Bankrupt Rivers

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Bankruptcy proceedings and water rights adjudications, perhaps surprisingly, share similar characteristics: there is a pool of resources to which multiple parties have legal claims, there are more claims to the pool than there are available resources, and the priority of those claims are sorted according to the date the claim was originally made. General stream adjudications involve state courts adjudicating the relative priorities and apportionment of all water rights claimants over a river basin, including the rights of Native American tribes, cities and towns, mines, industries, utilities, and farms. These adjudications often involve tens of thousands of parties, cost hundreds of millions of dollars, and last for decades. As the western United States copes with continuing drought conditions, the uncertainty and acrimony of general stream adjudications present a major obstacle to water resource management and drought resilience. This Article first describes the obstacles that make general stream adjudications the protracted and contentious affairs they are. It then relies on the economic theories underlying bankruptcy law to propose reforms to facilitate equitable and efficient resolution of general stream adjudications. These reforms include: (1) lowering transaction costs through more efficient dispute resolution; (2) avoiding hold-outs by implementing improved water resource management; and (3) increasing available water for claimants and the environment through water markets.

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INTRODUCTION

Scarcity and conflict often go hand in hand.[1] In no aspect of law or policy is this relationship more starkly exhibited than in general stream adjudications.[2] General stream adjudications are state court proceedings in which all water rights within a river basin are adjudicated to determine who holds rights to how much water, for what uses, and in what relative priority.[3] General stream adjudications often involve thousands of parties, including cities, towns, farms, national parks, Native American tribes, military bases, mines, power plants, utilities, and claims for water for the environment.[4] As the West faces continuing drought conditions, threatening the environment and the economy, the outcomes of general stream adjudications take on potentially tremendous significance.[5] This Article argues that reimagining general stream adjudications through the lens of bankruptcy law and theory will lead to more efficient and equitable resolution of these important court proceedings.

A general stream adjudication is in many ways like bankruptcy.[6] In bankruptcy, there is a pool of resources to which multiple parties have a legal claim.[7] Those claims are sorted based on priority, which is

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[1] *See generally* THOMAS F. HOMER-DIXON, ENVIRONMENT, SCARCITY, AND VIOLENCE (1999); *see also* James L. Huffman, *The Federal Role in Water Resource Management*, 17 N.Y.U. ENVTL. L.J. 669, 669 (2008) (invoking the quote often attributed to Mark Twain — "[W]hiskey is for drinking, water is for fighting over").

[2] *See generally* John E. Thorson et al., *Dividing Western Waters: A Century of Adjudicating Rivers and Streams, Part II*, 9 U. DENV. WATER L. REV. 299 (2006) [hereinafter *Dividing*] (reviewing water supply conflicts in the West).

[3] *See, e.g.*, Joseph M. Feller, *The Adjudication That Ate Arizona Water Law*, 49 ARIZ. L. REV. 405 (2007) (providing an overview of the ongoing difficulties associated with resolving the general stream adjudications in Arizona).

[4] *See* Kristin Carden, *Bridging the Divide: The Role of Science in Species Conservation Law*, 30 HARV. ENVTL. L. REV. 165, 251 & n. 606 (2006); A. Dan Tarlock, *Putting Rivers Back in the Landscape: The Revival of Watershed Management in the United States*, 6 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 167, 177-78 (2000).

[5] *See* Robert Glennon, *Water Scarcity, Marketing, and Privatization*, 83 TEX. L. REV. 1873, 1888 (2005) (noting that unquantified water rights disrupt effective water markets which can be an essential tool for addressing water scarcity).

[6] *See* Christine A. Klein, *Water Bankruptcy*, 97 MINN. L. REV. 560, 598, 607 (2012) [hereinafter *Water Bankruptcy*] (drawing an analogy between water overallocation and bankruptcy and explaining the concept of "water bankruptcy" as a guide for parties in voluntary, stakeholder negotiations).

[7] Donald R. Korobkin, *Rehabilitating Values: A Jurisprudence of Bankruptcy*, 91 COLUM. L. REV. 717, 736 (1991) (describing the conditions under which bankruptcy law operates).

determined by the date the claim was originally made.[8] Bankruptcy attempts to address some of the problems that arise when there are more claims than available resources.[9] Similarly, a general stream adjudication involves a pool of resources to which multiple parties have legal claims prioritized by date, but the pool (in this case, the river) cannot satisfy all legal claims.[10] In most western states, water rights are governed by the law of prior appropriation, which is similar to debtor-creditor law in that claims are prioritized based on "first-in-time, first-in-right."[11] Given these similarities, bankruptcy can provide insights into how general stream adjudications can function more effectively.

Take, for example, the general adjudication of all rights to the Gila River in Arizona. The adjudication of rights to the Gila River has languished for decades, involving tens of thousands of parties and leaving tribes, municipalities, industries, and farms under a cloud of uncertainty with respect to the validity and relative priority of their water rights.[12] Many more parties have claims to the river than the river can support, with more and more claims being made each year.[13] In effect, the Gila River is "bankrupt" — there are more legal claims to the resource than the resource can satisfy.

When there are more claims from creditors than there are resources held by the debtor, there are three possible approaches before considering bankruptcy.[14] The first could be to simply increase the debtor's resources, which could occur in several ways, including making more credit available to the debtor or the debtor winning the lottery.[15] This first approach would satisfy the debtor and creditors. However, additional resources may not be available. After all, if

[8] *See generally* Harry M. Flechtner, *Inflatable Liens and Like Phenomena: Converting Unsecured Debt Under U.C.C. Article 9 and the Bankruptcy Code*, 72 CORNELL L. REV. 696, 697 (1987) (discussing implications of U.C.C. Article 9 priority rules in after-secured obligations).

[9] *See generally* Donald R. Korobkin, *The Role of Normative Theory in Bankruptcy Debates*, 82 IOWA L. REV. 75, 103-21 (1996) (summarizing the normative underpinnings of bankruptcy law).

[10] *See* 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, 569 (1994).

[11] *See* Rhett B. Larson, *Interstitial Federalism*, 62 UCLA L. REV. 908, 921 (2015).

[12] *See generally* Feller, *supra* note 3 (evaluating the history and prospects of the Gila River Adjudication).

[13] *Id.*

[14] For a general discussion of different strategies for addressing debtor/creditor disputes, see Hon. Robert D. Martin, *Further Thoughts on Basic Bankruptcy*, 51 CONSUMER FIN. L. Q. REP. 6 (1997).

[15] *See, e.g.*, Steven L. Schwarcz, *The Easy Case for the Priority of Secured Claims in Bankruptcy*, 47 DUKE L.J. 425, 453-55 (1997).

additional resources were readily available, the debtor would likely not have been considering bankruptcy in the first place.

The second possible approach is to simply satisfy the claims of those creditors with the highest priority, and leave those with the lower priority unsatisfied.[16] On the one hand, this approach satisfies the parties' reasonable expectations — the law clearly prioritizes the claims, and the lower priority debt is typically taken with notice of the higher priority debt as the value of the debt is adjusted accordingly. On the other hand, this may have inequitable or otherwise undesirable results, with individuals and businesses suffering simply because of their lower priority status. After all, priority of claim does not necessarily reflect public policy priorities.

The third approach is to declare bankruptcy, which provides a process whereby all creditors can potentially receive some, albeit incomplete, satisfaction, and the debtor can start more or less afresh. Bankruptcy proceedings are overseen by bankruptcy judges, who have the necessary expertise in the field to expeditiously handle objections and complicated facts.[17] Bankruptcy is not intended to address all issues associated with debtor-creditor relations. To the contrary, the main function of bankruptcy is to address high transaction costs and hold-outs. Bankruptcy proceedings should ideally lower transaction costs to help creditors overcome collective action problems.[18] Often, settling for less than owed is in the best collective interests of creditors, but high transaction costs prevent these creditors from effectively cooperating. Bankruptcy can force creditor hold-outs to accept settlement, and thereby prevent such hold-outs from precluding Pareto-optimal resolution of the dispute by insisting on full satisfaction to the detriment of other claimants.[19] Apart from these two functions, bankruptcy also aims to provide the debtor with a fresh start by forgiving debts and incentivizing productivity.[20]

Efforts to address water scarcity can take three similar approaches. First, water supplies can be augmented through importation,

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[16] *See* Anthony J. Casey, *The Creditors' Bargain and Option-Preservation Priority in Chapter 11*, 78 U. CHI. L. REV. 759, 771-72 (2011).

[17] *See* Thomas E. Carlson, *The Case for Bankruptcy Appellate Panels*, 1990 BYU L. REV. 545, 558.

[18] *See* Jonathan Sedlak, Comment, *Sovereign Debt Restructuring: Statutory Reform or Contractual Solution?*, 152 U. PA. L. REV. 1483, 1494 (2004).

[19] *See id.* at 1494-95.

[20] Nicholas L. Georgakopoulos, *Bankruptcy Law for Productivity*, 37 WAKE FOREST L. REV. 51, 55-56 (2002).

purchase, or by technological means, like desalination.[21] Augmentation has the potential to avoid the typical zero sum game of water apportionment, but additional supplies might not be available or if they are, they are very costly to secure.[22] Second, the water rights of senior priority holders can be fully satisfied, leaving nothing for low priority right holders.[23] This effectively satisfies the legal requirements of prior appropriation law.[24] However, the priorities of right holders are not necessarily the same as the priorities of society,[25] and as such, municipalities, the environment, farmers, or large employers could lose critical water supplies because they have low priority rights. Finally, a state could engage in a bankruptcy-like proceeding that would allow partial satisfaction for many or all right holders by increasing the institutional competency of adjudicating authorities, lowering transaction costs, and avoiding hold-outs to settlement.[26]

With these three approaches to resolving debtor/creditor disputes in mind, this Article proceeds in three parts. Part I provides the necessary background on general stream adjudications and the reasons rivers go bankrupt, using Arizona's Gila River Adjudication as an illustrative example. Part II explains the reasons general stream adjudications devolve into prolonged and ineffective proceedings. These reasons include some of the same problems in debtor/creditor disputes addressed in bankruptcy, including lack of judicial expertise, high transaction costs, and hold-outs.

Importantly, in bankruptcy, parties may often know if they will receive less than they are owed.[27] Under a prior appropriation regime, parties can expect their respective priority dates to be honored, with senior right holders understandably expecting to be fully satisfied, or

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[21] *See, e.g.*, Rhett B. Larson, *Innovation and International Commons: The Case of Desalination Under International Law*, 2012 UTAH L. REV. 759 [hereinafter *Innovation*] (discussing the viability of desalination as a water supply augmentation tool).

[22] *See generally id.* (discussing the difficulties in securing supplies due to hydropolitics).

[23] Craig Anthony Arnold, *Adaptive Water Law*, 62 U. KAN. L. REV. 1043, 1057-58 (2014).

[24] *Id.*

[25] *See id.* at 1057.

[26] *See infra* Part III; *see also* Klein, *Water Bankruptcy*, *supra* note 6, at 598-608 (discussing how bankruptcy-derived principles can be used to resolve water overallocation conflicts).

[27] *See, e.g.*, James W. Bowers, *The Fantastic Wisconsylvania Zero-Bureaucratic-Cost School of Bankruptcy Theory: A Comment*, 91 MICH. L. REV. 1773, 1783 n.43 (1993); Laura Femino, *Ex Ante Review of Leveraged Buyouts*, 123 YALE L.J. 1830, 1842 (2014); Andrew J. Nussbaum, Comment, *Insider Preferences and the Problems of Self-Dealing Under the Bankruptcy Code*, 57 U. CHI. L. REV. 603, 621 (1990).

at least satisfied as much as possible before considering junior right holders.[28] Despite this significant difference between bankruptcy and stream adjudications, the aims of bankruptcy — institutional competency, lowered transaction costs, and avoiding hold-outs — should be the same as those of general stream adjudications given their fundamental similarities, and those shared aims could mean that general stream adjudications could be improved by importing some concepts from bankruptcy. To achieve these shared aims, Part III proposes three broad categories of reforms, based on the three approaches to resolving debtor/creditor disputes. Some of these reforms apply to the adjudication processes themselves, while others apply to the management of water rights after a decree is issued. Such post-decree reforms, while not necessarily part of the adjudication process, may be necessary to provide some comfort to parties reluctant to settle water rights claims that those claims will have value, and any lost claims can be mitigated, even when an adjudication is over.

The first category of reforms is aimed at lowering transaction costs to overcome collective action problems in water rights adjudications. This would be achieved by dividing claims into categories based on amount of water claimed and uses, with inexpensive and efficient mediation processes available for smaller water rights claimants. The mediation process would be made less expensive by having state agencies prepare a simplified catalog of claims within a sub-basin, called a Hydrographic Survey Report ("HSR"). Objections to the HSR by smaller appropriators would then be addressed, mediated, and settled by a water rights mediator with specialized water law knowledge, comparable to the water courts used in Colorado.[29] This would align general stream adjudications more closely with bankruptcy courts by ensuring that there is an appropriate level of institutional competence to handle complicated water law and facts.[30] Courts would have authority to approve non-federal water rights settlements made through the expedited mediation and HSR process for smaller claimants. The HSR would be improved by reliance on tax

[28] *See* Gregory J. Hobbs, Jr., *Priority: The Most Misunderstood Stick in the Bundle*, 32 ENVTL. L. 37, 41 (2002).

[29] *See* 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, 297-300 (2008) (evaluating the impact of specialization in Colorado's water courts).

