications

Arizona, like the majority of the states in the western United States, utilizes general stream adjudications to resolve competing water rights claims across a river basin.[81] As Arizona has continued to rapidly grow, the conflicts between water users and the need for a comprehensive proceeding to determine rights has become more pronounced.[82] Before GSAs, most disputes over water were two-party suits for injunctive relief or suits for damages against those taking water out of priority.[83] These disputes increasingly involved more and more parties, and courts had to adopt unique procedures for multi-party litigation.[84] While the goal of the courts was to "definitely award the respective rights to the parties to the action," the decrees frequently lacked finality and specificity, particularly when critical parties were not involved in the proceedings.[85] Additionally, these state courts could not assert

79. John Fleck, *On the Brink of a Major Deal to Reduce Colorado River Water Use*, INKSTAIN (Nov. 6, 2016), http://www.inkstain.net/fleck/2016/11/brink-major-deal-reduce-colorado-river-water-use/.

80. For an overview of Arizona's general stream adjudications, see generally Larson & Kennedy, *supra* note 4.

81. ALASKA STAT. § 46.15.065 (2016); ARIZ. REV. STAT. ANN. §§ 45-251 to -264 (2016); CAL. WATER CODE §§ 2000 to 2900 (West 2016); COLO REV. STAT. §§ 37-92-101 to -602 (2016); IDAHO CODE §§ 42-1401 to -1428 (2016); MONT. CODE ANN. §§ 85-2-201 to -243 (2016); NEB. REV. STAT. §§ 46-226 to -231 (2016); NEV. REV. STAT. §§ 533.090–.320, 534.100 (2016); N.M. STAT. ANN. §§ 72-4-13 to -19 (2016); N.D. CENT. CODE §§ 61-03-15 to -20 (2016); OKLA. STAT. tit. 82, §§ 105.6–.8 (2016); OR. REV. STAT. §§ 539.010–.350, 541.310–.320 (2016); S.D. CODIFIED LAWS §§ 46-10-1 to -13 (2016); TEX. WATER CODE ANN. §§ 11.301–.341 (West 2016); UTAH CODE ANN. §§ 73-4-1 to -24 (West 2016); WASH. REV. CODE §§ 90.03.110–.245 (2016); WYO. STAT. ANN. §§ 41.4.301 to -331 (2016).

82. *See* Holly Doremus and A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 ECOLOGY L.Q. 279, 286 (2003).

83. Larson & Kennedy, *supra* note 4, at 1345.

84. *Id.*

85. *Id.* (citation omitted).

jurisdiction over Native American tribes and the federal government in their respective claims to water within the state.[86]

In 1952, Congress passed the McCarran Amendment, which waived the federal government's sovereign immunity in state legal proceedings determining "rights to the use of water of a river system or other source."[87] The Amendment requires such proceedings to join a sufficient number of water users to constitute a "comprehensive" adjudication of all rights within the basin.[88] By allowing state courts to adjudicate federal water rights, the McCarran Amendment effectively made comprehensive GSAs like the Gila River Adjudication possible.[89]

As comprehensive proceedings, GSAs are lengthy, resource-intensive, and often span decades.[90] The Gila River GSA is a paradigmatic example of just how difficult and costly this process can be for a state. Legal disputes over water rights in the Gila River basin have been going on since before Arizona was a state.[91] The Gila River GSA itself officially began in 1976, and over forty years later it has still not been resolved.[92] The Gila River GSA arguably represents the most complex and contentious litigation in U.S. history.[93] Today, the Gila River GSA includes over 38,000 parties with nearly 100,000 claims.[94] It is similar in many respects to a large class action, but instead of a small number of defendants pitted against many small claimants with similar interests, it is every claimant pitted against every other claimant.[95] If the Gila River GSA can be efficiently and equitably resolved,

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86. *See generally* Stephen M. Feldman, *The Supreme Court's New Sovereign Immunity Doctrine and the McCarran Amendment: Toward Ending State Adjudication of Indian Water Rights*, 18 HARV. ENVTL. L. REV. 433 (1994).

87. 43 U.S.C. § 666 (2012); *see generally* Aubri Goldsby, *The McCarran Amendment and Groundwater: Why Washington State Should Require Inclusion of Groundwater in General Stream Adjudications Involving Federal Reserved Water Rights*, 86 WASH. L. REV. 185 (2011).

88. Goldsby, *supra* note 87, at 186; Reed D. Benson, *Deflating the Deference Myth: National Interests vs. State Authority under Federal Laws Affecting Water Use*, 2006 UTAH L. REV. 241, 268–69.

89. Scott B. McElroy & Jeff J. Davis, *Revisiting* Colorado River Water Conservation Dist. v. United States*—There Must Be a Better Way*, 27 ARIZ. ST. L.J. 597, 642 (1995).

90. Larson & Kennedy, *supra* note 4, at 1347–48.

91. *See, e.g.*, Hurley v. Abbott, No. 4564, slip op. at 8 (Ariz. Terr. Ct. Mar. 1, 1910), http://azmemory.azlibrary.gov/cdm/ref/collection/feddocs/id/906.

92. Larson & Kennedy, *supra* note 4, at 1348.

93. *See generally* Joseph M. Feller, *The Adjudication that Ate Arizona Water Law*, 49 ARIZ. L. REV. 405 (2007).

94. *Id.*; *see also General Description of Adjudications Program*, ARIZ. DEP'T OF WATER RES., http://www.azwater.gov/AzDWR/SurfaceWater/Adjudications/ (last updated May 12, 2017).

95. Larson & Kennedy, *supra* note 4, at 1348.

there will likely be tremendous benefits to the state's economy and the environment, and greater promise of resolving other similar basin-scale water disputes.[96]

To understand the significance of the Gila River GSA, it is necessary to have some familiarity with the Gila River. Stretching nearly 600 miles across Arizona, the Gila River is the second largest river in Arizona next to the Colorado.[97] The Gila River originates in southwestern New Mexico, and travels west through Arizona, through the Gila River Indian Community and the Phoenix metropolitan area, and then southwest where it joins the Colorado River near Yuma.[98] The river drains nearly 60,000 square miles, totaling half the land in the state.[99] Almost every major river in Arizona flows into the Gila, including large tributaries like the San Pedro River, Salt River, and Verde River, and about 20% of the water used in Arizona is from the Gila River and its tributaries.[100]

The Gila River GSA began in 1974 when the Salt River Project petitioned the Arizona State Land Department to adjudicate the water rights in the Salt River above Granite Reef Dam.[101] The Salt River Project sought to determine rights in the Verde River and its tributaries, and several petitions followed thereafter, including the Phelps Dodge Corporation seeking adjudication of rights in the Gila River, the ASARCO Corporation seeking determination of rights in the San Pedro River, and the Buckeye Irrigation Company petitioning for the inclusion of the Santa Cruz River watershed.[102] In 1979, the Arizona state legislature enacted statutes providing for the general adjudication of water rights by state trial courts rather than the state land department.[103] The Gila Adjudication was then transferred to the Maricopa County Superior Court.[104]

The Gila River GSA's next four years were occupied by jurisdictional challenges. Some Native American tribes filed suit in federal court seeking removal of the GSA to federal court and an injunction against the state in

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96. *Id.*

97. *See* JIM TURNER, ARIZONA: A CELEBRATION OF THE GRAND CANYON STATE 43 (2011).

98. Larson & Kennedy, *supra* note 4, at 1349.

99. ENVTL. DEF. FUND, RIVER OF THE MONTH SERIES: AUGUST 2012 THE GILA RIVER 1 (2012), http://www.edf.org/sites/default/files/GilaRiverFactSheet.pdf.

100. Feller, *supra* note 93, at 409.

101. *Id.* at 406, 407 n.8, 417.

102. *Gila River and Little Colorado River General Stream Adjudications*, ARIZ. DEP'T OF WATER RES., http://www.azwater.gov/AzDWR/SurfaceWater/Adjudications/GilaRiverandLittleColoradoRiverGeneralStreamAdjudications.htm (last updated Apr. 24, 2017).

103. Feller, *supra* note 93, at 417.

104. Larson & Kennedy, *supra* note 4, at 1351.

adjudicating tribal water claims. These filings culminated in the U.S. Supreme Court's 1983 decision in *Arizona v. San Carlos Apache Tribe*.[105] The Court held that while federal courts have jurisdiction to adjudicate tribal water claims, state courts may also determine those tribal rights so long as they are determined as part of a comprehensive state adjudication.[106] The case was remanded for a determination on whether the federal suit should be stayed or dismissed, and on remand, the Ninth Circuit Court of Appeals stayed the federal suit in favor of the state adjudication.[107] Additional claims challenging the state's jurisdiction were similarly stayed, clearing the way for a general stream adjudication in the Gila River basin.[108]

In 1986, nearly twelve years after SRP's initial filing, the superior court moved forward with the Gila River GSA. In the following years, the Arizona Supreme Court dealt with several critical interlocutory appeals. The first, often called "*Gila I*," involved the question of whether the service of summons and filing and service of pleadings comported with due process, a critical and complex issue given the number of claimants dispersed over a large area.[109] The Arizona Supreme Court found that the Arizona Department of Water Resources' procedures for publishing and mailing notice satisfied constitutional requirements for due process.[110]

The second interlocutory appeal, called "*Gila II*," involved the critical issue of "subflow."[111] General stream adjudications in Arizona apply only to surface water rights.[112] Arizona has a bifurcated water rights system, wherein surface water operates under one set of legal rules (largely prior appropriation, as discussed above), and groundwater operates under an entirely different set of rules (discussed in detail below).[113] This legal distinction between surface water and groundwater is critical, because it determines not only what rules apply to a water right, but also whether or not a right is subject to the GSA.[114] But there is no simple way to draw a

105. Arizona v. San Carlos Apache Tribe, 463 U.S. 545, 545 (1983).

106. *Id.* at 569–70.

107. N. Cheyenne Tribe of N. Cheyenne Indian Reservation v. Adsit, 721 F.2d 1187, 1189 (9th Cir. 1983).

108. United States v. Superior Court, 697 P.2d 658, 674 (Ariz. 1985).

109. *In re* Rights to Use of Gila River (*Gila River I*), 830 P.2d 442, 445 (Ariz. 1992).

110. *Id.* at 455–56.

111. *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River II*), 857 P.2d 1236, 1237 (1993).

112. Larson & Kennedy, *supra* note 4, at 1342.

113. *Id.* at 1342 nn.32–33.