[30] *See* Yichuan Wang, *Courting Colorado's Water Courts in California to Improve Water Rights Adjudication? Letting Go and Improving Existing Institutions*, 15 VT. J. ENVTL. L. 538, 547-49 (2014) (discussing the pros of Colorado water courts).

parcel numbers and a Geographic Information System ("GIS") approach to notification of claims. This improved notification system is based on the approach taken in general stream adjudications in Montana.[31]

The second category of reforms would be improved water resource management with a bankruptcy-like approach aimed at avoiding hold-outs in water settlements. "Hold-outs," for purposes of this Article, mean parties that can prevent settlement of competing claims by refusing to negotiate and insisting instead on full adjudication of rights, even where a settlement would be Pareto-optimal. This approach addresses one of the most vexing problems in many general stream adjudications — the bifurcated management of surface water and groundwater.[32] Some states have separate water rights regimes for surface water and groundwater, despite the fact that there is no defensible line between the two sources, which are in near constant hydrologic communication.[33] As such, much of the effort in general stream adjudications is devoted to deciding whether or not a claimant should even be a party to a stream adjudication, which ostensibly only addresses surface water rights.[34] Some wells pump "subflow," which is underground water that flows through the loose sand and gravel of the river bed, and thus is legally classified as surface water.[35] Improved water resource management would grandfather in subflow appropriators by establishing a priority date, use, and quantity of the right if the claimant had no reason to suspect at the time of appropriation that they were appropriating surface water. *De minimis* subflow appropriations — a single well owned by a single claimant with a pumping capacity of ten acre feet per year or less — would be exempt from management. All other subflow appropriations would be subject to prior appropriation law, including loss of water rights for lower priority claimants. The grandfathered rights would be subject to objection by classes of claimants grouped based on sub-basin, type of

[31] *See* H.B. 39, 60th Leg., Reg. Sess. (Mont. 2007).

[32] *See* Glennon & Maddock, *supra* note 10, at 570-74 (detailing the problems of bifurcation in Arizona's adjudications); Thorson et al., *Dividing*, *supra* note 2, at 356 (highlighting that Oklahoma, which has a bifurcated system, encounters disputes regarding the hydrological connection).

[33] Glennon & Maddock, *supra* note 10, at 574-84 (explaining general principles of hydrogeology); *see also* Allison Evans, *The Groundwater/Surface Water Dilemma in Arizona: A Look Back and a Look Ahead Toward Conjunctive Management Reform*, 3 PHOENIX L. REV. 269, 281-85 (2010) (discussing the challenges associated with Arizona's bifurcated water rights system).

[34] *See* Evans, *supra* note 33, at 272.

[35] *Id.* at 273.

use, and amount. So long as the majority of each class of claimants adversely affected by the grandfathered rights approves the *de minimis* designation and grandfathered subflow rights, those water rights will become valid. This approach has the potential to eliminate hold-outs and resolve the most significant ambiguity preventing settlement of water rights disputes.

The third category of reforms is aimed at improving water supplies through markets and technology. This includes implementing a water trust, through which water transfers would be made with an expedited approval process. The water trust approach is based on a concept developed in the state of Washington to improve availability of water for environmental purposes like salmon population preservation.[36] The trust would include water held back in escrow from each transaction for environmental in-stream flow preservation. Water held back in escrow would also be available at discounted prices for any claimants seeking to mitigate water rights lost through the adjudication. This hold-back concept is adapted from an approach taken by states to facilitate artificial groundwater recharge.[37] Water supplies could be further augmented as necessary through improved watershed management and implementation of desalination.

These three categories of reforms, based on the theories underlying bankruptcy law, will facilitate equitable and efficient resolution of general stream adjudications. That resolution will then lead to better management of water resources and improved drought resiliency. And like a debtor in bankruptcy, these bankrupt rivers may have a fresh start in achieving sustainable and collaborative management.

I. THE IMPORTANCE OF GENERAL STREAM ADJUDICATIONS

As growing populations and climate change place increasing stress on the already scarce water resources of the western United States, the outcome of general stream adjudications will become increasingly tied to the environmental integrity and economic health of the nation.[38] Some legal and historical foundation is required to fully grasp the significance of these water rights disputes and how the issues involved mirror those of debtor/creditor disputes. This Part provides the necessary background in western water law and illustrates the

[36] *See* WASH. REV. CODE § 90.42.005 (2015).

[37] *See* ARIZ. REV. STAT. §§ 45-801.01 to -898.01 (2016).

[38] *See* Janet C. Neuman, *Drought Proofing Water Law*, 7 U. DENV. WATER L. REV. 92, 96-98 (2003) [*Drought Proofing*]; *see generally* Robert W. Adler, *Climate Change and the Hegemony of State Water Law*, 29 STAN. ENVTL. L.J. 1 (2010).

challenges and importance of general stream adjudications using the example of Arizona's adjudication of all rights to the Gila River.

A. Western Water Rights and General Stream Adjudications

The eighteen western states in the United States utilize general stream adjudications to resolve competing water rights claims across a river basin.[39] Rivers and streams are critical sources of water for water users in the arid West as rainfall can be unpredictable in certain areas.[40] Water allocations in the West are based on the doctrine of prior appropriation.[41] Also called "first in time, first in right," the doctrine allocates water to users in order of priority, limited to the amount of water that can be put to beneficial use.[42] Prior appropriation grew out of the settlement of the West as large amounts of water were needed for uses like agriculture and mining.[43] Such amounts would inevitably impair downstream users.[44] With a sparsely populated West 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."[45] The doctrine provided certainty and encouraged the use of scarce western water resources without waste.

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[39] *See* ALASKA STAT. §§ 46.15.065–.169 (2016); ARIZ. REV. STAT. §§ 45-251 to -264 (2016); CAL. WATER CODE §§ 2000–2900 (2016); COLO. REV. STAT. §§ 37-92-101 to -602 (2016); IDAHO CODE ANN. §§ 42-1401 to -1428 (2016); KAN. STAT. ANN. §§ 82a-704a to -704c, -719 to -720, -724 to -725 (2016); MONT. CODE ANN. § 85-2-212 to -237, -243 to -271, -280 to -282 (2016); NEB. REV. STAT. ANN. §§ 46-226 to -231 (2016); NEV. REV. STAT. ANN. §§ 533.090–.320 (2016); N.M. STAT. ANN. §§ 72-4-13 to -19 (2016); N.D. CENT. CODE §§ 61-03-15 to -19 (2016); OKLA. STAT. ANN. tit. 82, §§ 105.6–.8 (2016); OR. REV. STAT. §§ 539.005–.350 (2016); S.D. CODIFIED LAWS §§ 46-10-1 to -8.1, (2016); TEX. WATER CODE ANN. §§ 11.301–.341 (2016); UTAH CODE ANN. §§ 73-4-1 to -24 (2016); WASH. REV. CODE ANN. §§ 90.03.110–.245 (2016); WYO. STAT. ANN. §§ 41-4-301 to -331 (2016).

[40] *See* Craig Anthony Arnold, *The Reconstitution of Property: Property as a Web of Interests*, 26 HARV. ENVTL. L. REV. 281, 309-10 (2002).

[41] Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63, 65 (2011).

[42] *Id.* at 86.

[43] Frank J. Trelease, *Coordination of Riparian and Appropriative Rights to the Use of Water*, 33 TEX. L. REV. 24, 28-29 (1954).

[44] *See* Ralph W. Johnson, *Public Trust Protection for Stream Flows and Lake Levels*, 14 UC DAVIS L. REV. 233, 257 (1980); Michael Toll, Comment, *Reimagining Western Water Law: Time-Limited Water Right Permits Based on a Comprehensive Beneficial Use Doctrine*, 82 U. COLO. L. REV. 595, 600 (2011).

[45] Toll, *supra* note 44, at 607.

Under the prior appropriation system, when river flows are insufficient to satisfy all rights, a senior appropriator will place a "call on the river."[46] The call forces junior appropriators to stop diverting until the senior's right is satisfied.[47] However, under the "futile call" doctrine a state will decline to cut off a junior appropriator if the water saved would not reach the senior user downstream — in other words, a futile call.[48]

As the western states continued to rapidly grow, the conflicts between water users and the need for a comprehensive proceeding to determine rights became more pronounced.[49] Interstate competition, federal-state tensions over water basins, the emergence of federal reserved rights, and energy requirements fueled the need for adjudications.[50] Additionally, problems arose within the prior appropriation system. Miners, settlers, and farmers established early prior appropriative rights through common-law notice, diversion, and use requirements, without paper records or a permit system. Even after western states established permit systems (or in Colorado, a water court system), water rights holders could put their rights at risk through reduced use, non-use, or waste. As such, what may appear to be a straightforward system to implement (first-in-time, first-in-right) is in reality highly nuanced and adversarial.

Before general stream adjudications, most disputes over water were two-party suits in equity for injunctive relief or suits for damages.[51] Over time, courts have had to adopt special procedures for multi-party litigation as water disputes rarely affect only two users.[52] While the goal of the common law courts was to "definitely award the respective rights to the parties to the action," the decrees often lacked specificity and finality.[53] Furthermore, the courts could not attain jurisdiction over the United States and its expansive claims to water.[54] Gradually,

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

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

[48] A. DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 5:33 (2015).

[49] *See* Holly Doremus & A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 ECOLOGY L.Q. 279, 285-86 (2003).

[50] *See* John E. Thorson, *State Watershed Adjudications: Approaches and Alternatives*, 42 ROCKY MTN. MIN. L. INST. 22-1, § 22.04 (1996) [hereinafter *State Watershed*].

[51] *Id.* § 22.02.

[52] *Id.*

[53] *Id.* (citation omitted).

[54] *See* Stephen M. Feldman, *The Supreme Court's New Sovereign Immunity Doctrine and the McCarran Amendment: Toward Ending State Adjudication of Indian Water Rights*,

states began to develop more comprehensive procedures to resolve conflicts among competing water users in the nineteenth century, but the inability to adjudicate federal or tribal rights clouded "the value and utility of all other water rights."[55] Particularly in the West, the federal government and Indian tribes have significant water claims. Federal land ownership is nearly fifty percent of the eleven coterminous western states,[56] and the majority of the fifty-six million acres of trust tribal land[57] is in the West.

In a major achievement for general stream adjudications, in 1952 Congress passed the McCarran Amendment which waived the sovereign immunity of the United States in cases determining "rights to the use of water of a river system or other source."[58] The Amendment requires adjudications to join a sufficient number of water uses, termed use comprehensiveness.[59] By allowing states to adjudicate federal water rights in state courts, the Amendment essentially made possible modern general stream adjudications.[60]

The method used for determining water rights for federal reserved land is different than that used for other water users. When the United States reserves public land for any use, including Indian reservations and national parks, it implicitly reserves water rights.[61] These rights are called *Winters* rights after the Supreme Court case *Winters v. United States*,[62] which established federal reserved water rights. The lands receive a reservation of the minimal amount of water sufficient to meet the primary purpose for which the reservation was established.[63] The "primary purpose" of Indian reservations is to

18 HARV. ENVTL. L. REV. 433, 439 (1994) (discussing how the immunity of the federal government frustrated state efforts to adjudicate water rights).

55 Thorson, *State Watershed*, *supra* note 50, § 22.03.

56 ROSS W. GORTE ET AL., CONG. RESEARCH SERV., FEDERAL LAND OWNERSHIP: OVERVIEW AND DATA 18 (2012), *available at* http://fas.org:8080/sgp/crs/misc/R42346.pdf.

57 RUBEN N. LUBOWSKI ET AL., U.S. DEP'T OF AGRIC., MAJOR USES OF LAND IN THE UNITED STATES, 2002, at 35-36 (2005), *available at* http://ers.usda.gov/media/250091/eib14_1_.pdf.

58 43 U.S.C. § 666 (2012).

59 Thorson et al., *Dividing*, *supra* note 2, at 366; *see also* 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.

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

61 Arizona v. California, 373 U.S. 546, 600-01 (1963); Winters v. United States, 207 U.S. 564, 577 (1908).

62 Winters v. United States, 207 U.S. 564 (1908).

63 Cappaert v. United States, 426 U.S. 128, 141 (1976); *see also* United States v.

establish a permanent homeland.[64] In order to quantify the amount of water necessary to achieve this purpose, courts have generally used the Indian reservation's practicably irrigable acreage or PIA.[65] However, the Arizona Supreme Court refused to use PIA as the only quantification method and included the consideration of factors like tribal culture, population, and water use plans.[66] Additionally, the priority date for reserved rights is time immemorial for aboriginal lands reserved[67] or the date the reservation was established.[68]

Although the process is long, the single adjudication creates a final determination of parties' water rights, preventing duplicative litigation and providing the state with centralized water use information.[69] Adjudications can be triggered by a variety of factors. States may have a lack of records on the rights in the watershed and need a proceeding to gather information.[70] During periods of drought, downstream users may face the prospect of receiving no water and request an adjudication to attempt to ascertain priority.[71] Additionally, the large un-quantified claims of federal reserved rights cast a shadow of uncertainty over all water rights users and can lead to cause for resolution.[72]

As comprehensive proceedings, general stream adjudications are time-consuming, resource-intensive, and lengthy, often spanning decades. A multitude of western states have large comprehensive adjudications underway. The adjudication of the Big Horn River Basin in Wyoming began in 1977, and was not completed until 2014, after a significant investment of public funds to the adjudication process.[73]

New Mexico, 438 U.S. 696, 718 (1978).

[64] *Winters*, 207 U.S. at 576-77.

[65] *Arizona*, 373 U.S. at 600-01. Included in calculating the PIA are total acreage, arability of the land, and engineering and economic feasibility. *See In re* Gen. Adjudication of All Rights to Use Water in Big Horn River Sys., 753 P.2d 76, 101-04 (Wyo. 1988), *aff'd*, Wyoming v. United States, 492 U.S. 406 (1989).

[66] *See In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, 35 P.3d 68, 78-80 (Ariz. 2001).

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

[68] *Cappaert*, 426 U.S. at 138.

[69] *See* Thorson et al., *Dividing*, *supra* note 2, at 369-70.

[70] *See* Sidney Ottem, *Quantifying Water Rights in General Stream Adjudications*, 133 J. CONTEMP. WATER RES. & EDUC. 10, 10 (2006) [hereinafter *Quantifying Water Rights*] (discussing the reasons for the commencement of the Washington Yakima River Basin Adjudication); Thorson et al., *Dividing*, *supra* note 2, at 305.

[71] *See* Ottem, *Quantifying Water Rights*, *supra* note 70, at 10.

[72] *See* Thorson et al., *Dividing*, *supra* note 2, at 305-06.

[73] Lawrence J. MacDonnell, *Prior Appropriation: A Reassessment*, 18 U. DENV. WATER L. REV. 228, 308 (2015).

The Snake River Adjudication in Idaho persisted for 27 years, and ended in August of 2014.[74] One example of an ongoing adjudication is the Gila River Adjudication in Arizona. Begun in 1976, over 40 years later it has yet to be resolved. Arizona's general stream adjudication of the rights to the Gila River illustrates the nature of the proceedings and array of challenges that arise, many common among western adjudications.

B. The Example of the Gila River Adjudication

The adjudication of water rights in the Gila River basin in Arizona is arguably the most complex and contentious piece of litigation in the history of the United States.[75] Claims over water rights in this basin have persisted for over a century. Today, there are over 38,000 parties with over 82,000 claims.[76] It is tantamount to a large class action, but instead of many small claimants with similar interests pitted against a single defendant or small group of defendants, it is every claimant pitted against every other claimant.[77] At stake in these adjudications is the sustainability and productivity of river basins that include critical habitat and endangered species, scarce water resources for growing desert communities and industries, sacred resources for indigenous peoples, and basic constitutional rights of property, due process, and equal protection.[78] If this case can be equitably and efficiently resolved, the implications for the global economy, the environment, and the resolution of similar large stream adjudications throughout the world are potentially enormous.

While technically just over 40 years old, the disputes underlying the Gila River Adjudication stretch back more than a century.[79] Court decrees and code enactments prior to the Adjudication have shaped its course. To understand the importance of the Adjudication, it is essential to know the appropriated river. Stretching nearly 600 miles across Arizona, the Gila River is the second largest river in Arizona

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[74] Clive J. Strong, *SRBA Retrospective: A 27-Year Effort*, 57 ADVOCATE 1, 28 (2014), *available at* https://isb.idaho.gov/pdf/advocate/issues/adv14novdec.pdf.

[75] *See generally* Feller, *supra* note 3 (providing a comprehensive overview of the Adjudication).

[76] *General Description of Adjudications Program*, ARIZ. DEP'T WATER RESOURCES (Dec. 21, 2015), http://www.azwater.gov/AzDWR/SurfaceWater/Adjudications/.

[77] Thorson et al., *Dividing*, *supra* note 2, at 447-48 (comparing general stream adjudications to class actions).

[78] *See generally* Feller, *supra* note 3 (noting the scope of parties and issues associated with the Gila River Adjudication).

[79] *Id.* at 405-06.

next to the Colorado.[80] The Gila River originates in southwestern New Mexico. It travels west through Arizona, north of Casa Grande, through the Gila River Indian Community and the Phoenix metropolitan area, and then southwest where it joins the Colorado River near Yuma.[81] The river drains nearly 60,000 square miles, totaling half the land in the state.[82] Almost every major river in Arizona flows into the Gila and about twenty percent of the water used in Arizona is from the Gila River and its tributaries.[83] The other eighty percent comes from the Colorado River and pumped groundwater.[84]

Issues relevant to the Adjudication stretch back to 1905 when P.T. Hurley, a farmer in the Salt River Valley,[85] filed suit to quiet title for the use of water needed to farm his land.[86] After the commencement of the suit, the United States intervened because a determination would be necessary for the then under construction Salt River Project by the Bureau of Reclamation and for the Indian tribe reservations in the valley.[87] The United States' intervention brought all landowners in the district in the valley served by canals on the north of the river into the adjudication.[88] Overall, 4,800 landowners were served with process.[89]

The decree, known as the "Kent Decree" after the territorial judge who rendered it, determined priority dates for 151,000 acres of irrigated non-Indian farmland from 1869 through 1909.[90] The decree also summarized the terms of the agreement between the United States and the Salt River Valley Water Users Association regarding stored waters in the Roosevelt reservoir. To "execute and carry out" the decree, a water commissioner was appointed to ascertain conditions, control, supervise, or regulate delivery, carriage, or distribution.[91]

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[80] JIM TURNER, ARIZONA: A CELEBRATION OF THE GRAND CANYON STATE 43 (2011).

[81] Feller, *supra* note 3, at 408.

[82] *The Gila River Featured as Arizona's River of the Month*, ENVTL. DEF. FUND (Aug. 29, 2012), https://www.edf.org/news/gila-river-featured-arizonas-river-month (describing the Gila River's feature as River of the Month).

[83] *See* Feller, *supra* note 3, at 409.

[84] *Id.*

[85] The Salt River is a tributary of the Gila River. *Id.* at 409-10.

[86] Hurley v. Abbott (*Kent Decree*), No. 4564, slip op. 1, 7 (Ariz. Terr. Ct. Mar. 1, 1910).

[87] Feller, *supra* note 3, at 410.

[88] *Kent Decree*, No. 4564, slip op. 1, at 7.

[89] *Id.*

[90] *Id.* at 8, 78.

[91] *Id.* at 16.

A few years after the Kent Decree, Arizona's surface water code was enacted on June 12, 1919.[92] The code provides the foundation for the determination of rights in the Adjudication. Prior to the code, a person could acquire a surface water right by applying the water to beneficial use and providing notice at the point of diversion. After the adoption of the code, a person was required to apply for and obtain a permit to appropriate surface water. Beneficial use is still the "basis, measure and limit to the use of the water" in the state.[93] It includes domestic, municipal, irrigation, stock watering, recreation, wildlife, water storage, and mining uses.[94] In order to perfect a surface water right one must apply for a permit[95] and, if approved, must begin construction of the diversion within two years and put the water to beneficial use within five years.[96] A person may then apply for a certificate of water right and upon "satisfaction of the director that an appropriation has been perfected and a beneficial use completed" must receive a certificate.[97] The code also created a procedure for the adjudication of water rights, although it was later altered.

In 1935, another decree affecting rights in the Gila River concluded. The United States District Court determined the rights for all diversions of the mainstem of the Gila River, its "confluence with the Salt River to the headwaters in New Mexico."[98] The case was brought by the United States in 1925 on behalf of the tribes and irrigators in the Florence-Casa Grande Irrigation Project and the San Carlos Irrigation Project.[99] The United States wanted to determine the Indian and non-Indian rights in anticipation of the completion of the Coolidge Dam on the San Carlos Apache Indian Reservation.[100] Brought in the Globe Division of the United States District Court for the District of Arizona, the decree became known as Globe Equity No. 59.[101]

The Gila River Adjudication began when the Salt River Valley Water Users' Association petitioned the Arizona State Land Department to

92 Feller, *supra* note 3, at 411.

93 ARIZ. REV. STAT. § 45-141(B) (2016).

94 *Id.* § 45-151(A) (2016).

95 *Id.* § 45-152(A) (2016).

96 *Id.* § 45-160 (2016).

97 *Id.* § 45-162(A) (2016).

98 Consent Decree, United States v. Gila Valley Irrigation Dist. (No. E-59-GLOBE, D. Ariz. June 29, 1935); *Water Supply of the Southeastern Arizona Planning Area — Surface Water*, ARIZ. DEP'T WATER RESOURCES (Mar. 27, 2014), http://www.azwater.gov/AzDWR/StatewidePlanning/WaterAtlas/SEArizona/PlanningAreaOverview/WaterSupply.htm.

99 Feller, *supra* note 3, at 414.

100 *Id.*

101 *Id.*; Consent Decree, *supra* note 98.

adjudicate the water rights in the Salt River above Granite Reef Dam in 1974.[102] A string of petitions followed suit.[103] The Salt River Project sought to determine rights in the Verde River and its tributaries, the Phelps Dodge Corporation sought an adjudication of rights in the mainstem of the Gila River, the ASARCO Corporation filed for a determination in the San Pedro River, and the Buckeye Irrigation Company intervened and petitioned to include areas of the Gila River watershed that were not included in previous filings along with portions of the Santa Cruz River watershed.[104]

In 1979, the statutory provisions for the adjudication of water rights by the state land department were repealed by the Arizona legislature and replaced with provisions that called for state trial courts to handle stream adjudications.[105] The Gila Adjudication was then transferred to the Maricopa County Superior Court.[106]

Jurisdictional challenges soon arose in the Adjudication. A few "Indian tribes filed actions in federal court seeking removal of the Adjudication to federal court, an injunction against adjudication of Indian water claims by the state court, and adjudication of the Indian claims in the federal court."[107] These actions culminated in the 1983 U.S. Supreme Court decision *Arizona v. San Carlos Apache Tribe*.[108] The Court found that while federal courts have jurisdiction to adjudicate Indian claims, state courts may also determine Indian water rights in a comprehensive state adjudication.[109] The case was remanded for a determination on whether the federal suit should be stayed or dismissed.[110] On remand, the Ninth Circuit Court of Appeals instructed the federal district courts to stay proceedings until the conclusion of the state court proceedings.[111] Additionally, the San Carlos Apache tribe and the Tonto Apache tribe brought suit in state court challenging the jurisdiction of the state to adjudicate their water

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[102] *Id.* at 417.

[103] *See id.*

[104] *Gila River and Little Colorado River General Stream Adjudications*, ARIZ. DEP'T WATER RESOURCES, http://www.azwater.gov/AzDWR/SurfaceWater/Adjudications/GilaRiverandLittleColoradoRiverGeneralStreamAdjudications.htm (last updated Mar. 27, 2014) (describing general stream adjudications).

[105] Feller, *supra* note 3, at 417.

[106] *Gila River and Little Colorado General Stream Adjudications*, *supra* note 104.

[107] Feller, *supra* note 3, at 419.

[108] 463 U.S. 545 (1983).

[109] *See id.* at 569-70.

[110] *Id.* at 570 n.21.

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

rights.[112] In 1985, the Arizona Supreme Court in a special action upheld the states' jurisdiction to adjudicate the Indian claims,[113] ultimately allowing the Adjudication to proceed.

In 1986, nearly twelve years after the filing of the petition for the Adjudication, the superior court moved forward with the adjudication. Judge Goodfarb, presiding over the Gila River Adjudication, established procedures and identified legal issues the court needed to address in order to continue.[114] To address some of the issues, Judge Goodfarb delivered a series of orders in 1988.[115] The Arizona Supreme Court then issued a Special Procedural Order for Interlocutory Appeals in 1989 allowing for appellate review of important legal decisions made by the trial court.[116]

In accordance with the order, the Arizona Supreme Court accepted six interlocutory appeal issues, but eventually vacated the sixth.[117] The remaining issues were reviewed in five court proceedings.

Gila I: The first issue was whether the service of summons and filing and service of pleadings comported with due process.[118] The Supreme Court found that the Department of Water Resources' procedures for publishing and mailing notice were constitutionally sufficient.[119]

Gila II: The second issue was over subflow — whether water underground was considered surface water or percolating groundwater.[120] If the water was surface water, then individuals would be subject to senior water rights. The Supreme Court considered whether a fifty percent/ninety day rule was the appropriate test to determine if the water was subject to appropriation.[121] The rule stated that percolating groundwater was appropriable if the volume of stream

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112 United States v. Superior Court, 697 P.2d 658, 661 (Ariz. 1985).

113 *See id.* at 674.

114 *See* Pre-Trial Order No. 1, *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, Nos. W-1, W-2, W-3, W-4 (Consolidated) (Ariz. Super. Ct. Maricopa Cnty. May 30, 1986).

115 Feller, *supra* note 3, at 419.

116 *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, Nos. W-1, W-2, W-3, W-4 (Consolidated) (Ariz. Maricopa Cnty. Sept. 26, 1989) (Special Procedural Order Providing for Interlocutory Appeals and Certifications).

117 *General Stream Adjudication: Interlocutory Appeals*, JUDICIAL BRANCH OF ARIZ., MARICOPA COUNTY, https://www.superiorcourt.maricopa.gov/SuperiorCourt/GeneralStreamAdjudication/interLocutoryAppeals.asp (last visited Nov. 15, 2015).

118 *In re* Rights to Use of Gila River (*Gila River I*), 830 P.2d 442, 444 (Ariz. 1992).

119 *Id.* at 455-56.

120 *See In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source (*Gila River II*), 857 P.2d 1236, 1238 (Ariz. 1993).

121 *Id.* at 1240.

depletion reached fifty percent or more of the total volume pumped during ninety days of continuous pumping.[122] Ultimately, the court determined that the test did not comport with prior case law and remanded the case.[123]

Gila III: In the third case, the court reviewed 1) whether federal reserved rights extend to groundwater when Arizona's bifurcated system does not subject groundwater to prior appropriation and 2) whether federally reserved rights holders are entitled to greater protection from groundwater pumping than surface water holders with rights under state law.[124] The court found that because the United States 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.[125]

Gila IV: In Gila IV the Court revisited the subflow issue after the trial court redefined subflow as the geological unit beneath and adjacent to the stream, or the "'saturated floodplain Holocene alluvium.'"[126] The trial court concluded that all wells located in the lateral limits of the subflow zone were subject to the adjudication and all wells located outside the zone were not.[127] However, a well outside the lateral limits of the zone would be included in the adjudication if the cone of depression from pumping reached a subflow zone and caused a loss of subflow.[128] Yet, wells pumping subflow that have a *de minimis* effect on the river may be excluded from the adjudication.[129] The Arizona Supreme Court affirmed the trial court's test.[130]

Gila V: The next issue was over what standard to apply when quantifying Indian tribes' water rights.[131] The court found that the purpose of an Indian reservation is to serve as a "'permanent home and abiding place.'"[132] The purpose of the reservation is limited by the concept of "minimal need," but the present and future needs of the

[122] *Id.* at 1239.

[123] *Id.* at 1247-48.

[124] *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).