114. For an overview of the importance and complexity of the subflow question, see generally Robert J. Glennon & Thomas Maddock, III, *In Search of Subflow: Arizona's Futile Effort to Separate Groundwater from Surface Water*, 36 ARIZ. L. REV. 567 (1994).

hydrologic line between surface water and groundwater.[115] A shallow well drilled near a river may be pumping mostly water from the river itself. A deeper well located farther from the river may be pumping mostly water from an aquifer in the phreatic zone, but could nevertheless still be taking some water more closely associated with the surface. Water associated with the surface must have a priority date and be adjudicated as part of the GSA, and a well pumping "surface water" may be taking that water out of priority. "Subflow" is water taken from underground, but that is more closely associated with surface water, and thus should be subject to rules of prior appropriation and adjudication within the GSA.[116]

In *Gila II*, the Arizona Supreme Court considered whether a "50%/90 day rule" was the appropriate test to determine if the water was subflow, and thus, subject to appropriation.[117] The rule stated that percolating groundwater was appropriable, and thus constitutes subflow, if the volume of stream depletion reached 50% or more of the total volume pumped during ninety days of continuous pumping.[118] Ultimately, the court determined that the test did not comport with precedent regarding appropriable groundwater and was too difficult to administer, and remanded the case for a determination of a better rule to distinguish between subflow and groundwater.[119]

In "*Gila III*," the court reviewed (1) whether federally-reserved rights extend to groundwater when Arizona's bifurcated system does not subject groundwater to prior appropriation; and (2) whether holders of federally-reserved rights are entitled to greater protection from groundwater pumping than surface water holders under state law.[120] The court held that because the U.S. reserved water for the Indians in an amount sufficient to accomplish the purpose of the reservation, federally reserved rights extend to groundwater and enjoy greater protection than holders of state law rights.[121]

In "Gila IV," the Arizona Supreme Court revisited the subflow issue after the trial court redefined subflow as waters residing in the geological unit beneath and adjacent to the stream, or the "saturated floodplain Holocene

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115. *Id.* at 570–74.

116. *See id.* at 570–71.

117. *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River II*), 857 P.2d 1236, 1239–40 (Ariz. 1993).

118. *Id.* at 1239.

119. *Id.* at 1248.

120. *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River III)*, 989 P.2d 739, 741 (Ariz. 1999).

121. *Id.* at 751.

alluvium."[122] The trial court concluded that all wells located in the lateral limits of this newly defined subflow zone were subject to the GSA and all wells located outside the zone were not.[123] However, a well outside the limits of this subflow zone would be included in the GSA if the cone of depression from pumping reaches a subflow zone and thereby impacts the availability of surface water to senior priority right holders.[124] The Arizona Supreme Court affirmed the trial court's subflow test.[125]

In "Gila V," the next issue was over what standard to apply when quantifying tribal water rights.[126] The court held that the purpose of an Indian reservation is to serve as a permanent homeland.[127] The amount of water for that purpose is still limited to the minimum amount necessary, but the court held that the amount is not limited solely to the federal courts' quantification based on practicably irrigable acreage, but must consider the present and future needs of the reservation as a viable homeland.[128] The court held that quantification of tribal rights should include consideration of certain reservation-specific factors, such as a tribe's history, culture, geography, topography, natural resources, economic base, past water use, and population.[129]

In May 1991 the Arizona Supreme Court enacted a Special Procedural Order Providing for the Approval of Federal Water Rights Settlements, establishing the process and conditions upon which settlements may be made with tribal and federal parties under the GSA.[130] Since its enactment, a number of Native American tribes have reached water right settlements, which require Congressional approval, including the Southern Arizona Water Rights Settlement Act of 1982, settling disputes with the San Xavier and Schuk Toak Districts and the Tohono O'Odham Nation; Ak-Chin Indian Community Water Rights Settlement Act of 1984; Salt River Pima-Maricopa Indian Community Water Rights Settlement Act of 1988; Fort McDowell Indian Community Water Rights Settlement Act of 1990; San Carlos Apache Tribe Water Rights Settlement Act of 1992; Yavapai-Prescott Indian Tribe

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122. *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River IV*), 9 P.3d 1069, 1073 (Ariz. 2000).

123. *Id.* at 1077.

124. *Id.*

125. *Id.* at 1083.

126. *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River V*), 35 P.3d 68, 71 (Ariz. 2001).

127. *Id.* at 76.

128. *Id.* at 77.

129. *Id.* at 79–80.

130. M. BYRON LEWIS, NEW ERA OF ARIZONA WATER CHALLENGES 10–11 (2014).

Water Rights Settlement Act of 1994; Zuni Indian Tribe Water Rights Settlement Act of 2003; and Arizona Water Settlement Act of 2004, finalizing an agreement between the U.S. and Arizona for Central Arizona Project repayment obligations, settling disputes between the Gila River Indian Community and other parties, and settling litigation with the Tohono O'Odham Nation.[131] Other tribal settlement negotiations are ongoing.[132] Importantly, in many of these settlements, the tribes agree to forego diversion from streams to which they may otherwise have a legal claim under *Winters* in exchange for deliveries of water from CAP, thereby making the law of the Colorado River a critical component to the ultimate resolution of the GSAs.[133]

At the same time as the Gila River GSA, the Apache County Superior Court in Arizona was adjudicating the rights of users in the Little Colorado River basin.[134] The attempt to determine rights in the Silver Creek watershed of the Little Colorado River Adjudication led to major revisions of the state's water code and an Arizona Supreme Court decision.[135] The endeavor showcases the challenges of GSAs, including managing the sheer number of parties and the complex preparation of the hydrographic survey report (HSR).

The HSR for Silver Creek was completed by the Arizona Department of Water Resources (ADWR) in 1990, and its function was to catalog claims, diversion points, uses, and subflow zones.[136] During the 180-day objection period established for the draft HSR, 3,456 objections were filed.[137] Parties were concerned about having to defend their rights against the thousands of objections and sought relief from the state legislature.[138] The result was an amendment of the water code meant to streamline Arizona GSAs. Several tribal and federal parties challenged these statutory amendments, claiming that they violated the due process and separation of powers clauses in Arizona's constitution.[139] The Arizona Supreme Court struck down many of

131. *Id.*

132. *Id.* at 11.

133. *See* John B. Weldon, Jr. & Lisa M. McKnight, *Future Indian Water Settlements in Arizona: The Race to the Bottom of the Waterhole?*, 49 ARIZ. L. REV. 441, 442 (2007) (discussing the role of the CAP in facilitating tribal water rights settlements).

134. *In re* Gen. Adjudication of All Rights to Use Water in Little Colo. River Sys. & Source, No. CV-6417 (Super. Ct. Apache Cty. Dec. 2, 1991).

135. Larson & Kennedy, *supra* note 4, at 1354.

136. Comprehensive Case Management Order No. 1 Regarding Objections Filed to the Silver Creek Hydrographic Survey Report at 3, *In re* Gen. Adjudication of All Rights to Use Water in Little Colo. River Sys. & Source, No. CV-6417 (Super. Ct. Apache Cty. Dec. 2, 1991).

137. *Id.*

138. Feller, *supra* note 93, at 421.

139. San Carlos Apache Tribe v. Superior Court *ex rel.* County of Maricopa, 972 P.2d 179, 188 (Ariz. 1999).

these provisions,[140] leaving the cumbersome adjudicatory process in place and in need of reform within these constitutional constraints.

C. Arizona's Groundwater Management Act

Arizona has a separate set of laws applicable to surface water and groundwater. The use of groundwater in Arizona is governed by the Groundwater Code. ADWR administers the Groundwater Code, which is largely the product of the Arizona's landmark Groundwater Management Act of 1980.[141]

Even though the Groundwater Management Act governs the use of groundwater throughout the state, the Act's main provisions focus within geographical areas called Active Management Areas (AMAs).[142] Within AMAs groundwater use is subject to much stricter restraints than other parts of the state.[143] Currently there are five AMAs in Arizona—the Prescott AMA, Phoenix AMA, Pinal AMA, Tucson AMA, and the Santa Cruz AMA.[144] Not coincidently, the boundaries of the state's AMAs take in nearly 80% of Arizona's population.[145]

The Arizona Legislature passed the Groundwater Management Act in large part because for decades water users in many parts of Arizona were pumping groundwater faster than water could naturally recharge back into underground aquifers.[146] Lawmakers recognized that continued and unsustainable mining of groundwater would result in harm to the state's economy and welfare.[147] As a result, the Groundwater Management Act contained provisions designed to prevent future groundwater overdraft.

To help address the overdraft problem, the Groundwater Management Act creates Management Goals for each AMA. Four of the AMAs have a Management Goal under the Act of maintaining or achieving by 2025 a balance between groundwater withdrawals and natural and artificial recharge,

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140. *Id.*

141. Groundwater Management Act, ch. 1, § 86, 1980 Ariz. Sess. Laws 2d Spec. Sess. 1339 (codified at ARIZ. REV. STAT. ANN. §§ 45-401 to -704 (2016)).

142. ARIZ. REV. STAT. ANN. § 45-402(2) (2016).

143. *See id.*

144. *Id.* §§ 45-411, -411.03.

145. *Overview of the Arizona Groundwater Management Code*, ARIZ. DEP'T OF WATER RES., http://www.azwater.gov/AzDWR/WaterManagement/documents/Groundwater_Code.pdf (last visited May 26, 2017).

146. ARIZ. REV. STAT. ANN. § 45-401 (2016).

147. *Id.*

a state known as "safe yield."[148] As a result of its agricultural characteristics, the Pinal AMA has a distinct Management Goal of preserving groundwater for agricultural uses "for as long as feasible" while preserving water for other non-agricultural purposes.[149] With respect to agriculture in the AMAs, the Act sought to limit the expansion of agricultural pumping by preventing the expansion of any additional agricultural lands within AMAs.[150]

To progress towards each AMA's Management Goal, ADWR regulates water use among major water users by periodically publishing for each AMA a document called a Management Plan.[151] These Management Plans, which by statute ADWR must publish every ten years between 1980 and 2020 and again in 2025, include mandatory water conservation, reporting, and water use requirements for groundwater users within each AMA.[152]

In addition to mandatory conservation requirements, the Groundwater Management Act defines and limits who has rights to pump groundwater. Outside of AMAs, the pumping of groundwater is virtually unregulated under the Code as long as the water is for a reasonable or beneficial use.[153] Within AMAs, a person or entity may only pump groundwater if there is explicit legal authority to do so under the Act.[154] The Act identifies four main types of authority to withdraw groundwater: (1) Grandfathered Groundwater Rights, (2) Service Area Rights, (3) Groundwater Withdrawal Permits, and (4) Small Exempt Wells.[155]

(1) Grandfathered Groundwater Right: Grandfathered groundwater rights are largely determined based on the historical uses of groundwater during the five-year period preceding the creation of an AMA.[156] There are three types of grandfathered rights, with each having specific purposes and uses: Irrigation Grandfathered Rights, Type 1 Rights, and Type 2 Rights.[157]

148. *Id.* §§ 45-561(12), -562.
149. *See id.* § 45-562(B).
150. *Id.* § 45-452.
151. *Id.* § 45-563.
152. *See id.* §§ 45-563 to -568.02.
153. *Id.* § 45-453.
154. *Id.* § 45-451(A).
155. *Id.* §§ 45-454, -462(A), -492(A), -512.
156. *Id.* §§ 45-462(A), -463(A)–(B), -464(A), -465(A).
157. *Id.* §§ 45-462 to -464. Irrigation Grandfathered Rights are tied to land that was irrigated for agricultural purposes anytime within five years before the creation of an AMA. *Id.* §§ 45-402(18), -465. Type 1 rights are former Irrigation Grandfathered Right that are permanently converted to a non-irrigation use. *Id.* §§ 45-463, -469. Type 1 rights do not exceed three acre-feet per year. §§ 45-463(A), -469(F). A Type 2 right stems from groundwater use that was not for irrigation purposes. *Id.* § 45-464(A). Unlike the other two grandfathered rights, Type 2 rights are not tied to or appurtenant to land, meaning they can be used virtually anywhere within an AMA. *Id.* § 45-471.

(2) Service Area Right: A service area right allows a city, town, or private water company to withdraw groundwater within its service territory "for the benefit of landowners and residents."[158] Likewise, irrigation districts have a similar right to withdraw groundwater for landowners in an irrigation district.[159] An entity that holds a service area right to pump groundwater is still subject to the conservation requirements to limit groundwater use under each AMA's Management Plan.[160]

(3) Groundwater Withdrawal Permits: In some cases, ADWR will issue permits to withdraw groundwater for limited and specialized purposes listed in statute. These uses are: (1) Dewatering permits, (2) Mineral extraction and metallurgical processing permits, (3) General industrial use permits, (4) Poor quality groundwater permits, (5) Temporary permits, (6) Drainage water permits, and (7) Hydrologic testing permits.[161]

(4) Small Exempt Wells: Wells with a capacity of less than thirty-five gallons per minute that withdraw groundwater for non-irrigation purposes are exempt from the requirements of the Act.[162] In practice these small exempt wells usually provide water for domestic household purposes.

Perhaps the most innovative provision in the Groundwater Management Act is the Assured Water Supply requirement. The Act states that a real estate developer developing land in an AMA may not sell subdivided lots unless the developer can show there is enough water for 100 years.[163] In order to prove a 100-year supply, the developer must either obtain a certificate of assured water supply from ADWR or obtain a commitment to receive water from a water provider that ADWR has designated as having met the 100-year requirement.[164]

ADWR has promulgated a complex set of rules to implement the 100-year requirement. These rules require that an applicant for a certificate or designation of assured water supply must show that water will be continuously, legally, and physically available for 100 years as defined in the rules.[165] Furthermore, any use of groundwater under the rules must be consistent with an AMA's Management Goal—which for most AMAs is safe-yield.[166] In effect, the Assured Water Supply rules are designed to limit

158. *Id.* § 45-492(A).
159. *Id.* § 45-494.
160. *Id.* § 45-492(A).
161. *Id.* § 45-512.
162. *Id.* § 45-454.
163. *Id.* § 45-576(A), (J).
164. *Id.* § 45-576(B), (J).
165. *Id.* § 45-576(A), (J); ARIZ. ADMIN. CODE §§ 12-15-716 to -718 (2016).
166. ARIZ. ADMIN. CODE §§ 12-15-704(F) to -710(E) (2016).

the use of groundwater for urban development, and to eliminate the use of "mined" groundwater beyond that which naturally seeps into the ground or is intentionally stored underground by water providers.[167]

Because the Assured Water Supply rules are designed to severely limit the use of groundwater, developers and designated providers in AMAs must rely primarily on renewable surface water supplies.[168] Renewable surface water supplies include water from the Salt and Verde rivers, water from the Colorado River, and recycled wastewater.[169] Water providers can either use these water sources directly, or store water underground to offset pumped groundwater.[170] In cases where a provider stores water underground beyond the amount needed to offset groundwater pumping, the provider can receive a long-term storage credit from ADWR.[171] This allows the water provider to later pump a roughly equivalent amount of groundwater anywhere within the AMA subject to a discount or "cut to the aquifer," which in most cases is 5%.[172]

The Assured Water Supply rules provide some flexibility to meet the Management Goal in the three AMAs that have access to Central Arizona Project water. In these AMAs developers and water providers can enroll in an entity called the Central Arizona Groundwater Replenishment District (commonly known as "CAGRD").[173] Enrolling in CAGRD allows a development or water provider to be consistent with the AMA's Management Goal while relying on groundwater supplies as long as other provisions of the rules are met.[174] Developers and water providers enrolled in CAGRD pay fees that CAGRD uses to purchase excess available Central Arizona Project water to replace or "replenish" what would otherwise be mined groundwater.[175] This allows a developer or water provider to meet the requirements of the 100-year Assured Water Supply rules without having direct access to renewable surface water supplies.[176] As the Colorado River faces the prospect of continued drought, some have expressed concerns about the future

167. McGinnis & Heilman, *supra* note 5, at 590–91.
168. *Id.* at 591, 578; ARIZ. ADMIN. CODE § 12-15-722.
169. *See* McGinnis & Heilman, *supra* note 5, at 591.
170. ARIZ. REV. STAT. ANN. § 45-852.01(A)–(C) (2016).
171. *Id.*
172. *See id.* §§ 45-834.01(A) to -852.01(A)–(C).
173. *Id.* § 48-3780.
174. Avery et al., *supra* note 12, at 343–44.
175. ARIZ. REV. STAT. ANN. §§ 48-3771 to -3772(A) (2016).
176. Avery et al., *supra* note 12, at 344.

availably of excess Central Arizona Project water upon which CAGRD largely relies.[177]

The Assured Water Supply rules do not apply outside of AMAs. However, a less restrictive set of requirements applies to all other areas of the state, known as the Adequate Water Supply requirement.[178] This requires a developer of a proposed subdivision to obtain a determination from ADWR as to whether there is a 100-year available water supply.[179] Like the Assured Water Requirement, an applicant for an Adequate Water Supply determination must show that water will be continuously, legally, and physically available for 100 years.[180] However, there are at least two important differences. First, under the Adequate Water Supply rules an applicant can rely exclusively on groundwater.[181] This is because areas of the state outside of AMAs do not have a Management Goal or Management Plan that requires the use of renewable supplies.[182] Second, a developer may still sell lots even if ADWR determines there is an inadequate supply of water.[183] However, the developer must disclose the water inadequacy determination to buyers.[184] In effect, this makes the Adequate Water Supply requirement a consumer-protection law for Arizona's homebuyers.

Individual counties outside of AMAs can make the Adequate Water Supply requirement mandatory.[185] Under state law, a County Board of Supervisors may unanimously pass an ordinance that requires a developer to demonstrate a 100-year Adequate Water Supply before the county will approve any new development.[186] This in effect makes the Adequate Water Supply requirement mandatory for counties that opt in to the program.[187] To date, only Cochise and Yuma counties have adopted the requirement.[188]

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177. *See id.* at 348–52.

178. ARIZ. REV. STAT. ANN. § 45-108 (2016).

179. § 45-108(A), (I).

180. *Id.*

181. L. William Staudenmaier, *Between a Rock and a Dry Place: The Rural Water Supply Challenge for Arizona*, 49 ARIZ. L. REV. 321, 330 (2007).

182. *Id.*

183. *See* ARIZ. REV. STAT. ANN. § 32-2181(F)(2) (2016).

184. *Id.*

185. *Id.* § 11-823(A) (2016).

186. *See id.*

187. *See id.*

188. *See* COCHISE COUNTY, ARIZ., SUBDIVISION REGULATIONS art. 4, § 408.03 (2008); YUMA COUNTY, ARIZ., SUBDIVISION REGULATIONS art. IV, § 4.31 (2008). State law also allows a city or town outside of an AMA to adopt a mandatory adequate water supply requirement. ARIZ. REV. STAT. ANN. § 9-463.01 (2016). To date, only the towns of Clarkdale and Patagonia have adopted this requirement. *See* CLARKDALE, ARIZ., ZONING CODE § 12-1-21 (2012); PATAGONIA, ARIZ., TOWN CODE § 15-5-8 (2008).

II. THE CURRENT CLOUDS ON ARIZONA'S WATER FUTURE

Arizona's surface water code and groundwater code do not always work together harmoniously. Much of this tension comes from the fact that while the law treats groundwater and surface water differently, the two types of water are often hydrologically connected and at times are one and the same.[189] This can create conflicts between those who hold rights to use groundwater and those who hold rights to use surface water.[190]

A recent example of such a conflict comes from the city of Sierra Vista, which is located near the banks of the San Pedro River in southern Arizona. The conflict that occurred over water in Sierra Vista found its way through Arizona's courts, the halls of the Legislature, and all the way to the desk of Arizona's governor. The litigation and subsequent political fallout present a fascinating case study on the conflict between the groundwater and surface water laws in Arizona.

A. The Sierra Vista Litigation in Arizona

The San Pedro River is one of the last free flowing rivers in the southwestern United States.[191] The San Pedro originates in Sonora Mexico and flows north through southeastern Arizona until it converges with the Gila River.[192]

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189. *See* Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 22 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf.

190. For example, a person may have a legal right to pump groundwater. However, if the person pumps groundwater in an area hydrologically connected to a stream, they may be pumping water that provides the baseflow of the stream. If another party has a legal right to use the water in the stream, there will inevitably be a conflict of legal rights. In some cases, such conflicts are ignored or unknown to the parties. However, in other cases such conflicts have profound and expensive consequences, including many of the claims in Arizona's General Stream Adjudication. *See, e.g.*, John D. Leshy, *A Conversation About Takings and Water Rights*, 83 TEX. L. REV. 1985, 1988–90 (2005).

191. Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 2 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/lawsuit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

192. ARIZ. DEP'T OF WATER RES., ARIZONA'S NEXT CENTURY: A STRATEGIC VISION FOR WATER SUPPLY SUSTAINABILITY, at Fig. P.A.3-3, P.A. 18-2 (2014), http://www.azwater.gov/AzDWR/Arizonas_Strategic_Vision/documents/ArizonaStrategicVisionforWaterResourcesSustainability_May2014.pdf [hereinafter ARIZ. DEP'T OF WATER RES., ARIZONA'S NEXT CENTURY].

In order to protect the ecological, scientific, and recreational benefits of this desert river, Congress passed the Arizona-Idaho Conservation Act of 1988.[193] This law sought to protect the San Pedro and its wildlife by setting aside nearly 56,000 acres of federal land along the River.[194] This area is called the San Pedro Riparian National Conservation Area (SPRNCA).[195] In the Act, Congress specifically set aside water to fulfill the purposes of the SPRNCA, but did not specify an exact quantity.[196] Congress did, however, direct the United States Secretary of Interior to file a claim in the Gila River General Stream Adjudication (General Stream Adjudication) to quantify the water right.[197] One year after the Act's passage, the United States filed a claim in the General Stream Adjudication.[198] Some twenty years later in 2009, the Special Master for the General Stream Adjudication acknowledged the United States' rights to water for SPRNCA, but did not specify an exact quantity.[199]

Near the banks of the San Pedro in southern Arizona is a growing city of nearly 44,000 people called Sierra Vista.[200] In the view of some (including ADWR), Sierra Vista will likely be a regional center for growth in the coming decades.[201] ADWR has also acknowledged that groundwater levels in the area have been falling as a result of increased groundwater pumping.[202] Over the past several years, some individuals and entities have expressed concerns that continued pumping could disrupt the San Pedro's flows by depleting the River's underlying baseflow.[203]

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193. Arizona-Idaho Conservation Act of 1988, Pub. L. No. 100-696, § 101, 102 Stat. 4571, 4571.

194. *Silver*, slip op. at 2.

195. § 101, 102 Stat. at 4571.

196. *Id.* §§ 101–102, 102 Stat. at 4571–72.

197. *Id.* In addition to the express water right reservation, the Bureau of Land Management obtained a Certificate of Water Right from the Arizona Department of Water Resources pursuant to state law granting to the United States "a right to the use of the water flowing in the San Pedro River . . . for recreation and wildlife, including fish." *Silver*, slip op. at 2.

198. *Silver*, slip op. at 2. The United States has since amended its statement of claim three times. *Id.*

199. *Id.*

200. *American FactFinder*, U.S. CENSUS BUREAU, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_G001&prodType=table (last visited May 14, 2017).