[125] *Id.* at 751.

[126] *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).

[127] *Id.* at 1077.

[128] *Id.*

[129] *See id.* at 1081.

[130] *Id.* at 1083.

[131] *See 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).

[132] *Id.* at 76.

reservation as a livable homeland must be taken into account.[133] The court noted factors to consider in the quantification, including a tribe's history, culture, geography, topography, natural resources, economic base, past water use, and population.[134]

In the attempt to move the Adjudication along even further, in May 1991 the Arizona Supreme Court enacted a Special Procedural Order Providing for the Approval of Federal Water Rights Settlements, laying out the conditions upon which settlements may be made.[135] Since its enactment, a number of Indian water right settlements and judicial confirmations have been reached: Southern Arizona Water Rights Settlement Act of 1982, settling disputes with the San Xavier and Schuk Toak Districts and the Tohono O'Odham Tribe; 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 Water Rights Settlement Act of 1994; Zuni Indian Tribe Water Rights Settlement Act of 2003; Arizona Water Settlement Act of 2004, finalizing an agreement between the United States and Arizona for Central Arizona Project, settling disputes between the Gila River Indian Community and other parties, and settling litigation with the Tohono O'Odham Nation;[136] and White Mountain Apache Tribe Water Rights Settlement Act of 2010.[137]

At the same time as the Gila River Adjudication, an adjudication in the Little Colorado River was underway.[138] 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.[139] The endeavor showcases many of the challenges of general stream adjudications, including the preparation of the HSR and sheer number of parties.

The first report prepared in either adjudication, the HSR for Silver Creek was completed by the Arizona Department of Water Resources ("ADWR") in 1990.[140] During the 180-day objection period, 3,456

[133] *Id.* at 77.

[134] *Id.* at 79-80.

[135] *See* M. BYRON LEWIS, NEW ERA OF ARIZONA WATER CHALLENGES 10 (2014).

[136] *Id.* at 10-11.

[137] *Id.* at 11.

[138] *See* Pre-Trial Order No. 1, *In re* Gen. Adjudication of All Rights to Use Water in Little Colo. River Sys. & Source, No. 6417 (Ariz. Super. Ct. Apache Cnty. Apr. 24, 1987).

[139] Feller, *supra* note 3, at 421.

[140] *Id.*

objections were filed.[141] Objectors questioned ADWR's work in preparing the report and about the information associated with their water rights.[142] Farmers and ranchers became concerned about having to defend their rights against the thousands of objections and sought relief from the legislature.[143] The result was an amendment of the water code meant to streamline both Adjudications.[144] However, the provisions largely favored appropriative water rights and left others at a disadvantage, including the United States and Indian tribes.[145] Subsequently, the United States and several tribes challenged the amendments claiming that they violated the due process and separation of powers clauses in Arizona's constitution.[146] The Arizona Supreme Court eventually struck down many of the provisions, leaving the cumbersome adjudicatory process in place.[147]

Echoing a bankruptcy, the Gila River is the pool of limited resources and a multitude of parties have claims to it. With seemingly no end in sight, approaching the Adjudication as a bankruptcy proceeding, with three approaches lending toward a more efficient process, may provide the means to move forward and resolve the General Stream Adjudication.

C. Why General Stream Adjudications Matter

The process for resolving, and the actual resolution of, general stream adjudications has enormous significance beyond the water rights claimants involved. They provide the certainty needed to manage the state's water resources, facilitate water markets, promote economic development, and resolve political divisions. As with bankruptcy proceedings, general stream adjudications should ideally clarify property and contractual rights and obligations, and facilitate equitable settlements of disputes involving over-allocated resources. And just as bankruptcies, the clarification of water rights in adjudications can revive productivity.

The rights and responsibilities established or clarified by the adjudication process generate critical information for water resource

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141 *Id.*

142 *Id.*

143 *Id.*

144 *Id.*; *see* 1995 Ariz. Sess. Laws, ch. 9 (effective Mar. 17, 1995).

145 Feller, *supra* note 3, at 421-22.

146 *See* San Carlos Apache Tribe v. Superior Court, 972 P.2d 179, 188, 194 (Ariz. 1999).

147 *See id.* at 186.

management.[148] This information is important for the water department's daily tasks.[149] States cannot monitor the appropriations, diversions, and distributions of water without knowing the water supply and demand.[150] For example, to process new appropriations, a state should know whether water is available. Also, general stream adjudications provide the state with the information needed to plan for growth and drought; a state is better able to gauge how much water is available for future development or what steps must be taken to ensure a sufficient supply of water remains in a drought.[151] Additionally, it helps with enforcement of water rights during times of shortages.[152] During a drought, a water user may find the amount of water they previously used unavailable, causing a dispute to arise between users. The dispute may require the judicial process to ensure delivery. The state cannot help the user however if it does not know the users' validity, extent, and priority of the water right.

General stream adjudications should help facilitate water markets by clarifying property rights in water and avoiding externalities associated with over-appropriation. Markets function best when there are clearly assigned property rights, limited negative externalities, and low transaction costs.[153] Water markets may ultimately prove one of the most critical tools to achieving resiliency to extreme water variability associated with global climate change.[154]

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148 *See* Thorson, *State Watershed*, *supra* note 50, § 22.04.

149 *See* Thorson et al., *Dividing*, *supra* note 2, at 305; *see generally* Holly Doremus, *Scientific and Political Integrity in Environmental Policy*, 86 TEX. L. REV. 1601 (2008) (pointing out that good environmental policy requires knowing the available scientific evidence).

150 Thorson et al., *Dividing*, *supra* note 2, at 305.

151 *See generally* James M. McElfish, Jr. & Lyle M. Varnell, *Designing Environmental Indicator Systems for Public Decisions*, 31 COLUM. J. ENVTL. L. 45, 46-52 (2006) (providing an overview of the use of environmental indicators by public decisionmakers).

152 *See* Christopher L. Len, *Synthesis — A Brand New Water Law*, 8 U. DENV. WATER L. REV. 55, 73-74 (2004).

153 *See* Daniel C. Esty, *Toward Optimal Environmental Governance*, 74 N.Y.U. L. REV. 1495, 1507 (1999). *See generally* R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960) (discussing market transactions costs).

154 *See* PETER W. CULP, ROBERT GLENNON & GARY LIBECAP, SHOPPING FOR WATER: HOW THE MARKET CAN MITIGATE SHORTAGES IN THE AMERICAN WEST 13, *available at* http://waterinthewest.stanford.edu/sites/default/files/market_mitigate_water_shortage_in_west_paper_glennon_final.pdf; *see also* Carol M. Rose, *Property Rights and Responsibilities*, *in* THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY 49, 49 (Marian R. Chertow & Daniel C. Esty eds., 1997); Rhett B. Larson, *The New Right in Water*, 70 WASH. & LEE L. REV. 2181, 2221 n.212 (2013).

Knowing how much water is available is important for creating and encouraging economic development and improving water policy.[155] Water is an essential input in agriculture, mining, energy production, and other goods.[156] Businesses consider water resources when deciding where to locate or invest.[157] Uncertainty over water supplies jeopardizes job creation and social well-being. If the goal is to create a sustainable, well-functioning society, certainty on the water resources is needed.[158] Certainty is also vital to water policy. Water policy should have three primary goals. First, water policymakers must understand the water they have — who owns rights to the water, for what uses, in what quantities, and in what priorities. The function of general stream adjudications is to achieve this primary goal. The second priority is to conserve the water they have, with improved water efficiency, water banking, and recognition and respect for the value of in-stream flows. The third priority is increasing the water they have — through improved watershed management and water augmentation technology, like desalination. Achieving the second and third priority, however, requires first resolving general stream adjudications in order to know how best to conserve water and whether and how much water augmentation may be needed.

Furthermore, the resolution of the adjudication reduces the political divisions among urban/rural and tribal/non-tribal interests. Once water users' rights are confirmed, users may engage in more cooperative behavior with each other. For instance, with tribal rights quantified, tribes may decide to lease some of their water to non-Indian users.[159] Settlements associated with general stream

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[155] *See generally* Douglas A. Kysar, *Sustainable Development and Private Global Governance*, 83 TEX. L. REV. 2109 (2005) (using the example of water to explore conceptions of sustainable development).

[156] *See generally* Rhett B. Larson, *Reconciling Energy and Food Security*, 48 U. RICH. L. REV. 929 (2014) [hereinafter *Reconciling*] (evaluating how greater focus on water integrates concerns related to food and energy security because water is an essential input in both agriculture and energy exploration and generation).

[157] *See* Pilita Clark, *Water Shortages Pose Growing Risk for American Companies*, FIN. TIMES (Mar. 31, 2014, 4:55 PM), http://www.ft.com/intl/cms/s/0/6ceea5a6-b8c9-11e3-a189-00144feabdc0.html (highlighting the fact that water is a criterion for businesses in deciding where to locate).

[158] *See* Reed D. Benson, *Recommendations for an Environmentally Sound Federal Policy on Western Water, Delivered to the Western Water Policy Review Advisory Commission on April 30, 1997*, 17 STAN. ENVTL. L.J. 247, 255 (1998).

[159] The City of Phoenix in Arizona leases water from three Indian tribes. Brett Walton, *In Drying Colorado River Basin, Indian Tribes Are Water Dealmakers*, CIRCLE BLUE (July 1, 2015, 06:00 AM), http://www.circleofblue.org/waternews/2015/world/in-drying-colorado-river-basin-indian-tribes-are-water-dealmakers/.

adjudications have also brought in resources for infrastructure development and economic growth on tribal lands.[160] Economic growth and societal health can flourish when individuals work together. As general stream adjudications provide more than just a determination of water rights, the need to reexamine them and consider avenues of reform is critical to a state's long-term prospects.

General stream adjudications are therefore as important, if not more so, than bankruptcy. Of course, general stream adjudications are different than bankruptcy in important ways. A bankruptcy proceeding arguably functions more similarly to a class action, in that creditors align against a single debtor, just as a class aligns against a single defendant in a class action.[161] General stream adjudications, on the other hand, are *inter sese* — everyone against everyone.[162] Additionally, while priority in both bankruptcy and water rights is more complicated than simply "first-in-time, first-in-right," the complications arise in different ways. Water rights, for example, require beneficial use without waste in order to perfect an appropriative right (and often other administrative hurdles).[163] Bankruptcy, on the other hand, has a priority system that depends on the nature of the debt as secured or unsecured.[164] Yet despite these and other differences, both proceedings perform essential functions aimed at efficiently resolving disputes involving claims to an over-allocated resource, and the theories underlying bankruptcy law can inform why the adjudication process fails and how it can be reformed to succeed in improving water management.

II. THE FAILURE OF GENERAL STREAM ADJUDICATIONS

General stream adjudications each have unique challenges as diverse as the communities and ecosystems relying on western rivers. However, the complexity associated with an environmental and economic system

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160 *See* Barbara A. Cosens, *The Measure of Indian Water Rights: The Arizona Homeland Standard, Gila River Adjudication*, 42 NAT. RESOURCES J. 835, 867-68 (2002).

161 *See* John C. Coffee, Jr., *Class Wars: The Dilemma of the Mass Tort Class Action*, 95 COLUM. L. REV. 1343, 1355 (1995); *see also* Alan N. Resnick, *Bankruptcy as a Vehicle for Resolving Enterprise-Threatening Mass Tort Liability*, 148 U. PA. L. REV. 2045, 2059-60 (2000).

162 Thomas H. Pacheco, *How Big Is Big? The Scope of Water Rights Suits Under the McCarran Amendment*, 15 ECOLOGY L.Q. 627, 636 (1988).

163 *See* Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919, 923-24 (1998).

164 *See* Yair Listokin, *Is Secured Debt Used to Redistribute Value from Tort Claimants in Bankruptcy? An Empirical Analysis*, 57 DUKE L.J. 1037, 1053 (2008).

like a river basin, compounded by the sheer number of parties and claims, is a challenge common to virtually all general stream adjudications.[165] The challenge of complexity gives rise to high transaction costs that create the collective action problem water law shares with debtor/creditor law.[166] The value of water in arid regions like the West gives rise to the problem of hold-outs.[167] As with bankruptcy, claimants refuse to settle, even when not in their best interest, because of the real or perceived value of their claim.[168] Paradoxically, another challenge to resolving general stream adjudications in addition to the perceived high value of water rights is the degree to which many people take water for granted.[169] This Part relies on Arizona's Gila River Adjudication to illustrate these three obstacles to the efficient and equitable resolution of general stream adjudications: appropriate water valuation, hold-outs, and transaction costs.

A. The Challenge of Valuing Water in Stream Adjudications

Valuing water is inevitably a fraught enterprise. Adam Smith, in his seminal *The Wealth of Nations*, wrote of the water/diamond paradox.[170] There, Smith noted that water has a high use value, but low exchange value, while diamonds have a high exchange value, but low use value.[171] Plato phrased the issue more succinctly: "For it is the rare thing . . . which is the precious one, and water is cheapest, even though . . . it is the best."[172] There is life that survives without air and

165 *See* Pacheco, *supra* note 162, at 635.

166 *See generally* Charles W. Howe et al., *Transaction Costs as Determinants of Water Transfers*, 61 U. COLO. L. REV. 393 (1990) (analyzing transaction costs of water transfers).

167 *See* Gary D. Libecap, *Chinatown: Owens Valley and Western Water Reallocation — Getting the Record Straight and What It Means for Water Markets*, 83 TEX. L. REV. 2055, 2070 (2005).

168 *See* Mark J. Roe, *The Voting Prohibition in Bond Workouts*, 97 YALE L.J. 232, 247 (1987); Barton H. Thompson, Jr., *Markets for Nature*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 261, 272 (2000).

169 Jayne E. Daly, *From Divining Rods to Dams: Creating a Comprehensive Water Resource Management Strategy for New York*, 1995 PACE L. REV. 105, 106; Tom I. Romero, II, *The Color of Water: Observations of a Brown Buffalo on Water Law and Policy in Ten Stanzas*, 15 U. DENV. WATER L. REV. 329, 354 (2012).

170 ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS 28 (Edwin Cannan ed., Modern Library 1937) (1776).

171 *Id.*

172 Plato, *Euthydemus*, *in* PLATO: COMPLETE WORKS 708, 743 (John M. Cooper ed. & trans., Hackett Publ'g Co. 1997).

without sun, but water is the only true universal necessity of life.[173] Yet despite its status of universal necessity, to say nothing of its aesthetic and cultural significance, water is often undervalued.[174] Perhaps the most significant obstacle to resolving general stream adjudications is to appropriately value water.[175]

Undervaluing water may result in a failure to adequately fund courts, special masters, and regulatory agencies tasked with administering adjudication decrees and serving as the technical advisors to adjudicative courts.[176] Strained state budgets must necessarily prioritize expenditures. Politicians and their constituencies, falling victim to the same tendency to undervalue water, noted by both Plato and Smith, fail to adequately fund water rights adjudications.[177]

ADWR is a good example of this problem. ADWR is the technical arm of Arizona's general stream adjudications, providing expert opinions to the court and special master and administering the water rights regime in the state, including adjudication decrees.[178] Yet despite the prolonged nature of the general stream adjudications in the state and its impact on water management for desert communities, ADWR's budget has been dramatically reduced in recent years.[179] In 2008, ADWR received more than $22 million from the state budget, but by 2014, its funding had been reduced to $12 million and its staff reduced by forty percent.[180] Reduced funding to state agencies is not the sole cause of delays in general stream adjudications, as the proceedings have languished even when agency funding was at higher levels. But improved funding will be an essential component to

[173] *See* Christine A. Klein, *The Constitutional Mythology of Western Water Law*, 14 VA. ENVTL. L.J. 343, 352 (1995).

[174] *See* Larson, *Reconciling*, *supra* note 156, at 949-50.

[175] *See, e.g.*, Bonnie G. Colby, *Assessing the Value of Adjudications in a World of Uncertainty: An Economic Perspective*, 10 U. DENV. WATER L. REV. 327, 333 (2007).

[176] *See, e.g.*, Thorson et al., *Dividing*, *supra* note 2, at 379; *see also* David H. Getches, *The Metamorphosis of Western Water Policy: Have Federal Laws and Local Decisions Eclipsed the States' Role?*, 20 STAN. ENVTL. L.J. 3, 48-49 (2001).

[177] *See* 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/.

[178] *See* ARIZ. REV. STAT. § 45-256 (2016); *see also* Richard N. Morrison, *State and Federal Law in Conflict over Indian and Other Federal Reserved Water Rights*, 2 DRAKE J. AGRIC. L. 1, 7 (1997).

[179] *See* Ferris, *supra* note 177.

[180] *Id.*

expediting the process and would evidence appropriate prioritization of water management in the budgets of arid western states.

Even if water is prioritized in state and municipal budgets, it is often prioritized in ways that promote development and maintenance of infrastructure, rather than efficiently resolving water disputes and facilitating water markets.[181] While improving and maintaining water infrastructure is an important aim, prioritizing it above resolving water rights disputes is tantamount to building roads but having no licensing or registration requirements for cars. The infrastructure is there, but the very purpose of the infrastructure is undercut by a lack of a clear property rights regime and effective regulatory structure.

Perhaps the uniquely difficult issue of valuing water is one way in which general stream adjudications are different than bankruptcy. After all, bankruptcy deals principally with the simplest thing of all to value — money. On the other hand, bankruptcy laws may exist, at least in part, precisely to address the issue of valuation.[182] Comparing the relative value of different creditors' claims requires careful evaluation and a high degree of expertise.[183] This is particularly true of Chapter 9 municipal bankruptcies, where the court is dealing with claims from municipal bondholders, pensions, and debts impacting everything from education, to fire and police, to water infrastructure.[184] Bankruptcy courts have the requisite institutional competency to address the prioritization and valuation of each of these claims.[185] And bankruptcy courts have, in some instances, brought in external experts to augment their relative institutional competency.[186]

When general stream adjudication courts, special masters, and support agencies are underfunded, water disputes become a quagmire

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[181] *See* Robin Kundis Craig, *Adapting Water Federalism to Climate Change Impacts: Energy Policy, Food Security, and the Allocation of Water Resources*, 5 ENVTL. & ENERGY L. & POL'Y J. 183, 233 n.302 (2010).

[182] *See generally* Robert M. Lawless & Stephen P. Ferris, *Economics and the Rhetoric of Valuation*, 5 J. BANKR. L. & PRAC. 3 (1995) (discussing the centrality of valuation to bankruptcy law).

[183] *See* Anthony J. Casey & Julia Simon-Kerr, *A Simple Theory of Complex Valuation*, 113 MICH. L. REV. 1175, 1177 (2015) (highlighting the fact that valuation of assets is complex and requires experts).

[184] *See* David A. Skeel, Jr., *From Chrysler and General Motors to Detroit*, 24 WIDENER L.J. 121, 138 n.85 (2015); *see also* Clayton P. Gillette, *Fiscal Federalism, Political Will, and Strategic Use of Municipal Bankruptcy*, 79 U. CHI. L. REV. 281, 292 (2012).

[185] *See* Rafael I. Pardo & Kathryn A. Watts, *The Structural Exceptionalism of Bankruptcy Administration*, 60 UCLA L. REV. 384, 425-26 (2012).

[186] *See, e.g.*, Joseph Sanders, *From Science to Evidence: The Testimony on Causation in the Bendectin Cases*, 46 STAN. L. REV. 1, 70 (1993).

to efficient water management and effective water conservation.[187] The failure to adequately fund government officials and offices tasked with resolving general stream adjudications arises from the age-old problem of taking water for granted, and therefore undervaluing the most valuable resource, particularly for arid western states.[188] The lack of resources undermines what should be a primary function of general stream adjudications, and what is a primary function of bankruptcy courts — the development and maintenance of institutional competency to address critical and highly technical large-scale legal disputes.[189]

B. The Challenge of Hold-Outs in Stream Adjudications

The establishment of bankruptcy courts was, in part, aimed at addressing the related challenges of valuation and institutional competency plaguing general stream adjudications.[190] But an issue more central to the purpose of bankruptcy looms perhaps even larger in general stream adjudications. One of the central purposes of bankruptcy is to resolve the issue of hold-outs, a circumstance in which one creditor refuses to settle and thereby precludes efficient resolution of the broader dispute.[191] As with debtor-credit law, the unique challenges of hold-outs and collective action problems prevent equitable and efficient resolution of general stream adjudications.[192]

Parties hold out of settlement in both debtor-creditor disputes and in general stream adjudications for a host of legitimate and illegitimate reasons.[193] Hold-outs may see settlement as simply adverse to their

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[187] *See* Ferris, *supra* note 177; *see also* McElroy & Davis, *supra* note 60, at 612-13.

[188] *See* Susan D. Brienza, *Wet Water vs. Paper Rights: Indian and Non-Indian Negotiated Settlements and Their Effects*, 11 STAN. ENVTL. L.J. 151, 175 (1992).

[189] *See* Daniel J. Bussel, *Power, Authority, and Precedent in Interpreting the Bankruptcy Code*, 41 UCLA L. REV. 1063, 1086 (1994); *see also* Donald D. MacIntyre, *Quantification of Indian Reserved Water Rights in Montana:* State ex rel. Greely *in the Footsteps of* San Carlos Apache Tribe, 8 PUB. LAND L. REV. 33, 56 (1987).

[190] *See* Bussel, *supra* note 189, at 1083-89; *see also* Jon T. Alexander, *Issue Preclusion, Full Faith and Credit, and Default Judgments: A Dilemma for the Bankruptcy Courts*, 44 UCLA L. REV. 159, 185 (1996); Indraneel Sur, *Jealous Guardians in the Psychedelic Kingdom: Federal Regulation of Electricity Contracts in Bankruptcy*, 152 U. PA. L. REV. 1697, 1721 (2004).

[191] *See* Omer Kimhi, *Chapter 9 of the Bankruptcy Code: A Solution in Search of a Problem*, 27 YALE J. ON REG. 351, 355-56 (2010).

[192] *See generally* Thorson et al., *Dividing*, *supra* note 2; *see also* Feller, *supra* note 3, at 431-32.

[193] *See* Elizabeth Chamblee Burch, *Litigating Together: Social, Moral, and Legal Obligations*, 91 B.U. L. REV. 87, 99 (2011).

own interests, or may use the process as a means of extorting additional considerations not part of the hold-out parties' original legal claim.[194] Bankruptcy law is intended to avoid or eliminate hold-outs in resolving debtor-creditor disputes.[195] Without bankruptcy, creditors cannot have their claims reduced without their consent.[196] In that case, each creditor will strategically hold out for full satisfaction, even if they know that such satisfaction will depend on other creditors' agreeing to accept less than their legal claim.[197] This creates a collective action problem that bankruptcy law addresses by allowing two-thirds of the holders of a particular class of debt to bind dissenting hold-outs to an acceptable settlement.[198]

No such solution to the hold-out problem exists in water law, despite the prevalence of hold-outs in general stream adjudications and the comparable collective action problems posed by such cases.[199] The rationale for holding out as a strategy in water settlements is similar to that of debtor-creditor disputes — a collective action challenge arising from legitimate pursuits of full satisfaction of the legal claim or extortions of additional considerations.[200]

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194 *See* Adam Clanton, *Enforcing Individual Rights in an Industrial World: Legal Rules and Economic Consequences*, 4 GEO. J.L. & PUB. POL'Y 165, 191 (2006); *see also* Howard M. Erichson, *The Trouble with All-or-Nothing Settlements*, 58 U. KAN. L. REV. 979, 1011-12 (2010).

195 *See* Zohar Goshen, *Controlling Strategic Voting: Property Rule or Liability Rule?*, 70 S. CAL. L. REV. 741, 790 (1997).

196 *See* Robert K. Rasmussen & Randall S. Thomas, *Whither the Race? A Comment on the Effects of the Delawarization of Corporate Reorganizations*, 54 VAND. L. REV. 283, 288 (2001).

197 *See id.*; *see also* Emily D. Johnson & Ernest A. Young, *The Constitutional Law of State Debt*, 7 DUKE J. CONST. L. & PUB. POL'Y 117, 153 (2012) (noting the collective-action problem in bankruptcy).

198 Rasmussen & Thomas, *supra* note 196, at 288; *see also* 11 U.S.C. §§ 1122(a)–1126(c) (2012).

199 *See, e.g.*, Eyal Benvenisti, *Collective Action in the Utilization of Shared Freshwater: The Challenges of International Water Resources Law*, 90 AM. J. INT'L L. 384 (1996) (analyzing collective action problems in international water resources); *see also* Gregory A. Hicks & Devon G. Peña, *Community Acequias in Colorado's Rio Culebra Watershed: A Customary Commons in the Domain of Prior Appropriation*, 74 U. COLO. L. REV. 387, 448-49 (2003).

200 *See, e.g.*, Rasmussen & Thomas, *supra* note 196, at 288 (discussing the collective action problem in bankruptcy); Meredith K. Marder, Note, *The Battle To Save the Verde: How Arizona's Water Law Could Destroy One of Its Last Free-Flowing Rivers*, 51 ARIZ. L. REV. 175 (2009) (discussing the conflict over the Verde River with multiple parties with valid water rights).

The challenge of a bifurcated water rights system and the question of subflow delineation is, in many ways, a hold-out concern.[201] Consider the following hypothetical involving the adjudication of rights in a bifurcated system. In 1930, a farmer begins irrigating land relying on wells. These wells were drilled hundreds of meters from the ordinary high water mark of any stream. At the time, it would not have been possible for the farmer to secure a surface water right, with an associated priority date, for water pumped from these wells, because the surface water rights regime at the time required diversion from the stream. Now, eighty-five years later, monitoring and modeling suggest that the farmer's wells are pumping from within the subflow zone, and effectively appropriating surface water. Legally speaking, the farmer failed to file and perfect their surface water right. As such, the farmer has no water rights at all. Imagine the exact same scenario, but replace the farmer with a city or town.

These subflow appropriators, faced with the prospect of losing water rights that they have come to depend on, and to which they have an equitable (if not necessarily legal) claim, may have no choice but to hold-out unless and until their water rights are recognized as legitimate. This hypothetical scenario in fact describes the real world controversy leading to hold-outs in general stream adjudications.[202] Furthermore, many Native American federally-reserved water rights remain unquantified and unsettled in part because of the tribes' incentives to hold out of negotiated settlements.[203] Tribes may view settlements that fail to account for in-stream environmental flow protections, water quality, preservation of tribal sovereignty, improved water infrastructure and water resource development financing, and junior priority non-tribal water users as unacceptable, and therefore refuse to pursue settlement of their claims.[204] So long as tribal claims remain unsettled and unquantified, a cloud of uncertainty will persist over general stream adjudications that will hinder resolution.[205]

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[201] *See* J. David Aiken, *Hydrologically-Connected Ground Water, Section 858, and the* Spear T Ranch *Decision*, 84 NEB. L. REV. 962, 976-77 (2006) [hereinafter *Ground Water*]; *see also* Marder, *supra* note 200, at 190-92.

[202] *See* Marder, *supra* note 200, at 209; *see also* Christine A. Klein, *On Integrity: Some Considerations for Water Law*, 56 ALA. L. REV. 1009, 1065 (2005).

[203] *See* Celene Hawkins, *Beyond Quantification: Implementing and Sustaining Tribal Water Settlements*, 16 U. DENV. WATER L. REV. 229, 239 (2013).

[204] *See generally* Jesse Harlan Alderman, Winters *and Water Conservation: A Proposal to Halt "Water Laundering" in Tribal Negotiated Settlements in Favor of Monetary Compensation*, 31 VA. ENVTL. L.J. 1 (2013) (finding negotiated settlements to be bad public policy).