201. ARIZ. DEP'T OF WATER RES., ARIZONA'S NEXT CENTURY, *supra note* 192, at P.A. 18-4.

202. *Id.* at P.A. 18-2, P.A. 18-5.

203. *Id.*

Much of the remaining developable land in Sierra Vista is owned by real estate development company Castle and Cooke.[204] Castle and Cooke owns and has plans to develop nearly 1,900 acres of land in Sierra Vista in a development called Tribute.[205] The plans for Tribute call for the development of nearly 7,000 homes and offices.[206]

Castle and Cooke also owns Pueblo Del Sol, which is the local water company that provides water to the area which takes in Tribute.[207] In 1972 the state of Arizona gave Pueblo Del Sol a certificate of convenience and necessity authorizing the company to provide water to customers.[208] Pueblo Del Sol relies exclusively on groundwater.[209] In order to provide water to Tribute, Pueblo Del Sol would rely on wells located about 4.5 miles from the banks of the San Pedro River.[210] Pueblo Del Sol currently pumps about 1,600 acre-feet of water per year, and it would need to pump almost three times that amount for Tribute at build-out.[211]

Sierra Vista is located in Cochise County. Cochise County has adopted a mandatory Adequate Water Supply requirement as allowed under state law.[212] This means that a developer or water provider must make a showing of a 100-year adequate water supply before the county will approve plans for any new development.[213] In order to obtain the designation, the applicant must show that water will be continuously, legally, and physically available for 100

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204. Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 3, 14 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf.

205. Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 2 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/lawsuit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

206. *See* Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 3 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf.

207. *Id.* at 2–3, 15.

208. *Silver*, slip op. at 2.

209. *See* Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 2 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf.

210. *Id.* at 15.

211. *Silver*, slip op. at 2.

212. *See* ARIZ. REV. STAT. ANN. § 11-823(A) (2016); COCHISE COUNTY, ARIZ., SUBDIVISION REGULATIONS art. 4, § 408.03 (2008).

213. *See* § 11-823(A); COCHISE COUNTY, ARIZ., SUBDIVISION REGULATIONS art. 4, § 408.03 (2008).

years.[214] The criteria for meeting these requirements are defined in ADWR's administrative rules.[215]

In June of 2011, Pueblo Del Sol submitted to ADWR an application for a designation of adequate water supply.[216] Several parties submitted objections to the application. Some of the objectors argued, among other things, that the water Pueblo Del Sol would pump would not be legally available because the pumping would negatively impact the United States' water rights to the San Pedro.[217] Despite these objections, ADWR approved the application in June 2012.[218] In its decision, ADWR took the position that it did not have the authority to consider whether any proposed pumping would impact streamflow.[219] The United States Bureau of Land Management and two local environmental activists appealed ADWR's decision to a state administrative law judge.[220] The administrative law judge upheld ADWR's decision, finding among other things that (1) the water was "legally available" because Pueblo Del Sol had a certificate of convenience and necessity, and (2) ADWR could not consider the impact to the federal government's water rights.[221]

On appeal, the superior court rejected the position of ADWR and the administrative law judge. The court found that ADWR must consider the potential effect of Pueblo Del Sol's pumping on the federal government's water rights when determining if water is "legally available."[222] The court

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214. ARIZ. REV. STAT. ANN. § 45-108(I) (2016).

215. ARIZ. ADMIN. CODE §§ R12-15-716, 717 (2016).

216. *See* Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 22 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf.

217. Pueblo Del Sol, No. 40-700705.0000, 1–2 (Ariz. Dep't of Water Res. July 23, 2012), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/ADWR/DWR-64%202012%2008-23%20BLM%20Appeal.pdf.

218. *Id.*

219. *Id.*

220. Tony Davis, *Dispute Looms in Sierra Vista Over Housing vs. Water Rights*, ARIZ. DAILY STAR (May 29, 2013), http://tucson.com/news/science/environment/dispute-looms-in-sierra-vista-over-housing-vs-water-rights/article_03a3c62f-ad96-5c64-a5c0-5983e55b88ad.html.

221. *See* Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 22 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR/12A-AWS001-DWR.pdf. ADWR affirmed the decision of the administrative law judge, subject to certain modifications. Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 3 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/law-suit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

222. *Id.*

found that ADWR must consider the federal government's rights even if ADWR cannot determine the quantity of water attached to the right—which must be done in the General Stream Adjudication.[223]

Pueblo Del Sol and the ADWR appealed the court's decision to the Arizona Court of Appeals. In November 2016, the Court of Appeals rejected the reasoning of the superior court.[224] In doing so, the court upheld ADWR's position that the agency need not consider the Bureau of Land Management's water rights or the impact of the proposed pumping on the San Pedro River in determining if water is "legally available."[225] However, in a seemingly paradoxical twist, the court found that ADWR must consider the Bureau's federal water rights in determining whether there is "adequate water" for Pueblo Del Sol under the relevant water adequacy statute.[226] The court's opinion therefore appears to favor the Bureau of Land Management. As of this writing, the parties have appealed the decision to the Arizona Supreme Court and are waiting to see if the court will review the case.

B. The Legislative Response to Sierra Vista

As a result of the litigation described above, Castle and Cooke's plans for Tribute came to a screeching halt. Without a determination of an Adequate Water Supply under the law, Castle and Cooke could not get approval to build Tribute.[227]

After the fallout, the City of Sierra Vista and other local interests pushed for a political solution. In early 2016, state legislators representing Sierra Vista sponsored two bills aimed at the 100-year Adequate Water Supply restriction in Cochise County. The first of these bills, Senate Bill 1268, in its final form would have allowed municipalities located in counties with an Adequate Water Supply ordinance (including Sierra Vista) to opt out of the

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223. *Silver*, slip op. at 6.

224. Silver v. Pueblo Del Sol, 384 P.3d 814, 817 (Ariz. Ct. App. 2016).

225. *Id.* at 823.

226. *Id.* at 826–27. While the court stated that ADWR is not required to consider the impact of Pueblo Del Sol's pumping on the San Pedro River, the agency must look at Pueblo Del Sol's application with "an educated eye as to what the Gila Adjudication may eventually determine" with respect to the Bureau of Land Management's water rights, and take that into consideration in determining if there is adequate water. *Id.* at 817, 826–27. The Court of Appeals remanded the case back to ADWR to reexamine whether there was adequate water for Pueblo Del Sol in accordance with the court's decision. *Id.* at 817.

227. ARIZ. REV. STAT. ANN. § 11-823(A) (2016); *see also* COCHISE COUNTY, ARIZ., SUBDIVISION REGULATIONS art. 4, § 408.03 (2008).

requirement.[228] The second bill, Senate Bill 1400, would have required the Board of Supervisors for a county with a mandatory Adequate Water Supply requirement to review the requirement every five years with the option to rescind by a unanimous vote.[229]

The two bills proved controversial. Political interests on both sides of the debate took strong positions. David Gowan, the then-current Speaker of the Arizona House of Representatives and a resident of Sierra Vista, was among the strident supporters of the bills. He argued that the "water belongs to us when it's underneath that ground . . . . This is private property we're talking about."[230] Several environmental and municipal coalitions opposed the bills. Among other things, they argued that the bills would chip away at Arizona's perception as a state that manages water effectively.[231] In a letter to Governor Doug Ducey, an association of Valley cities argued that the bills would "create uncertainty for homeowners, businesses, and investors regarding the State's long-term commitment to water policies that promote sustained economic growth."[232]

After passing the Arizona House and Senate, Governor Doug Ducey vetoed the controversial bills. In his veto letter, he remarked that "[e]nsuring the certainty and sustainability of Arizona water is a top priority. I will not sign legislation that threatens Arizona's water future."[233]

At its core, the litigation and political jockeying described above illustrates a prime example of the tension that exists between the Groundwater Code

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228. S.B. 1268, 52d Leg., 2d Reg. Sess. (Ariz. 2010). Senate Bill 1268 would have allowed any municipality with a population of less than 25,000 to opt out of the requirement to show a 100-year adequate water supply before plat approval. *Id.* The bill would have allowed municipalities with a population greater than 25,000 to do the same only if the municipality met several requirements, including the implementation of an aquifer augmentation program, plans to reuse reclaimed water, implementation of conservation program, and other water management requirements. *Id.*; *see also* ARIZ. HOUSE OF REPRESENTATIVES, 52D LEG., 2D REG. SESS., SB 1268: ADEQUATE WATER SUPPLY REQUIREMENTS; MUNICIPALITIES 1–2 (2016), http://www.azleg.gov/legtext/52leg/2r/summary/h.sb1268_05-04-16_astransmittedtogovernor.pdf.

229. S.B. 1400, 52d Leg., 2d Reg. Sess. (Ariz. 2010); *see also* ARIZ. STATE SENATE, 52D LEG., 2D REG. SESS., FACT SHEET FOR S.B. 1400, at 1–2 (2016), http://www.azleg.gov/legtext/52leg/2r/summary/s.1400we_asvetoed.pdf.

230. Howard Fischer, *Ducey Faces Water Policy Dilemma in Cochise County Case*, ARIZ. CAP. TIMES (Apr. 1, 2016), http://azcapitoltimes.com/news/2016/04/01/ducey-faces-water-policy-dilemma-in-cochise-county-case/.

231. Letter from Ariz. Mun. Water Users Ass'n to Doug Ducey, Governor, Ariz. (Apr. 11, 2016), http://www.amwua.org/resource_documents/SB1268SB1400veto.pdf.

232. *Id.*

233. Letter from Douglas A. Ducey, Governor, Ariz., to Andy Biggs, President of the Senate, Ariz. State Senate (May 9, 2016), http://azgovernor.gov/sites/default/files/sb1268_and_sb1400_veto_letter.pdf.

and the Surface Water Code. On one hand, there is a developer arguing that a development will rely only on groundwater as permitted under the state's groundwater laws. On the other hand, the U.S. government is arguing that the same pumping will deplete the San Pedro River, which is a surface water source that falls within the purview of the General Stream Adjudication.[234]

The bills mentioned above exacerbate this tension. This is because the bills at issue would have allowed Pueblo Del Sol to pump water that at its core is in dispute in the Adjudication. Essentially, the bills would have allowed Tribute to build houses and commercial developments in Sierra Vista using water that it may not have rights to use in the future.[235]

C. Sierra Vista as an Example of Clouding Arizona's Water Future

The Pueblo Del Sol case illustrates an inconvenient fact—the conflicts in Arizona's water laws have created a cloud that looms over water rights throughout the state.[236] This potentially creates a problem for thousands of individuals, subdivisions, and businesses. As water becomes more valuable and scarce, there is plenty of room for similar conflicts going forward. Resolving the Adjudication would help avoid such conflicts. This is because the Adjudication has essentially clouded water rights throughout many parts of the state. As a result, water right holders cannot affirmatively know the true extent or security of their water rights until the court addresses competing claims.[237]

This lack of certainty has several negative consequences. As Arizona faces a potential statewide supply and demand gap over the next several decades, it is important that the state's major water users have the ability to allocate water as efficiently as possible through market-oriented sales, exchanges, and

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234. At the hearing before the administrative law judge, the United States presented the results of modeling which showed that about 30% of Pueblo Del Sol's hypothetical pumping over a fifty-year period would be water that would have eventually gone to the San Pedro River or riparian along the River. Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 10 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR-appeal/12A-AWS001-DWR.pdf.