[205] *See generally* Amy Cordalis & Daniel Cordalis, *Indian Water Rights: How*

C. The Challenge of Transaction Costs in Stream Adjudications

Ultimately, the general stream adjudication breaks down because the law fails to properly recognize the inevitably fluid nature of water, and its invariably complex valuation amongst different communities, industries, and eras. The ludicrous legal fiction of a bifurcated system over surface water and groundwater, and the resulting subflow controversy, is a prime example of the costs of failing to understand water and integrate law with hydrology.[206] The confusion surrounding subflow has led not only to hold-outs, but the related challenge of high transaction costs.[207] It is difficult for claimants to know with whom they should negotiate settlements and water sharing and purchase agreements when it remains unclear who is in and who is out of general stream adjudications.[208] This uncertainty, aggravated by settlement hold-outs and a lack of quantification of federally-reserved rights, imposes extremely high transaction costs on adjudication claimants seeking settlement and resolution.[209]

The adjudication process often carries other unnecessarily high transaction costs. The HSR process involves extensive technical review and a protracted objection period that often results in confusion and contention, as was the case with the Silver Creek HSR.[210] Without a simple description of claims, too many parties are left to guess as the actual disputes at issue, or to expend resources challenging the HSR rather than adjudicating their claims.

Arizona v. California *Left an Unwanted Cloud over the Colorado River Basin*, 5 ARIZ. J. ENVTL. L. & POL'Y 333 (2014) (examining the problem of unquantified tribal claims in the Colorado River Basin).

[206] *See* L. William Staudenmaier, *Between a Rock and a Dry Place: The Rural Water Supply Challenge for Arizona*, 49 ARIZ. L. REV. 321, 325 (2007); *see also* J. David Aiken, *The Western Common Law of Tributary Groundwater: Implications for Nebraska*, 83 NEB. L. REV. 541, 546-50 (2004).

[207] *See* Colby, *supra* note 175, at 334.

[208] *See id.* at 333-35; *see also* Barton H. Thompson, Jr., *Uncertainty and Markets in Water Resources*, 36 MCGEORGE L. REV. 117 (2005) (evaluating the burden of uncertainty with respect to vested water rights on water resource management, water rights litigation, and water markets); Olivia S. Choe, *Appurtenancy Reconceptualized: Managing Water in an Era of Scarcity*, 113 YALE L.J. 1909, 1911-12 (2004) (noting the impact of uncertainty with respect to vested water rights on water markets).

[209] *See, e.g.*, Steven W. Strack, *Pandora's Box or Golden Opportunity? Using the Settlement of Indian Reserved Water Right Claims to Affirm State Sovereignty over Idaho Water and Promote Intergovernmental Cooperation*, 42 IDAHO L. REV. 633, 636-37 (2006); A. Dan Tarlock, *The Illusion of Finality in General Water Rights Adjudications*, 25 IDAHO L. REV. 271, 286-88 (1989) (describing how federal water rights complicate adjudications).

[210] *See* Feller, *supra* note 3, at 421-22.

Furthermore, transaction costs are increased where stream adjudications lack clear systems of notice to landowners that they may be parties to the adjudication. As property changes hands over a vast geographic area like a river basin, and over decades of time, maintaining appropriate levels of notice to all potential parties becomes increasingly difficult and costly.[211] Too often, parties are left guessing as to whether they even hold water rights, much less whether those rights are subject to the adjudication.[212] Ineffective notice both increases transaction costs due to uncertainty as well as underlines the importance of appropriate funding to agencies that maintain water rights databases and registries of wells and diversion points.

Perhaps no aspect of a general stream adjudication results in unnecessarily high transaction costs more so than the adjudication of rights held by *de minimis* water users and users that could equitably and efficiently settle out of the adjudication but for high legal costs and inability to coordinate with so many parties.[213] Often general stream adjudications lack necessary inexpensive dispute resolution mechanisms for small appropriators or fail to exclude *de minimis* users who have no impact on stream flows or senior right holders.[214]

Finally, transaction costs in the narrow sense of the phrase present a very real obstacle to the efficient resolution of general stream adjudications. It is simply too complicated and expensive to engage in water rights transactions in many parts of the country.[215] The

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[211] *See, e.g.*, Pacheco, *supra* note 162, at 659; *see also* Sidney P. Ottem, *The General Adjudication of the Yakima River: Tributaries for the Twenty-First Century and a Changing Climate*, 23 J. ENVTL. L. & LITIG. 275, 290 (2008).

[212] *See, e.g.*, Craig Adams, *The Nevada Supreme Court Determines Free Alienation of a Water Right Irrespective of the Land on Which a Party Uses that Water Right:* Adaven Management, Inc. v. Mountain Falls Acquisition Corporation, 13 U. DENV. WATER L. REV. 179 (2009).

[213] *See, e.g.*, Sean E. O'Day, San Carlos Apache Tribe v. Superior Court*: Rejecting Legislative Favoritism in Water Right Allocations*, 4 U. DENV. WATER L. REV. 29, 31, 52 n.166 (2000) (describing the Arizona Legislature's attempts to address concerns for costly and lengthy adjudications, including an exception for *de minimis* water users).

[214] *See, e.g.*, Barbara Cosens, *Water Dispute Resolution in the West: Process Elements for the Modern Era in Basin-Wide Problem Solving*, 33 ENVTL. L. 949 (2003) (discussing the need for, and proposing, criteria to evaluate and improve the cost effectiveness of water rights dispute resolution mechanisms); McElroy & Davis, *supra* note 60, at 623 n.204; Janet C. Neuman, *Run, River, Run: Mediation of a Water-Rights Dispute Keeps Fish and Farmers Happy – For a Time*, 67 U. COLO. L. REV. 259, 294-95 (1996) (noting the need for inexpensive dispute resolution mechanisms in water rights disputes).

[215] *See, e.g.*, Charles W. Howe, *Reconciling Water Law and Economic Efficiency in Colorado Water Administration*, 16 U. DENV. WATER L. REV. 37, 38 (2012) (noting that transaction costs are a substantial barrier to water market transactions in Colorado).

administrative hurdles necessary to sever water rights from property and transfer them to another often are notification to the state agency and a period of public notice and comment. This in turn leads to objections to the transfer and an agency evaluation of the objections and the transfer's potential to impact other vested rights. Uncertainty regarding property rights in water associated with subflow, priority, land descriptions, and other issues enumerated above also plague transfers.[216] The high transaction costs associated with water rights markets preclude reliance on water rights acquisitions as a means of mitigating impacts to water rights from adverse holdings in the adjudication.

For example, if a subflow appropriator loses their right, or a right holder is adjudicated as having less water or a more recent priority than originally claimed, it is unnecessarily expensive for that claimant to mitigate the impact of the adjudication by simply purchasing water rights in the open market.[217] That market is stunted by transaction costs, not only the administrative burdens associated with sever and transfer, but all of the costs associated with the opaque and contentious nature of general stream adjudications.[218]

III. RESOLVING GENERAL STREAM ADJUDICATIONS

The challenges associated with general stream adjudications have been significant enough to create some of the most complicated pieces of litigation in U.S. history. They are, nevertheless, surmountable, particularly when viewed through the lens of debtor/creditor law and the economic theories underlying bankruptcy. Although adjudication challenges vary by states and watersheds, bankruptcy principles could potentially be utilized in any adjudication where transaction costs, hold-outs, and lack of incentives prevent timely, economical, and adequate determinations. This Part proposes three broad categories of reforms based on the law and economic theories associated with debtor/creditor relationships, as well as specific prescriptions within each category, that will facilitate an equitable and efficient resolution of general stream adjudications.

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[216] *See* CULP ET AL., *supra* note 154, at 13. *See generally* Howe, *supra* note 215, at 38-39 (outlining transaction costs in water transfers).

[217] *See* Anthony Scott & Georgina Coustalin, *The Evolution of Water Rights*, 35 NAT. RESOURCES J. 821, 923-24 (1995) (describing the expense of water transfers).

[218] *See id.* at 923-24, 937.

A. Lowering Transaction Costs in General Stream Adjudications

Unequivocally, "[h]igh transaction costs are the rule in water wars, where parties are numerous, claims are hotly disputed, and measurement is difficult."[219] Cooperation is difficult to attain due to collective action problems where individual rational behavior prevents optimal outcomes.[220] Components of the adjudication process such as the HSR or the sever and transfer process for conveying water rights take years to complete and are marred by objections.[221] Inadequate state resources also prevent adjudications from moving forward.[222] Bankruptcy proceedings are intended, in part, to lower transaction costs by facilitating the interaction and negotiation amongst the debtor and multiple creditors.[223] The courts' detailed rules and specialized expertise orchestrate the negotiation.[224]

General stream adjudications should have the same aim, in part because they have the same purpose — the orderly adjudication of priorities and the settlement of claims to an over-allocated scarce resource. States should reform the general stream adjudications in the following ways in order to reduce transaction costs and facilitate negotiation and cooperation amongst water rights claimants.

First, *de minimis* water users should be exempted from adjudication. Smaller subflow appropriators (those using a maximum of 10 acre-feet per year) should be excluded from adjudication of their water rights altogether. This would eliminate costs associated with adjudicating these claims, and avoid the potential inequities associated with forcing small water rights holders to forfeit their rights even though such rights have virtually no impact on other users.

For other small but non-*de minimis* users, an inexpensive dispute resolution mechanism should be provided by the state. For large claims (greater than 250 acre-feet), the court should remain the primary adjudicator of water rights. These claims generally represent a small

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

220 *See* Benvenisti, *supra* note 199, at 388-92.

221 *See* Feller, *supra* note 3, at 421; *see also General Description of Adjudications Program*, *supra* note 76.

222 Lauren J. Caster, *General Stream Adjudications and Eastern River Systems*, 133 J. CONTEMP. WATER RES. & EDUC. 43, 45-46 (2006).

223 Vincent S.J. Buccola & Ashley C. Keller, *Credit Bidding and the Design of Bankruptcy Auctions*, 18 GEO. MASON L. REV. 99, 121-22 (2010); *see also* Christopher W. Frost, *Bankruptcy Redistributive Policies and the Limits of the Judicial Process*, 74 N.C. L. REV. 75, 108 (1995).

224 Pardo & Watts, *supra* note 185, at 424-25.

percentage of the total claims within any adjudication, but the majority of the total water.[225] For small claims (less than 250 acre-feet), a court-appointed mediator would seek to settle any objections to characterization of water rights made by any claimant, as published in the HSR prepared by the state agency. These claims can be further broken down into classes based on stream segment, sub-basin, and type of use (stockpond, irrigation, domestic, municipal, or industrial). The mediator would have a high level of institutional competence (a water rights expert), and could approve settlements between parties within a particular segment and sub-basin. The prioritization of institutional competency in adjudication authorities, so prominent in bankruptcy law, has precedent in water law in the specialized water courts relied on in Colorado.[226] Most critical for purposes of mediation would be the authority of the mediator to recommend, and the court to approve, settlements of non-federal water rights claims. This authority is a major distinction between the current special master powers in many general stream adjudications and the authority necessary to efficiently resolve small-scale, non-federal water rights claims.

For this dispute resolution approach to function, the process for generating and finalizing the HSR must be streamlined, as the nature of each claim (type of use, type and point of diversion, amount and priority claimed) would be established in the HSR. As noted above, the HSR (or other catalogs of claims prepared by state water agencies) are common features of general stream adjudications.[227] Arizona's HSR process provides the paradigmatic example.[228] Claimants file a statement of claim that includes the quantity of the water claimed, the purpose of the claimed use, the diversion point and place of use, and the priority date of the right.[229] The HSR contains the state agency's proposed findings with respect to the attributes and validity of the

[225] *See* Feller, *supra* note 3, at 432; *see also* Burke W. Griggs, *General Stream Adjudications as a Property and Regulatory Model for Addressing the Depletion of the Ogallala Aquifer*, 15 WYO. L. REV. 413 (2015); Pacheco, *supra* note 162, at 654; Jason A. Robinson, *Wyoming's Big Horn General Stream Adjudication*, 15 WYO. L. REV. 243, 278 (2015); LEWIS, *supra* note 135.

[226] *See* 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).

[227] *See, e.g.*, ARIZ. REV. STAT. § 45-256(B) (2016); N.M. STAT. § 72-4-13 (2016); N.D. CENT. CODE § 61-03-15 (2016); WYO. STAT. ANN. § 1-37-106 (2016); Thorson et al., *Dividing*, *supra* note 2, at 351.

[228] *See* Thorson et al., *Dividing*, *supra* note 2, at 383.

[229] ARIZ. REV. STAT. § 45-254(A), (C) (2016).

water rights claimed in each statement of claimant within the watershed addressed by the HSR.[230]

ADWR first publishes a preliminary HSR, which is subject to public comment from those claimants located within the affected watershed.[231] After the publication of the preliminary HSR, ADWR revises the draft and responds to comments, and then publishes a final version.[232] A court-appointed special master holds hearings on any objections to the HSR, and may prepare a report and make recommendations to the court.[233] The entire process, even under ideal circumstances, can easily take four years from beginning to end. But objections raised to the special master, along with increasingly limited resources available to ADWR, can significantly extend this time frame. The HSR should be a relatively straightforward document, containing the claimed amount and priority dates of each right made by each party, as well as locations of diversion points.

Uncertainties and delays in the HSR process hinder efficient resolution of claims within the adjudication, particularly for claimants with small water rights who might lack the technical resources to gather the necessary information contained within the HSR.[234] If the HSR process could be streamlined and adapted to facilitate dispute resolution for smaller appropriators, then the adjudication of larger water rights could move forward expeditiously, and state agencies could better direct its resources toward addressing the larger claims.