235 Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 7 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/law-suit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

236. *See* discussion *supra* Part II.B.

237. *See* Larson & Kennedy, *supra* note 4, at 1356–57.

leases.[238] This is virtually impossible to do if water users cannot affirmatively quantify their rights to use water due to ongoing legal disputes. Because water is an essential input in many of Arizona's major industries—including mining, energy production, homebuilding, and agriculture—this lack of certainty could potentially have an impact on the state's long-term economic development.[239]

The example in Sierra Vista shows that this is not merely a theoretical concern. As of 2013, the developers in Sierra Vista had invested $7 million in Tribute excluding the cost of land, which is likely a much higher number.[240] In this particular case, the Adjudication has created lack of certainty in water rights that has (thus far) prevented the creation of jobs and economic growth in Sierra Vista.[241]

The lack of certainty resulting from the Adjudication hits close to home for many of Arizona's homebuyers, whether they realize it or not. One of the primary reasons the Legislature created the 100-year Adequate and Assured Water Supply requirements was to protect Arizona's homeowners.[242] In the 1960s and 1970s, there were several well-publicized scandals in Arizona where developers sold desert land to the public for homes without an available water supply.[243] The Legislature developed the 100-year Adequate and Assured Water Supply requirements as a reaction to such abuses, thus ensuring that that water supplies would be available for future homeowners and businesses.[244]

Without certainty in the water rights that make up an adequate or assured water supply, the efficacy of the 100-year water supply protections could come into question. This very issue came up in the oral argument in the Sierra Vista litigation. Judge McClennen asked the lawyers for Pueblo Del Sol what would hypothetically happen in twenty years if Pueblo Del Sol had to

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238. *Id.*; *see also* ARIZ. DEP'T OF WATER RES., ARIZONA'S NEXT CENTURY, *supra note* 192, at 9, 45–46 (2014).

239. Larson & Kennedy, *supra* note 4, at 1357.

240. Pueblo Del Sol Water Company's Application for Designation as Having an Adequate Water Supply, No. 12A-AWS001-DWR, at 13 (Ariz. Office of Admin. Hearings Mar. 12, 2013), https://portal.azoah.com/oedf/documents/12A-AWS001-DWR-appeal/12A-AWS001-DWR.pdf.

241. *See* discussion *supra* Part II.B.

242. *See* Silver v. Pueblo Del Sol Water Co., LC2013-000264-001 DT, slip op. at 7 (Ariz. Super. Ct. Maricopa Cty. June 6, 2014) (order vacating prior order), http://earthjustice.org/sites/default/files/files/lawsuit%2020140606%20ORDER_ADEQUATE%20%20SUPPLY%20OF%20WATER%20NOT%20LEGALLY%20AVAILABLE%20LC2013-000264-001DT-512-06062014.pdf.

243. Brief for John Leshy & Robert Glennon as Amici Curiae at 5–6, Silver v. Pueblo Del Sol Water Co., 384 P.3d 814 (Ariz. Ct. App. 2016) (No. 1-CA-CV 14-0811).

244. *Id.*

significantly reduce pumping in order to protect the federal government's water rights in the San Pedro River.[245] The lawyer for Pueblo Del Sol stated that the water company would have to find another source, such as trucking water in to serve customers.[246] In his written decision, Judge McClennen observed that this scenario goes against the very purpose of the 100-year adequate water supply requirement—which is primarily to "assure home buyers that water will be available."[247]

Dispersing the cloud that hangs over Arizona's water future presents a unique challenge and opportunity. Enacting meaningful reforms to clarify water rights, however difficult the reforms may be, would be a monumental addition to Arizona's legacy of strategic water stewardship and innovation.

III. DISPERSING THE CLOUDS ON ARIZONA'S WATER FUTURE

Arizona responded to the challenge of scarcity and underdevelopment with prior appropriation and reclamation. Arizona responded to the challenge of inter-state and international disputes over the Colorado River with the Central Arizona Project and related legal, legislative, and regulatory reforms. Arizona responded to the legal and economic challenges of groundwater overdraft by enacting the Groundwater Management Act. Today, Arizona must be similarly innovative and proactive in responding to the challenges illustrated by the Sierra Vista controversy and the related failure to resolve the GSAs. This Part proposes three legal reforms to respond to the challenges reflected in the Sierra Vista controversy and the ongoing GSAs in Arizona: (A) a state water escrow to improve water markets and encourage conservation and protection of environmental flows; (B) regional water mitigation authorities to facilitate resolution of water disputes and clarify water rights; and (C) specialized state water courts to expeditiously and expertly resolve water rights adjudications.

A. Arizona Water Escrow

To encourage resolution of the GSA, those that stand to lose the most (junior priority right holders and subflow appropriators) should have some access to water supplies to mitigate their losses.[248] Improving water markets

245. *Silver*, slip op. at 7.
246. *See id*.
247. *Id.*
248. Larson & Kennedy, *supra* note 4, at 1343.

is one part of expanding options for these parties to mitigate lost water rights and thereby encourage resolution of the GSA.[249] An improved water market would help alleviate risks associated with subflow appropriators losing water rights, facilitate efficient resolution of disputes through lowered transaction costs in buying and selling water rights and negotiating settlements, and could create a source of revenue for courts and agencies overseeing adjudications.[250]

A few states, such as Washington, have enacted water trust programs, facilitating water transfers.[251] Washington enacted the statewide Trust Water Rights Program[252] in 1991, in part to protect salmon fisheries.[253] The program authorizes the Washington Department of Ecology to acquire trust water rights by purchase, gift, or other means.[254] The rights can be used for the preservation of in-stream flows, irrigation, energy production, and other beneficial uses.[255] Water right holders may donate all or a portion of their right and on a temporary or permanent basis.[256] Water rights held in trust are shielded from forfeiture and maintain their original priority date.[257] The Washington program has achieved some success—a number of temporary and permanent transactions have occurred since its enactment.[258]

A similar approach could be adopted in Arizona to help resolve the Gila River GSA.[259] A state agency like ADWR, or even a non-governmental escrow company, could act as the trustee of donated or sold water rights.[260] As in Washington, water right holders could place all or a portion of their water right in escrow, making it available for purchase.[261] Water rights placed in escrow would be protected from forfeiture, which would allow farmers and industrial processes to implement water conservation measures and more

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249. *See, e.g.*, King, Culp & de la Parra, *supra* note 78, at 83–85; *see also* Janis M. Carey & David L. Sunding, *Emerging Markets in Water: A Comparative Institutional Analysis of the Central Valley and Colorado-Big Thompson Projects*, 41 NAT. RESOURCES J. 283, 293–94 (2001).

250. *See generally* TERRY L. ANDERSON & PAMELA SNYDER, WATER MARKETS: PRIMING THE INVISIBLE PUMP (1997); CLAY J. LANDRY, SAVING OUR STREAMS THROUGH WATER MARKETS: A PRACTICAL GUIDE (1998).

251. Larson & Kennedy, *supra* note 4, at 1378.

252. WASH. REV. CODE §§ 90.42.005–.42.900 (2016); *see generally* Matthew Rajnus, *Washington's Water Right Impairment Standard: How the Current Interpretation Impedes the State's Policy of Maximizing Net Benefits*, 4 WASH. J. ENVTL. L. & POL'Y 178 (2014).

253. § 90.42.005(2)(a); H.B. 2026, 52d Leg., Reg. Sess. (Wash. 1991).

254. § 90.42.080(1)(a).

255. § 90.42.040(1).

256. § 90.42.080(1)(a), (3).

257. § 90.42.040(3), (6).

258. Larson & Kennedy, *supra* note 4, at 1378.

259. *Id.* at 1378–79.

260. *Id.* at 1378.

261. *Id.*

water-efficient technology and processes without the risk of losing their rights to those saved waters.[262] Water rights placed in escrow would have an expedited sever and transfer process, making it less costly and administratively complex to buy and sell water rights through the escrow, which would also reduce transaction costs by acting as a clearinghouse for state water rights available for purchase.[263] Arizona's sever and transfer statute requires consent and approval from the irrigation district, agricultural improvement district, or water users' association before any transaction, but the escrow's expedited process would remove such obstacles.[264] This voluntary expedited process, in addition to avoiding forfeiture, would encourage water rights holders to donate, buy, and sell through the escrow.[265] The escrow holder would have a fiduciary obligation to manage water placed in escrow for the benefit of the donor, and would serve to augment in-stream flows while in escrow.[266]

In exchange for the benefits of avoiding forfeiture and lower transaction costs, water rights holders using the escrow would have a percentage of the water from each transaction held back in escrow.[267] This hold-back would serve two functions. First, the hold-back water would go toward the preservation and augmentation of in-stream flows.[268] Second, water held back in escrow from each transaction would serve as a bank of water rights to which others could resort to offset losses sustained in the adjudication process.[269] Those who lost right or had their rights diminished through the adjudication process could go to the state escrow for a source of discounted water rights to mitigate their losses. This hold-back approach has some precedent in Arizona groundwater law. In Arizona, facilities that engage in artificial groundwater recharge that later withdraw that banked water receive certain incentives from the state for recharge (including recharge credits that are saleable on the open market) in exchange for leaving a portion of the recharged water in the aquifer.[270]

Water markets, appropriately facilitated by this escrow approach, can play a critical role in providing certainty to claimants once a final determination

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262. *Id.*
263. *Id.*
264. ARIZ. REV. STAT. ANN. § 45-172(A)(4) (2016).
265. Larson & Kennedy, *supra* note 4, at 1378–79.
266. *Id.* at 1379.
267. *Id.*
268. *Id.*
269. *Id.*
270. ARIZ. REV. STAT. ANN. §§ 45-801.0 to -898.01 (2016).

is made in a GSA.[271] In a GSA, as in any litigation, there will be losers, in part due to a finding that the water was subject to federal claims, was junior to other claims, or that they were pumping appropriable subflow.[272] A state water market catalyzed by the incentives of the escrow would provide potential offsets to claimants at risk of losing their water rights.[273] Water held back in escrow could be sold to disadvantaged claimants at a discounted rate, providing comfort that their cooperation in the resolution of the GSA will not result in the loss of their water supply or in dramatically increased water costs.[274]

Despite its promise, the escrow approach is not without its problems. The viability of this approach will depend upon the unique conditions within the specific basin or sub-basin, including whether the incentives are strong enough to move enough water through the escrow to generate sufficient hold-backs to sustain in-stream flows and provide a bank of discounted water rights to offset losses.[275] While Washington has successfully implemented a similar approach, that state has a particularly robust conception of the public trust doctrine in terms of how water rights relate to environmental protection and, with fisheries, a stronger economic interest in maintaining environmental flows.[276] Additionally, enacting the program would require legislation, and thus has inevitable political obstacles.[277] Yet, the program may be the best hope for providing water claimants who lose in the GSA some comfort that their cooperation in its resolution will not result in being left high and, literally, dry.[278]

It is also possible that the escrow and related improvements to water markets can provide a source of revenue for the courts and agencies in charge of the GSAs, thereby providing funds critical to expediting the process

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271. *See, e.g.*, Brandon Winchester & Ereney Hadjigeorgalis, *An Institutional Framework for a Water Market in the Elephant Butte Irrigation District*, 49 NAT. RESOURCES J. 219, 237 (2009).

272. *See In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, 9 P.3d 1069, 1072–73 (Ariz. 2000); *see also In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, 857 P.2d 1236, 1247 (Ariz. 1993).

273. Larson & Kennedy, *supra* note 4, at 1380.

274. There is even precedent for such a holdback to benefit the environment and mitigate water rights losses—Arizona's approach to establishing long-term storage credits for aquifer re-charge projects. *See* ARIZ. REV. STAT. ANN. §§ 45-801.01 to -898.01.

275. Larson & Kennedy, *supra* note 4, at 1380.

276. *See generally* Richard O. Zerbe, Jr. & Linda J. Graham, *The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams*, 74 WASH. L. REV. 763 (1999).

277. Larson & Kennedy, *supra* note 4, at 1380.

278. *See id.* at 1380.

(including paying for a specialized water judge, as discussed below).[279] A transaction fee or percentage of the purchase price for water sold through the escrow could be directed to fund adjudication courts and agencies.[280] Even if the escrow is successful, Arizona will still require resources for the adjudication of disputes that cannot be resolved outside of the courts. The escrow would therefore benefit not only those seeking to buy and sell water, and not only those needing to mitigate their losses, but also everyone involved in the GSAs.

B. Arizona Regional Water Mitigation Authorities

Even with an improved market facilitated by a water escrow, the two largest obstacles to the expeditious resolution of the GSAs remain: the subflow question and the sheer number of parties. Additional legal innovations will be required to address these obstacles. One possible innovation is the establishment of regional water mitigation authorities.

Under this approach, a mathematical model would be used to assess a well's relationship to subflow, based on its depth, proximity to the stream, pumping capacity, and the surrounding hydrogeology of the area. The model would make a conservative estimate, based on these factors, of the impact a well has on senior surface water right holders. That estimate would then be used to establish a mitigation fee. The mitigation fee would be paid to a regional water mitigation authority (RWMA). The RWMA would be a quasi-municipal entity, authorized by statute, to collect these mitigation fees. Its boundaries would be based on the geographies of sub-basins. Members would voluntarily join the RWMA and pay the mitigation fee based on the model. Those who elected to remain outside of the RWMA would then choose to pursue final adjudication of their water rights within the GSA, including the possibility that the GSA court would find that their well is appropriating entirely subflow and has a recent priority date subject to a call on the river.

The RWMA, funded by its members' voluntarily-paid mitigation fees generated by the model, would then take those funds and pursue ways in which to mitigate the impact of members' pumping on senior water rights holders. So long as RWMA members pay their mitigation fee, they are shielded from liability to senior right holders for any impacts on those rights from pumping. The RWMA would assume responsibility for mitigating impacts and liability for its failure to do so.

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279. *Id.*
280. *Id.*

The RWMA could pursue mitigation in several ways. It could use mitigation fee revenues to purchase more senior rights or compensate senior right holders for impacts from member pumping. It could pay other water users to temporarily or permanently forego diversions or pumping. The RWMA could work with farmers in the region on fallowing to reduce water uses, or pay for increased water efficiency or water conservation measures in the region. Or the RWMA could pursue funding water augmentation projects.

Sea water or brackish groundwater desalination could provide a source of augmented water.[281] Desalination has potentially high energy and environmental costs, but the technology has rapidly improved in both energy efficiency and overall costs in recent years.[282] Nevertheless, desalination is still very energy intensive, and even more so if the desalinated water is to be transported from the ocean to inland areas in Arizona. This would likely be cost-prohibitive, and there may not be a market yet in Arizona for water that would have to be very expensive for there to be full cost recovery. As such, desalination would have to be implemented in coastal areas, which would then forego appropriations from the Colorado for Arizona's benefit. A joint U.S.-Mexico desalination project on the Gulf of California could provide additional water supplies to Mexico and southern parts of California and Arizona, which would then forego some claims to Colorado River water.[283] Or a similar approach could be taken with California. The scenario would be similar to the resolution of disputes over the Colorado resulting in the CAP. Just as California agreed to support the CAP in exchange for Arizona being the junior priority state on the river, Arizona would support desalination in California in exchange for California foregoing appropriations from the river to provide additional supplies through the CAP. That additional Colorado River water would be available for purchase from the CAP by the RWMA. That water would then be available to RWMAs to mitigate impacts to senior rights holders and shield junior RWMA members from liability and remove thousands of parties from the GSA. The viability of these augmented sources of course has many obstacles, including the costs and environmental impacts

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281. *See generally* Symposium, *Desalination in California: Should Ocean Waters Be Utilized to Produce Freshwater?*, 57 HASTINGS L.J. 1343 (2006) (discussing the feasibility and environmental impact of desalination).

282. Rhett B. Larson, *Innovation and International Commons: The Case of Desalination Under International Law*, 2012 UTAH L. REV. 759, 766.

283. *See, e.g.*, Sandra Dibble, *One Desal Plant, Two Countries?*, SAN DIEGO TRIB. (Aug. 24, 2014, 5:00 PM), http://www.sandiegouniontribune.com/news/border-baja-california/sdut-rosarito-Mexico-desalination-plant-binational-2014aug24-htmlstory.html; *see also* Elliot Spagat, *Mexico's Newest Export to US May Be Water*, ASSOCIATED PRESS (Oct. 15, 2011), https://www.yahoo.com/news/mexicos-newest-export-us-may-water-150135559.html?ref=gs.

of desalination, the potential risks associated with a shortage declaration on the CAP, and the economic and ecologic sustainability of brackish groundwater pumping.

There are other potential sources of augmented water besides desalination for the RWMA to pursue to make senior right holders whole. RWMAs could seek bulk water, inter-basin transfers. Bulk water imports involve water-poor jurisdictions importing water in-bulk, via pipeline or tanker, from another (presumably) water-rich jurisdiction.[284] California has considered importing water in-bulk via tanker from Canada to deal with its ongoing severe drought.[285] But these projects were ultimately not implemented due to public opposition surrounding exporting water.[286] Bottled water constitutes a bulk water transfer.[287] The Imperial Canal and the CAP divert water away from the Colorado River outside of the basin, effectively creating a bulk water export out of the Colorado River basin.[288] The CAP itself could provide imported water in some instances to RWMAs.

Despite the promise of bulk water augmentation for RWMA, the energy costs of moving water via pipeline or tanker are typically very high.[289] Technological innovations could facilitate more efficient and cost-effective bulk water transports.[290] For example, as California contemplates potential alternative water sources to respond to its ongoing drought, desalination in San Diego could cost as much as $5 per cubic meter, whereas water from Alaska transported via towed bag technology could be as low as $2 per cubic meter.[291] But as is often the case with technological innovations, old legal regimes are ill-suited to address new technologies.[292]

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284. Larson, *supra* note 10, at 758; Elise L. Larson, *In Deep Water: A Common Law Solution to the Bulk Water Export Problem*, 96 MINN. L. REV. 739, 739–40 (2011).

285. Dennis J. Herman, *Sometimes There's Nothing Left to Give: The Justification for Denying Water Service to New Consumers to Control Growth*, 44 STAN. L. REV. 429, 449 n.121 (1992).

286. Larson, *supra* note 10, at 770.

287. *Id.* at 760; *see also* Douglas A. Kysar, *Sustainable Development and Private Global Governance*, 83 TEX. L. REV. 2109, 2116–17 (2005).

288. *See* James S. Lochhead, *An Upper Basin Perspective on California's Claims to Water from the Colorado River Part II: The Development, Implementation and Collapse of California's Plan to Live Within its Basic Apportionment*, 6 U. DENV. WATER L. REV. 318, 367 (2003).

289. Larson, *supra* note 10, at 761; *see also* Cynthia DeLaughter, *Priming the Water Industry Pump*, 37 HOUS. L. REV. 1465, 1491 n.242 (2000).

290. *See generally* Andrew Hodges, Kristiana Hansen & Donald McLeod, *The Economics of Bulk Water Transport in Southern California*, 3 RESOURCES 703 (2014) (comparing bulk water transport costs to those of constructing a new desalination facility and finding that using water bags to transport fresh water between northern and southern California is in some instances a low-cost alternative to desalination).

291. *See id.* at 709, 712.

292. *See, e.g.*, Troy A. Rule, *Airspace in an Age of Drones*, 95 B.U. L. REV. 155, 157 (2015).

Transportation costs are not the only obstacle. If water is exported faster than it is naturally recharged, then despite the renewing effects of the hydrologic cycle, water resources will be depleted.[293] This is particularly true of inter-basin transfers.[294] Such depletion may impact stream flow, and thus the health of the ecosystem.[295] This is perhaps the most significant concern raised in opposition to bulk water exports.[296] Additionally, concerns for water depletion and the cost of water transport may ultimately prove to be only two of many potential challenges associated with bulk water transport, with other challenges including the possibility of importing invasive species or pathogens along with the bulk water.[297]

In addition to desalination and bulk water imports, RWMAs could also pursue watershed management projects to mitigate member impacts on senior water right holders. Watershed management involves the removal of vegetation that takes in water that might otherwise be available for human use.[298] This vegetation may be an invasive species or else scrub brush.[299] Watershed management has several potential benefits.[300] First, removal of scrub brush can improve forest health.[301] Second, this removal may avoid or mitigate wildfires and bark beetle infestation.[302] Third, healthier forests and fewer wildfires decrease erosion and polluting runoff to rivers, thereby improving water quality.[303] Fourth, watershed management removes vegetation that would otherwise take up water, thereby augmenting water supplies.[304] Decades of research throughout the western U.S. has documented

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293. Larson, *supra* note 10, at 761.

294. Noah D. Hall & Benjamin L. Cavataro, *Interstate Groundwater Law in the Snake Valley: Equitable Apportionment and a New Model for Transboundary Aquifer Management*, 2013 UTAH L. REV. 1553, 1568, 1574; *see also* Kirt Mayland, *Navigating the Murky Waters of Connecticut's Water Allocation Scheme*, 24 QUINNIPIAC L. REV. 685, 716 (2006).

295. Larson, *supra* note 10, at 761; Mayland, *supra* note 294, at 724.

296. Larson, *supra* note 10, at 761.

297. *See, e.g.*, Tony G. Puthucherril, *Ballast Waters and Aquatic Invasive Species: A Model for India*, 19 COLO. J. INT'L ENVTL. L. & POL'Y 381, 382 (2008).

298. George Cameron Coggins, *Watershed as a Public Natural Resource on Federal Lands*, 11 VA. ENVTL. L.J. 1, 161 (1991).

299. Larson, *supra* note 10, at 758.

300. *Id.* at 762.

301. *Id.* at 763.

302. *Id.* The ultimate effectiveness of watershed management in addressing wildfire concerns is the subject of intense scholarly debate. *See generally* WILDFIRE POLICY: LAW AND ECONOMICS PERSPECTIVES (Karen M. Bradshaw & Dean Lueck eds., 2012).