A streamlined HSR process would require legislative changes to state statutes governing general stream adjudications. Such changes would narrow the scope of the HSR to simply providing a catalog of all statements of claimants filed within a particular watershed, including the claimed attributes of the water rights. A streamlined HSR would allow smaller appropriators to more cost-effectively evaluate their options given the simpler and more straightforward presentation of the necessary information.

Implementing a new method to update the claimant database would also help with streamlining the HSR by providing state agencies with the right information needed to catalog claims.[235] Consider the Gila

[230] *Id.* § 45-256(B) (2016).

[231] *Id.* § 45-256(H).

[232] *Id.*

[233] *Id.* § 45-257(A)(1)–(2) (2016).

[234] *See* Feller, *supra* note 3, at 421 (noting the extensive delays associated with the Silver Creek HSR in the Gila River Adjudication).

[235] A new method of updating claimants' names and addresses would also help to ensure that claimants are receiving proper notice and prevent future due process

River Adjudication's list of claimants. Currently, twenty percent of ADWR's addresses for current statements of claimants are inaccurate.[236] Arizona's water code requires claimants to notify ADWR "of a change in name or mailing address or an assignment."[237] Also, Judge Bolton in Pretrial Order No. 4 for the adjudication required claimants to notify the department of (1) a transfer of all or part of the land on which a water right was claimed and (2) a transfer of all or part of a claimed water right.[238] Yet, this order has not been uniformly followed, and it is likely that many claimants are unaware of these requirements.[239]

To ensure an accurate list of claimants, emulating a method used in Montana to update water records may be the answer. Montana faced a similar problem of inaccurate ownership records when property was bought and sold.[240] In order to keep water right filing information updated, Montana implemented a new automated system.[241] The Montana Department of Revenue ("DOR") synchronized its real property database with the Department of Natural Resources and Conservation's ("DNRC") water rights database.[242] The key to the synchronization involves geocodes — a property identification code. The geocodes are added to the water right record to link the parcel to the water.[243]

For example, in Montana, a person selling a parcel of real property executes a Realty Transfer Certificate and files it with the deed.[244] If the transfer involved a water right, the DNRC will be notified of the transfer when the DOR sends a list of the transfers once a month.[245] The DNRC programmer will manipulate the data and send the information to the

challenges.

[236] Memorandum from Snell & Wilmer on Adjudication Due Process and Notice Issues to the Kyl Ctr. for Water Pol'y 7 (Apr. 2, 2015) (on file with authors).

[237] ARIZ. REV. STAT. § 45-164 (2016).

[238] Pre-Trial Order No. 4, *In re* Gen. Adjudication of All Rights to Use Water in the Gila River Sys. & Source, Nos. W-1, W-2, W-3, W-4 (Consolidated) (Ariz. Super. Ct. Maricopa Cnty. Jan. 24, 2000).

[239] Memorandum from Snell & Wilmer, *supra* note 236, at 7.

[240] *Id.* at 8.

[241] *See* H.B. 39, 60th Leg., Reg. Sess. (Mont. 2007); *see* John Grassy, *House Bill 39: New System for Updating Water Right Ownership Records Will Bring Changes for Real Estate Transactions*, DEP'T NAT. & CONSERVATION (Nov. 2007), *available at* http://dnrc.mt.gov/divisions/water/water-rights/docs/hb39/hb39.pdf.

[242] Memorandum from Snell & Wilmer, *supra* note 236, at 8.

[243] *Id.*

[244] *Id.*

[245] *Id.*

regional office.[246] The staff at the regional office will check to make sure that the geocodes on the water right are validated.[247] Once checked, the DNRC programmer will create an ownership update record in the database.[248] After this, the old and new owner will receive a postcard explaining that the transfer has taken place.[249]

Other states could implement a similar system. Additionally, better marrying of the GIS maps, a technology already used by many land and water departments, could help with identifying land ownership changes.[250] Of course the process is labor-intensive and requires sufficient department resources. Montana was able to receive additional funding from the legislature in order to implement the system.[251] Such an appropriation may be difficult in states currently facing budget cuts. But for many states, adopting an approach similar to Montana's could significantly improve the claimant database in general stream adjudications. An updated and accurate list would allow water departments to create a more accurate catalog of claims in a streamlined HSR. It would also aid in subsequent mediations as the department would have a true account of the parties' and their claims.[252]

Attempts to lower transaction costs will of course benefit from appropriately funded adjudication proceedings. Adjudications often face funding difficulties,[253] and such inadequate funding causes delays and prevents the effective, efficient, and timely completion of adjudications.[254] Funding is necessary for items like staff, contractors, technical experts, and data acquisition and interpretation. Addressing inadequate funding for general stream adjudications should be a higher priority for state budgets with unresolved stream adjudications.

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246 *Id.*

247 *Id.*

248 *Id.*

249 *Id.* at 9.

250 *See* Barbara A. Cosens, *A New Approach in Water Management or Business as Usual? The Milk River, Montana*, 18 J. ENVTL. L. & LITIG. 1, 45-46 (2003).

251 *See* H.B. 39, 60th Leg., Reg. Sess. (Mont. 2007); *see* Grassy, *supra* note 241.

252 For an alternative approach, California relies on "sticks" rather than "carrots," in which claimants are required to file a document with the Water Resources Control Board, with enforcement powers vested in the board itself. *See* CAL. WATER CODE §§ 5106–5107 (2016).

253 Funding concerns have been expressed in Arizona, New Mexico, and Washington. Caster, *supra* note 222, at 45-46.

254 *See* Clive J. Strong, *The First Twenty Years of the Snake River Basin Adjudication: Is There an End in Sight?*, 50 ADVOCATE 14, 14 (2007) (noting that the success of the Snake River Basin Adjudication is due in part to adequate funding).

Making resolution of general stream adjudications a higher priority requires the education of the public and political leaders on the costs of prolonged adjudication and the benefits of efficient and equitable resolution.

Improved funding and political awareness, a streamlined dispute resolution process and HSR, and an improved claimant database will reduce transaction costs associated with general stream adjudications. These reforms will align the aims of general stream adjudications with those of bankruptcy proceedings by making the reduction of transaction costs a central feature of general stream adjudications, and converting these proceedings from protracted conflicts to collaborative endeavors to reach compromises.

B. Water Rights Hold-Outs and Water Resource Management

Transaction costs associated with low agency funding and bloated or ineffective administrative and judicial processes are not the only costs inhibiting resolution of general stream adjudications. As noted above, hold-outs are a common obstacle to equitable and efficient resolution of general stream adjudications, and another form of increased transaction costs.[255] One of the most important functions served by bankruptcy proceedings, in addition to lowering transactions costs in general, is to eliminate or avoid hold-outs.[256] States should reform general stream adjudications to reorient them to this same bankruptcy aim.

The bifurcated system of surface water and groundwater poses perhaps the most significant challenge to resolving many general stream adjudications, and is one source of hold-outs, as subflow appropriators have little incentive to engage in a process that either excludes them or deprives them of priority.[257] The proliferation of wells, whether pumping subflow or groundwater, will likely increase as drought impacts the availability of stream flow.[258] As such, general stream adjudications should integrate a groundwater management system to resolve the issue of subflow and improve water conservation. There are several possible approaches to resolving this issue.

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[255] *See, e.g.*, Gideon Parchomovsky & Peter Siegelman, *Selling Mayberry: Communities and Individuals in Law and Economics*, 92 CAL. L. REV. 75, 82 (2004).

[256] *See, e.g.*, Robert K. Rasmussen, *The Ex Ante Effects of Bankruptcy Reform on Investment Incentives*, 72 WASH. U. L.Q. 1159, 1209 (1994).

[257] *See* Aiken, *Ground Water*, *supra* note 201, at 975-76.

[258] *See, e.g.*, Neuman, *Drought Proofing*, *supra* note 38, at 101 (noting Oregon's drought management plan allows the Water Resources Commission "to more quickly permit new wells").

The first is an attempt to integrate both systems into a single priority system — conjunctive management.[259] Transitioning from a bifurcated system to conjunctive management, however, may prove ultimately unworkable given the property interests at stake and the likelihood of successful taking claims aimed at any legislation seeking to integrate surface water and groundwater rights regimes.[260]

The second possible approach is to draw a brighter line between surface water and groundwater. The problem with this approach is similar to that of transitioning to conjunctive management. Any law attempting to draw a brighter, more technically defensible line between surface water and groundwater is likely to be met with both political opposition as well as challenges that the law constitutes a regulatory taking.[261]

The third possible approach is a management approach that would grandfather in and quantify existing subflow appropriations, and then manage any additional wells or appropriation within the subflow zone.

Such a management approach would mirror, in some respects, the path taken earlier in Arizona's history of water management and model resolution of the general stream adjudications on Arizona's Groundwater Management Act ("GMA").[262] In the GMA, Arizona established grandfathered groundwater rights for existing users in 1980 and then a groundwater management scheme for any future users in designated areas.[263] Furthermore, the GMA provided exemptions for *de minimis* groundwater uses.[264]

Existing subflow uses could be recognized as valid surface water appropriations, with an established priority and quantified amount of water. The recognition of such rights could be limited only to those subflow appropriations that could not have obtained surface water

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[259] *See generally* Barton H. Thompson, Jr., *Beyond Connections: Pursuing Multidimensional Conjunctive Management*, 47 IDAHO L. REV. 273 (2011) (advocating for states to move toward conjunctive management).

[260] *See, e.g.*, Joseph W. Dellapenna, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. ARK. LITTLE ROCK L. REV. 9, 78-79 (2002).

[261] *See* Abrahm Lustgarten, *Less Than Zero: Despite Decades of Accepted Science, California and Arizona Are Still Miscounting Their Water Supplies*, PROPUBLICA (July 17, 2015), https://projects.propublica.org/killing-the-colorado/story/groundwater-drought-california-arizona-miscounting-water; *see also* Joseph L. Sax, *We Don't Do Groundwater: A Morsel of California Legal History*, 6 U. DENV. WATER L. REV. 269, 304 (2003).

[262] Groundwater Management Act, ch. 1, § 86, 1980 Ariz. Sess. Laws 4th Spec. Sess. (codified at ARIZ. REV. STAT. §§ 45-401 to -704 (2016)).

[263] *Id.*

[264] *Id.*

rights at the time of their original withdrawal and which could have reasonably been considered groundwater withdrawal. The priority date would be the date of the first beneficial use of the right, with the amount quantified based on calculating an irrigation duty based on acreage.[265] This would eliminate the uncertain status of these water uses and avoid the inequity of eliminating water rights for those who could not have known at the time of appropriation that their wells were appropriating surface water. It would also avoid the inequities evident in denying water rights to claimants who had no other legal means of having their water rights recognized or perfected. All future wells drilled within the established subflow zone would require a permit and certificated surface water right. Individual well owners pumping subflow appropriating a maximum of ten acre-feet per year would be exempt from management requirements as *de minimis* uses.

State agencies overseeing water resources will make regulatory determinations of *de minimis* status and the quantity and priority of grandfathered subflow rights. In some states, this may require either legislative changes granting such authority to agencies, or judicial decisions ruling that such is an appropriate administrative function.[266] These agencies will also make determinations about whether subflow appropriators could have reasonably foreseen that their pumping constituted a surface water diversion at the time of their first beneficial use. Claimants within sub-basins impacted by these determinations will have the opportunity to object in a process overseen by a special master. Claimants will be divided into classes based on use type (including federal, non-federal, and tribal rights) and location. So long as the majority of users in each impacted class agree to the agency's determinations, all other claimants will be precluded from holding-out and must accept the subflow and *de minimis* rights.[267] A court would

[265] *See, e.g.*, Corwin W. Johnson, *Adjudication of Water Rights*, 42 TEX. L. REV. 121, 140 (1963) (providing an overview of how to perfect appropriative water rights, including the requirement of beneficial use and methods for quantifying the right).

[266] *See, e.g.*, San Carlos Apache Tribe v. Superior Court, 972 P.2d 179, 195-96 (Ariz. 1999) (en banc) (applying a balancing test to a separation of powers challenge to amended water right statutes, holding that a legislative *de minimis* standard unconstitutionally interfered with judicial authority).

[267] The "majority" could be defined either by volume of water or by headcount. Volume measures for voting adapts voting to the degree of interest in the system and possibly lowers transaction costs by narrowing the number of parties with whom claimants must negotiate. On the other hand, institutional legitimacy and avoidance of inequitable allocation of voting powers that favor large industrial or agricultural interests may weigh in favor of allocation votes based on headcount. For a discussion of the role of voting rules in water markets, see generally Barton H. Thompson, Jr., *Institutional Perspective on Water Policy and Markets*, 81 CAL. L. REV. 671 (1993).

then have authority to approve these determinations made by the agency and special master, and agreed to by classes of claimants, including federal, tribal, and non-federal claimants. This approach achieves one of the central functions of bankruptcy — mandating settlement for hold-outs when similarly situated classes of creditors accept the settlement.[268]

There will inevitably be some controversy over priority dates and quantified amounts for recognized subflow and *de minimis* rights. Additionally, legislative recognition of such rights could potentially constitute an unconstitutional taking of vested senior rights to the extent recognition would interfere with those rights.[269] Furthermore, while a *de minimis* exemption has precedent in Arizona's groundwater statutes and in other states,[270] and would avoid expending resources adjudicating small rights, the cumulative effect of all *de minimis* uses could nevertheless interfere with other vested rights.[271] Effectively, recognizing *de minimis* rights would be death by a million small paper cuts for some senior rights holders.

Finally, the greatest opposition to this management approach could be political, as some municipalities may have to accept a cap on their growth because some water withdrawals could be effectively eliminated. The cost of water provision and the value of water rights are likely to rise in areas with stricter water management.