303. Larson, *supra* note 10, at 762.

304. *Id.*; *see also* Brandon Loomis, *Reduction in Tree Cover over Rivers Could Mean More Water Flow*, ARIZ. REPUBLIC (Oct. 30, 2015, 10:38 PM), http://www.azcentral.com/story/news/arizona/investigations/2015/10/31/reduction-tree-cover-over-rivers-could-mean-more-waterflow/74882770/.

the potential to increase water supplies through improved watershed management.[305]

Nevertheless, removal of this vegetation can impact ecosystems if done unsustainably, because it would reduce shade cover, eliminate key nesting areas, and increase access to fragile river banks for grazing animals.[306] Additionally, vegetation removal on a watershed scale can be costly with uncertain possible returns on those investments, in part because such vegetation typically has a narrow trunk diameter that does not lend itself well to use as timber, and may be an inefficient and polluting source of biomass energy.[307] Still, there are potential legal reforms that could make watershed management a more viable option for RWMA to pursue to mitigate impacts to senior water rights holders.

An important legal distinction under prior appropriation law for water augmentation is the distinction between developed water and salvaged water.[308] Developed water is water imported into a system that was not previously part of the basin—like bulk water imports.[309] Salvaged water is water that is part of the river basin but was otherwise inaccessible or unusable, but is made usable by human intervention—like liberating water embedded in vegetation through improved watershed management.[310] Developed water is owned by the party that develops it, independent of the prior appropriation system.[311] Anyone that imports water into a prior appropriation basin owns that water without it being subject to senior priority claims.[312] Salvaged water, on the other hand, remains part of the priority system, and the party that salvaged the water has no superior claim to the water.[313] For example, in *Southeastern Colorado Water Conservancy District v. Shelton Farms*, a party claimed right to increased stream flow created by

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305. Charles A. Troendle et al., *The Coon Creek Water Yield Augmentation Project: Implementation of Timber Harvesting Technology to Increase Streamflow*, 143 FOREST ECOLOGY & MGMT. 179, 179 (2001).

306. Larson, *supra* note 10, at 762.

307. *See* Elizabeth Long, Wyoming v. USDA*: A Look Down the Road at Management of Inventoried Roadless Areas for Climate Change Mitigation and Adaptation*, 40 ECOLOGY L.Q. 329, 341 (2013). *But see generally* Karen Bradshaw Schulz & Dean Lueck, *Contracting for Control of Landscape-Level Resources*, 100 IOWA L. REV. 2507 (2015) (discussing the incentives some forest landowners have to invest in watershed protection).

308. Ronald A. Kaiser, *Texas Water Marketing in the Next Millennium: A Conceptual and Legal Analysis*, 27 TEX. TECH. L. REV. 181, 255 (1996); Larson, *supra* note 10, at 766.

309. Kaiser, *supra* note 308, at 255.

310. Larson, *supra* note 10, at 766.

311. *Id.*

312. *Id.*

313. *Id.*

removing water-using vegetation from the stream banks.[314] The court held that such water was salvaged water and subject to prior appropriation.[315] This is perhaps the paradigmatic example of watershed management, and why the law provides few incentives to encourage its implementation.

The distinction between developed and salvaged water is both highly relevant, and potentially highly problematic, for water augmentation projects.[316] Water generated from seawater desalination is likely developed water, whereas water generated from desalinating saline-contaminated rivers or lakes is likely salvaged water.[317] The application of this distinction thus arguably incentivizes seawater desalination over treating pollution or improving in-land water supplies.[318] The distinction certainly recognizes the rights of bulk water importers to their developed water, despite the potential environmental costs associated with bulk water transfers, over the rights of those engaging in watershed management to salvaged water, despite its potential environmental benefits. But, senior right holders who recognize watershed management as a viable form of mitigation by the RWMAs would provide some incentives to encourage watershed management.

Cloud seeding could be an even more complex approach to water mitigation for the RWMAs. Cloud seeding involves the dispersal of particles into the air to create clouds and induce rainfall.[319] There are different approaches to cloud seeding.[320] Seeds are generally dispersed via airplanes or cannons.[321] The ideal particles for condensation nuclei—the "seeds"—are charged particles that will attract the oppositely charged water molecules in the air, and particles with significant surface water.[322] "Common particles in cloud seeding operations include dry ice (frozen carbon dioxide) and silver iodide."[323] "Precipitation can begin within fifteen to thirty minutes of seeding

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314. Se. Colo. Water Conservancy Dist. v. Sheldon Farms, Inc., 529 P.2d 1321, 1322 (Colo. 1974).

315. *Id.* at 1325.

316. Larson, *supra* note 10, at 767.

317. *Id.*

318. *Id.*

319. Ray Jay Davis, *Atmospheric Water Resources Development and International Law*, 31 NAT. RESOURCES J. 11, 12–13 (1991).

320. ARNETT S. DENNIS, WEATHER MODIFICATION BY CLOUD SEEDING 64–72 (1980); *see also* Larson, *supra* note 10, at 763.

321. DENNIS, *supra* note 320, at 69; *see also* Larson, *supra* note 10, at 763.

322. Xueliang Guo, Guoguang Zheng & Dezhen Jin, *A Numerical Comparison Study of Cloud Seeding by Silver Iodide and Liquid Carbon Dioxide*, 79 ATMOSPHERIC RES. 183, 184 (2006) (discussing how silver iodide creates "ice-forming nuclei").

323. Larson, *supra* note 10, at 764; *see also* Guo, Zheng & Jin, *supra* note 322, at 184.

and can extend as far out as 100 miles downwind."[324] The technology is constantly evolving, yet significant "uncertainties remain in the deployment of cloud seeding technologies."[325] "Whether cloud seeding is a viable option for enhancing precipitation depends in any given region largely on how well it could work in" that area.[326] "Studies show that seeding is effective" in some instances and can produce "an additional 5–25% precipitation from clouds," but the research on cloud seeding efficacy is still developing.[327]

Still, there are significant obstacles to cloud seeding beyond simply its largely untested efficacy. "Ecological concerns have heightened the barriers to the deployment of cloud seeding," including the potential for bioaccumulation of silver iodide in the environment.[328] Additionally, "the image of aircraft blazing through the atmosphere and cannons" firing on the peaks of mountains creating huge plumes of silver iodide understandably raises environmental concerns.[329] Cloud seeding also raises other concerns for human safety. For example, following the U.S. military's use of "cloud seeding as a tactical weapon . . . in Vietnam,"[330] the international community agreed to the International Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques of 1977 (ENMOD), banning the use of weather modification technology for warfare.[331] "The ratification of ENMOD and the supposed underlying efficacy of Operation Popeye indicate[] the potential for [damage by flooding due to] cloud seeding, including injuries, death, and property destruction."[332] Questions of causation and the allocation of liability associated with such damages would represent a significant challenge for how law might circumscribe the impacts of cloud seeding.[333] Additionally, it is not at all clear whether augmented water supplies from cloud seeding would qualify as

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324. Larson, *supra* note 10, at 764; *see also* Guo, Zheng & Jin, *supra* note 322, at 213–16; Virginia Simms, Comment, *Making the Rain: Cloud Seeding, the Imminent Freshwater Crisis, and International Law*, 44 INT'L LAW. 915, 919 (2010) (stating that precipitation can begin within 15 to 30 minutes).

325. Larson, *supra* note 10, at 764; *see, e.g.*, Daniel Rosenfield et al., *A Quest for Effective Hygroscopic Cloud Seeding*, 49 J. APPLIED METEOROLOGY & CLIMATOLOGY 1548, 1561 (2010).

326. Larson, *supra* note 10, at 764.

327. *Id.*; STEVEN M. HUNTER, U.S. BUREAU OF RECLAMATION, OPTIMIZING CLOUD SEEDING FOR WATER AND ENERGY IN CALIFORNIA 13, 18 (2007), http://www.energy.ca.gov/2007publications/CEC-500-2007-008/CEC-500-2007-008.PDF.

328. Larson, *supra* note 10, at 764.

329. *Id.* at 764–65.

330. *Id.* at 765; Noah Byron Bonnheim, *History of Climate Engineering*, 1 CLIMATE CHANGE 891, 893 (2010).

331. James R. Fleming, *The Climate Engineers*, 31 WILSON Q. 46, 55–56 (2007).

332. Larson, *supra* note 10, at 765; s*ee also* Fleming, *supra* note 331, at 55–56.

333. *See* Larson, *supra* note 10, at 775.

developed water or salvaged water, and therefore whether or not such water supplies would be subject to appropriation.[334] These questions would have to be answered before cloud seeding could be an effective avenue for RWMAs to mitigate their members' impacts on senior water rights holders.

The need for augmented water supplies may increase in the ensuing decades as drought continues and population increases. However, as discussed above, each augmentation source has its advantages and disadvantages. RWMAs will have to adapt as the technical, economic, and legal obstacles to each source change. In the meantime, RWMAs could invest in improved water efficiencies, and make use of the water escrow to purchase water rights for their members or to compensate senior right holders for impacts from their members on those senior rights.

C. Arizona Specialized Water Courts

Even with the escrow improving water markets, enhancing stream flows, and mitigating water rights losses, and even with the mitigation authority facilitating settlement of de minimis pumpers and clarifying subflow, adjudication institutions will still face resource and institutional constraints in resolving such a complex proceeding. One of the main sources of such constraints is the relative lack of expertise of most courts in issues of water rights, and their lack of resource necessary to manage the size of a proceeding like the GSA. To address these constraints, Arizona should institute and fund a specialized water court.[335]

The advantage of such a specialized court is that it has the resources and relative institutional competence to adjudicate within a field like water law that is highly technical, and requiring a high degree of expertise.[336] This approach has been taken in the fields of bankruptcy, tax, corporate law, and

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334. *Id.*

335. *See* Jeffrey W. Stempel, *A More Complete Look at Complexity*, 40 ARIZ. L. REV. 781, 833 (1998) (noting the role of court-appointed special masters in addressing highly complex problems outside of judicial expertise). *See generally* Jeffrey W. Stempel, *Two Cheers for Specialization*, 61 BROOK. L. REV. 67 (1995) (arguing the virtues of specialized tribunals).

336. *See* Charles G. Geyh, *Judicial Independence, Judicial Accountability, and the Role of Constitutional Norms in Congressional Regulation of Courts*, 78 IND. L.J. 153, 192 (2003) (discussing that opponents of the Commerce Court, a specialized tribunal, suggested that it did not have the "special expertise that was its raison de'tre"). *See generally* Emily Hammond Meazell, *Super Deference, the Science Obsession, and Judicial Review as Translation of Agency Science*, 109 MICH. L. REV. 733 (2011) (discussing the broad deference afforded by the judiciary to agency actions involving a high degree of scientific specialization).

patents.[337] The institutional competency of specialized courts does more than simply provide an informed adjudicator in a complicated dispute. It also protects the rights of the parties from arbitrary action by the executive.[338] Where a court reviewing executive action lacks field-specific competence relative to the executive agency it reviews, it typically defers to that agency's expertise, limiting the court's role as a check on executive power.[339] But where the court has sufficient relative expertise to effectively review de novo the actions of the executive, and particularly where those actions affect the management of critical resources, the court is more likely to provide an effective bulwark against executive overreach.[340]

The use of specialized tribunals in deciding cases involving natural resources is not without precedent. The U.S. Supreme Court often relies on special masters in cases involving interstate water disputes precisely because of their institutional competence.[341] Special masters play important roles in large general stream adjudications because of the high level of complexity, typically involving thousands of parties and technical evaluations of

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337. *See, e.g.*, Bryan T. Camp, *The Failure of Adversarial Process in the Administrative State*, 84 IND. L.J. 57, 125–26 (2009) (discussing the U.S. Tax Court's specialized procedures and its relative institutional competence); John J. Gibbons, *The Quality of the Judges is What Counts in the End*, 61 BROOK. L. REV. 45, 46 (1995) (noting the role of specialization in the Delaware Court of Chancery); Arti K. Rai, *Intellectual Property Rights in Biotechnology: Addressing New Technology*, 34 WAKE FOREST L. REV. 827, 843 (1999) (noting the institutional competence of the Court of Federal Claims in adjudicating intellectual property rights); Richard B. Saphire & Michael E. Solimine, *Shoring Up Article III: Legislative Court Doctrine in the Post CFTC v. Schor Era*, 68 B.U. L. REV. 85, 100 (1988) (noting the specialization of bankruptcy courts).

338. Robert M. Chesney, *Disaggregating Deference: The Judicial Power and Executive Treaty Interpretation*, 92 IOWA L. REV. 1723, 1763 (2007) (arguing that an overly-deferential judiciary driven by concerns of institutional competency can threaten the role the judiciary plays in checking the power of the executive).

339. *See* Chevron, U.S.A., Inc. v. Nat'l Res. Def. Council, Inc., 467 U.S. 837, 842–44 (1984) (holding that, where Congress has not spoken unambiguously in a statute, courts should defer to agency interpretations of statutes implemented by that agency unless the interpretation is unreasonable).

340. *See, e.g.*, Johnson v. California, 543 U.S. 499, 505–15 (2005) (holding that strict scrutiny, rather than deference, was appropriate in reviewing claims involving Constitutional rights); *see also* Eric Berger, *Individual Rights, Judicial Deference, and Administrative Law Norms in Constitutional Decision Making*, 91 B.U. L. REV. 2029, 2032 (2011) (arguing that judicial deference to executive agencies in cases involving individual constitutional rights is "inconsistent and inchoate" with its willingness to strike down legislative acts, where executive agencies are made up of unelected bureaucrats and legislators are elected).

341. *See* Anne-Marie C. Carstens, *Lurking in the Shadows of Judicial Process: Special Masters in the Supreme Court's Original Jurisdiction Cases*, 86 MINN. L. REV. 625, 648 (2002) (noting the role of special masters in interstate disputes). *See generally* Margaret G. Farrell, *Coping with Scientific Evidence: The Use of Special Masters*, 43 EMORY L.J. 927, 952–54 (1994) (noting the role of special masters in technical, complex, or specialized cases).

hydrologic models.[342] Similarly, the state of Colorado relies on special water courts to adjudicate water disputes, on the grounds of the expertise necessary to effectively adjudicate disputes involving water rights priority, water efficiency, and the reasonableness of water uses.[343] Evaluations of this system have commended it for its fairness, adaptability, and particularly for the high levels of expertise held by the judges.[344] The success has led calls for a similar approach in the adjudication of other disputes involving natural resources.[345] There is a connection between investing in the enhanced institutional competency of regulating or adjudicating institutions and the reduction of transactions costs to facilitate more efficient markets.[346]

"High transaction costs are the rule in water wars, where parties are numerous, claims are hotly disputed, and measurement is difficult . . . ."[347] "Cooperation [in sharing water resources and collaboration in water resource management] is difficult to attain due to collective action problems where individual rational behavior prevents optimal outcomes."[348] Aspects of the GSA process, such as the HSR, involve long periods of time, are resource intensive, and include many parties.[349] Inadequate resources for those state institutions involved in the GSA, including courts and ADWR, aggravate these high transaction costs. Duly-authorized and well-funded specialized courts will help reduce these transaction costs to make settlement, or at the very least determinations and filings, more efficient.[350]

These transaction costs can be further reduced by combining specialized water courts with additional reforms. First, de minimis water users should be

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342. *See* David H. Getches, *The Metamorphosis of Western Water Policy: Have Federal Laws and Local Decisions Eclipsed the States' Role?*, 20 STAN. ENVTL. L.J. 2, 32 (2001) (noting the role of special masters in Wyoming general stream adjudications); *see also* Farrell, *supra* note 341, at 953 (noting how courts may rely on special masters for "technical and scientific assistance in fact-finding, settlement facilitation, subject matter comprehension and the analysis of non-scientific data").

343. *See* Tom I. Romero, *Uncertain Waters and Contested Lands: Excavating the Layers of Colorado's Legal Past*, 73 U. COLO. L. REV. 521, 538–41 (2002) (noting the creation of Colorado's special water courts).

344. *Id.* at 540–41.

345. *See, e.g.*, Barbara Cosens, *Resolving Conflict in Non-Ideal, Complex Systems: Solutions for the Law-Science Breakdown in Environmental and Natural Resource Law*, 48 NAT. RESOURCES J. 257, 297 (2008).

346. Larson & Kennedy, *supra* note 4, at 1340–41.

347. Douglas Clement, *Water Wars*, FEDGAZETTE (July 1, 2003), https://www.minneapolisfed.org/publications/fedgazette/water-wars.

348. Larson & Kennedy, *supra* note 4, at 1368.

349. *See id.*

350. Rafael I. Pardo & Kathryn A. Watts, *The Structural Exceptionalism of Bankruptcy Administration*, 60 UCLA L. REV. 384, 424–25, 435 (2012).

exempted from adjudication.[351] Smaller subflow appropriators (those using a maximum of 10 acre-feet per year) could be excluded from adjudication of their water rights altogether, or at the very least allows an inexpensive route to settlement (including, in particular, participation in the mitigation authority option discussed above).[352] This would eliminate costs associated with adjudicating smaller claims, and avoid the potential inequities associated with compelling holders of minor water rights claims from forfeiting their rights even though such rights may have minimal impact on other users.[353]

For other small but non-de minimis users, an alternate inexpensive dispute resolution mechanism could be provided by the state.[354] For large claims (greater than 250 acre-feet), the specialized water court could remain the primary adjudicator of water rights. "These claims represent a small percentage of the total claims within [the GSA], but the majority of the total [quantity] of water in question."[355] "For small[er] claims (less than 250 acre-feet), a court-appointed mediator would [review] any objections to characterization of water rights made by any claimant, as published in the HSR" prepared by ADWR.[356] These claims can be further categorized based on stream sub-basin and type of water use.[357] The mediator in these cases should have a similarly "high level of institutional competence (a water rights expert), and could approve settlements between parties within a particular . . . sub-basin."[358] "The prioritization of institutional competency in adjudication authorities, so prominent in" other areas of law like tax, intellectual property, or bankruptcy law, "has precedent in water law in the specialized water courts relied on in Colorado."[359] Most critical for this specialized mediation "would be the authority of the mediator to recommend, and the [specialized] court to

351. Larson & Kennedy, *supra* note 4, at 1368.

352. *Id.*

353. *Id.*

354. *Id.*

355. *Id.* at 1369–70; *see* Feller, *supra* note 93, at 432–33 (arguing in favor of a system that resolves "actual disputes" rather than comprehensive "determination[s] of all waters rights in a stream system"); *see also* Thomas H. Pacheco, *How Big Is Big? The Scope of Water Rights Suits Under the McCarran Amendment*, 15 ECOLOGY L.Q. 627, 654 (1988) ("[T]here are arguments supporting the exclusion of small uses. From the states' point of view, it is not sound public policy to require users of de minimis amounts of water to subject themselves to the vagaries of a full-blown general stream adjudication.").

356. Larson & Kennedy, *supra* note 4, at 1369.

357. *Id.*

358. *Id.*

359. *See id.*; Laura Ziemer, Stan Bradshaw & Meg Casey, *Changing Changes: A Road Map for Montana's Water Management*, 14 U. DENV. WATER L. REV. 47, 90 (2010).

approve, settlement of non-federal water rights claims" through a procedure approved by the court.[360]

The challenge of implementing this reform can be the higher cost of such specialized courts and mediators.[361] However, procedural reforms can reduce costs to provide for efficient adjudication.[362] These include required disclosures held in a publicly accessible data-base, limits on participation of third parties not directly involved in the dispute, and cost-sharing and fee structures directed at lowering the cost of expert engineers and economists as witnesses and consultants.[363] The potentially higher costs of specialized courts have not precluded the implementation of that approach in tax, bankruptcy, and intellectual property. It should not be any greater an obstacle in the equally important realm of public utility regulation.

These specialized tribunals should review agency decisions impacting the positive right to public utilities de novo, with authority to award damages and issue equitable and declaratory relief. Critically, a positive right to public utilities should be combined with stakeholder rights to participate in the formulation of water, sanitation, and energy policy that are similarly enforceable by specialized tribunals.[364] The courts should be independent of the executive, and provide oversight of agency adjudication of utility disputes. By establishing specialized courts, the positive right to public utilities will not simply be an aspirational statement for executive agencies that avoid effective judicial review because of their relative institutional competence, but will be a right that can be enforced by judges capable of the complex balancing of economic, financial, ecologic, and public health interests.

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360. Larson & Kennedy, *supra* note 4, at 1369.

361. David M. Getches, *Foreword* to P. ANDREW JONES & TOM CECH, COLORADO WATER LAW FOR NON-LAWYERS, at x (2009) (finding the costs associated with specialized water courts in Colorado "troubling").

362. Charles W. Howe, *Reconciling Water Law and Economic Efficiency in Colorado Water Administration*, 16 U. DENV. WATER L. REV. 37, 39–40 (2013) (proposing reforms to enhance the efficiency of the Colorado water courts system).

363. *See id.*

364. Larson & Kennedy, *supra* note 4, at 1371–1378 (arguing for participation rights in water guaranteeing access to stakeholder processes relating to rate-setting, access, quality, and financing).

IV. CONCLUSION

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Some of humanity's greatest innovations—indeed, the innovation of civilization itself—are born out of the harsh conditions of desert life and water scarcity. Arizona has demonstrated time and again that it can adapt and innovate to meet these challenges, from prior appropriation and the development of dams, to resolving disputes over the Colorado River, to more effectively managing groundwater. But often our enthusiasm for innovation in water law, technology, and policy leads to a failure to set appropriate priorities. For example, our understandable enthusiasm for economic growth and development of our communities may lead to development that outstrips the pace of our water policy, or fails to properly account for the wisdom of current water laws. Such is arguably the case with the ongoing Sierra Vista controversy. The desire to facilitate development like Tribute may lead to prioritizing investments in water conservation technology or water augmentation to stimulate growth, rather than the more critical priority—clarity.

Arizona's water policy priorities should be (1) clarity; (2) conservation; and (3) if necessary, augmentation. Clarity means the resolution of the GSAs so that developers, industries, tribes, communities, and national parks can effectively plan based on known priorities and quantities of water. That clarity will allow a more efficient water market, facilitated by the water escrow, to make our water management more adaptable. The RWMA will make our water policy more equitable by making it possible for small pumpers to avoid losing their water rights entirely while still honoring the priority of senior right holders. And specialized water courts will expedite resolution of the GSA, and therefore provide clarity in our water policy through increased institutional competency. Once there is greater clarity in water rights, Arizona can then know how much to invest in water conservation, and when and whether to invest in water augmentation. Unclouding Arizona's water future through resolution of the GSA will help avoid controversies like that in Sierra Vista and lead to another bright era in the proud history of thoughtful water management in the state.