Still, some limits on growth due to available water resources, and higher water valuation, are inevitable in arid communities and must be accepted as a part of any long-term water rights regime. Furthermore, the scope of *de minimis* exemptions can be narrowed by making the exemption a rebuttable presumption subject to challenge by other parties or otherwise narrowing the exemption based on reasonableness factors applied to the *de minimis* water rights claim (the date the claim was made, the proximity of the well to the river, the efficiency of the use, etc.). Additionally, the theory underlying a *de minimis* exemption

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[268] *See* Marcel Kahan, *Rethinking Corporate Bonds: The Trade-Off Between Individual and Collective Rights*, 77 N.Y.U. L. REV. 1040, 1067 (2002).

[269] Such challenges could come under due process clauses in state constitutions. *See, e.g.*, ARIZ. CONST. art. II, § 4 (West, Westlaw through First Reg. Sess. and First Spec. Sess. of the 52nd Legislature).

[270] California provides exemptions for small domestic and irrigation uses from filing statement of claims for diversions. CAL. WATER CODE § 5101 (2016); *Registrations*, CAL. WATER BOARDS, http://www.waterboards.ca.gov/waterrights/water_issues/programs/registrations/ (last updated Nov. 13, 2015).

[271] *See, e.g.*, *San Carlos Apache Tribe*, 972 P.2d at 195 (parties estimated *de minimis* uses to "include between two-thirds and four-fifths of the total general adjudication claims").

not only has some precedent of success in groundwater management, but also in bankruptcy law. In bankruptcy, there can be a class of creditors called an "administrative convenience class," that includes smaller creditors that can be paid without having to go through the full proceeding because the value of their claims is not worth the cost of litigation.[272] Despite the potential challenges, a management approach that is combined with other dispute resolution mechanisms, water augmentation and conservation measures, and improved water rights markets could ultimately overcome many of the obstacles preventing efficient and equitable adjudication of water rights in western states.

C. Water Markets and Water Augmentation

Even with these recommended reforms implemented, general stream adjudications, just like bankruptcy proceedings, are conflicts with winners and losers. Even with lower transaction costs and less hold-outs, incentives may be necessary to encourage debtors and creditors to negotiate. To encourage settlement in stream adjudications, losers must have some access to water supplies to mitigate their losses. Improving water markets are one essential approach to achieving mitigation of lost water rights and thus encouraging resolution of adjudication claims.[273] An improved water market could conceivably help alleviate risks associated with subflow appropriators losing water rights, facilitate efficient resolution of disputes through lowered transaction costs and thus avoid the expensive process associated with adjudicating water rights, and could potentially create a source of revenue for courts and agencies overseeing adjudications.[274]

Arguably, a focus on improving water markets as a means of resolving general stream adjudications puts the cart before the horse. After all, part of the very function of general stream adjudications is to clarify property rights in order to create a more efficient market.[275]

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[272] David M. Neff, *Hotel Bankruptcies*, 11 J. BANKR. L. & PRAC. 27, 44 (2001); *see* 11 U.S.C. § 1122 (2012).

[273] *See, e.g.*, CULP ET AL., *supra* note 154, at 13; *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, 284 (2001).

[274] *See generally* TERRY L. ANDERSON & PAMELA SNYDER, WATER MARKETS: PRIMING THE INVISIBLE PUMP (1997) (examining how water markets can promote efficient water allocation); CLAY J. LANDRY, SAVING OUR STREAMS THROUGH WATER MARKETS: A PRACTICAL GUIDE (1998) (advocating for instream flow markets).

[275] *See* Zach Willey, *Behind Schedule and over Budget: The Case of Markets, Water,*

Regulatory reforms that facilitate sever and transfer will likely accomplish little when the priority and quantity of water rights remains unclear.[276] Nevertheless, regulatory reforms that facilitate water rights transactions in a post-adjudication world, where priority and quantity are established by judicial decree, may incentivize parties to participate in settlement negotiations in the adjudication with the expectation that any losses can be mitigated in the marketplace.

A few states, such as Washington, have enacted water trust programs, facilitating water transfers.[277] Washington enacted the statewide Trust Water Rights Program[278] in 1991. The program authorizes the Department of Ecology to acquire trust water rights by purchase, gift, or other appropriate means.[279] The rights can be used for in-stream flows, irrigation, and municipal or other beneficial uses.[280] Water right holders may donate all or part of their right and on a temporary or permanent basis.[281] Rights held in trust are protected from forfeiture and maintain the original priority date.[282] The Washington program has achieved success — a number of temporary and permanent transactions have occurred since its enactment.[283]

A similar approach could be adopted in other states faced with protracted general stream adjudications. A state agency, or even a non-government escrow company, could act as the trustee of water rights. A water right holder could place all or part of their water right in escrow, making it available for purchase. And just like Washington's program, water rights placed in escrow would be protected from forfeiture. Water rights placed in escrow would have an expedited sever and transfer process, making it less expensive and administratively complex to engage in water rights transactions through the escrow. For example, Arizona's sever and transfer statute

and Environment, 15 HARV. J.L. & PUB. POL'Y 391, 410 (1992).

276 *See* Tamar Frankel, *The Legal Infrastructure of Markets: The Role of Contract and Property Law*, 73 B.U. L. REV. 389, 392 (1993) (noting the role of clear property rights assignments in facilitating efficient markets).

277 Colorado, Washington, Montana, and Oregon all have water trust models. Mary Ann King, *Getting Our Feet Wet: An Introduction to Water Trusts*, 28 HARV. ENVTL. L. REV. 495, 496 (2004).

278 WASH. REV. CODE § 90.42 (2015).

279 *Id.* § 90.42.080(1)(a) (2015).

280 *Id.* § 90.42.040(1) (2015).

281 *Id.* § 90.42.080(3).

282 *Id.* § 90.42.040(3), (6).

283 *See* NICHOLAS P. LOVRICH ET AL., OF WATER AND TRUST: A REVIEW OF THE WASHINGTON WATER ACQUISITION PROGRAM 6-7 (2004).

requires consent and approval from the irrigation district, agricultural improvement district, or water users' association.[284] This requirement increases the transaction costs, which may prevent parties from participating.[285] The statute could be revised to allow for severs and transfers without the approval requirement. The expedited process, in addition to avoiding forfeiture, would serve as an incentive for water rights holders to operate through the escrow. The viability of a Washington-like approach in other states will depend on many factors. For example, the fact that Washington has conjunctive management of surface water and groundwater[286] will inevitably require the approach to be adapted to states with bifurcated systems.

One such adaption would be the implementation of a "hold-back" in transactions made through the escrow. In exchange for avoiding forfeiture and securing an expedited sever and transfer process, water rights holders using the escrow would have a percentage of each transaction held back in escrow. While in escrow, the escrow holder would have a fiduciary duty to manage water in escrow for the benefit of the donor, with water held in escrow going to the maintenance of in-stream flows, providing an essential baseline environmental support of aquatic and riparian ecosystems. In-stream flows would be further augmented by holding back a percentage of each water rights transaction made through the escrow. Additionally, water held back in escrow from each transaction could serve as a bank of water rights to which others could resort to offset losses sustained in the adjudication process. This hold-back has some precedent in groundwater law. In Arizona, facilities engaged in artificial groundwater recharge that later withdraw 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.[287]

Water markets can play a central role in providing certainty to claimants once a final determination is made in an adjudication.[288] In general stream adjudications, many individuals may lose their water

284 ARIZ. REV. STAT. § 45-172(A)(4) (2016).

285 *See* CULP ET AL., *supra* note 154, at 16-17.

286 *See* WASH. REV. CODE § 90.44.030 (2015).

287 *See* ARIZ. REV. STAT. §§ 45-801.01 to -898.01 (2016).

288 *See, e.g.*, CULP, ET AL., *supra* note 154, at 13 (emphasizing that water markets can help cities, farms, and industries "thrive even in the face of substantial disruption of water supplies"); Brandon Winchester & Ereney Hadjigeorgalis, *An Institutional Framework for a Water Market in the Elephant Butte Irrigation District*, 49 NAT. RESOURCES J. 219, 221 (2009) (discussing the possibility of a water market in New Mexico to address water resource challenges like a fully appropriated river).

supply due to a finding that the water was subject to federal claims or that they were pumping appropriable water or subflow.[289] A water market catalyzed by lower transaction costs would help provide assurances of potential offsets to claimants at risk of losing their water supply.[290] For example, the escrow program could particularly assist smaller claimants requiring mitigation of water rights decreed to be at lower amounts or lower priorities than originally claimed for. Water held back in escrow could be sold to them at a discounted rate. As smaller claimants may be less financially able to afford market water, the discount could help considerably. The viability of an escrow program though will depend upon the conditions within the watershed, including whether the incentives are strong enough to move enough water through the escrow to provide for hold-backs that could sustain in-stream flows and provide a bank of discounted water rights to offset losses.[291] Additionally, enacting the program would require legislative change and hence is subject to political hurdles. Yet, the program may be the best hope for providing water users who lose all or part of their water in adjudications a chance to attain a sufficient water supply.

It is also possible that water markets can offer a source of revenue for the courts and agencies in charge of adjudications. A percent of the transaction fees or of the price of water could be directed to fund administrative support for the adjudication, including a dispute resolution forum for smaller appropriators. Markets have much to offer. Creditors who fail to fully recoup their loans as part of a bankruptcy proceeding have a reasonably well-functioning credit market to which they can resort to mitigate their losses.[292] An improved water market would provide a similar mechanism for adjudication losers to recoup their losses, and thus provide some assurances that offsets are available if the parties will reach a settlement.

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[289] *See Gila River IV*, 9 P.3d 1069, 1082-83 (Ariz. 2000); *Gila River III*, 989 P.2d 739, 750-51 (Ariz. 1999); *Gila River II*, 857 P.2d 1236, 1248 (Ariz. 1993).

[290] *See supra* text accompanying note 276.

[291] *See* Colby, *supra* note 175, at 349-50 (noting the economic incentive to participate in water markets).

[292] *See, e.g.*, John A.E. Pottow, *Private Liability for Reckless Consumer Lending*, 2007 U. ILL. L. REV. 405, 451 n.220 (noting the scholarship and reports reflecting the possibility of a well-functioning subprime debt market); Todd J. Zywicki, *The Economics of Credit Cards*, 3 CHAP. L. REV. 79, 110-29 (2000) (arguing that the credit card market is an example of a reasonably well-functioning market); Ben Klaber, Note, *Bankruptcy Insurance: A Modular Approach to Systemic Risk*, 74 U. PITT. L. REV. 333, 353-57 (2012) (discussing the role of insurance in mitigating the risk of loss in bankruptcy).

Similar offsets could be available through water augmentation. Just as creditors may offset losses in bankruptcy by gains in other transactions,[293] water rights holders may similarly offset losses if additional water is made available. As the rivers and streams in the West are largely over-appropriated, water augmentation, or the transfer of one source of water to another, could assist in the development of water markets. Seawater or brackish groundwater desalination could provide a source of augmented water.[294] While this has potentially high energy and environmental costs, desalination technology is rapidly improving in both energy efficiency and overall costs, and providing a viable potential source of augmented water.[295] Other potential sources of augmented water could include federal Bureau of Reclamation project water, like water from the Central Arizona Project ("CAP"). Indeed, project water and desalination could work in harmony to increase supplies and thus mitigate water rights losses. 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, either in-stream rights or rights delivered through federal project infrastructure.[296] That water would then be available to offset losses in adjudications and form part of possible water rights settlements.

One area where augmentation can be utilized is on federal reserved lands. Any reservation of federal land implicitly reserves the minimum amount of water to meet the purpose of the reservation.[297] Many western states have significant reservations in national parks, and the water reserved for these non-tribal federal lands can be significant.[298]

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[293] *See, e.g.*, Howard Kern, *The Voidability of Security Interests in Tax Refunds Under Section 547 of the Bankruptcy Code*, 6 CARDOZO L. REV. 641, 658-61 (1985) (discussing the role of tax law in allowing creditors in bankruptcy to mitigate losses).

[294] *See generally* Symposium, *Desalination in California: Should Ocean Waters Be Utilized to Produce Freshwater?*, 57 HASTINGS L.J. 1343 (2006) (panel discussion over desalination).

[295] Larson, *Innovation*, *supra* note 21, at 766.

[296] *See, e.g.*, Sandra Dibble, *One Desal Plant, Two Countries?*, SAN DIEGO UNION-TRIB. (Aug. 24, 2014), http://www.sandiegouniontribune.com/news/2014/aug/24/rosarito-Mexico-desalination-plant-binational/; *see also* Elliot Spagat, *Mexico's Newest Export to U.S. May Be Water*, HUFFINGTON POST (Oct. 15, 2011, 12:24 PM), http://www.huffingtonpost.com/2011/10/15/mexicos-newest-export-to-us-water_n_1012479.html.

[297] *See* United States v. New Mexico, 438 U.S. 696, 700 (1978); Cappaert v. United States, 426 U.S. 128, 138 (1976); Winters v. United States, 207 U.S. 564, 577 (1908).

[298] *See generally* Alan E. Boles, Jr. & Charles M. Elliott, United States v. New Mexico *and the Course of Federal Reserved Water Rights*, 51 U. COLO. L. REV. 209 (1980) (discussing federal reserved rights in the wake of *United States v. New Mexico*).

The quantification and relative priorities of such federal reserved rights is a critical question in certain sub-watersheds. In some instances, there may be unallocated federal water that could be delivered through federal project infrastructure to satisfy these rights while alleviating surface supplies for others. Such a project water provision could be done on a temporary or permanent basis, depending on the amount of water needed by the reservation and the nature of the unallocated federal project water. The viability of this approach depends on several factors in addition to the availability of unallocated water and the amount of water needed by the reservation, including such considerations on the economic and engineering feasibility of transferring project water to the reservation.

The need for water augmentation is only bound to increase in the ensuing decades as drought continues and population increases. Augmentation sources however have their advantages and disadvantages. Some are still in the stages of development like desalination and cloud-seeding and others like inter-basin transfers require legislative change. Federally-reserved rights are also a complicated source of water offsets, given the complexity of quantifying such rights. Indeed, many of those rights are among the most complicated components of resolving general stream adjudications. Looking forward though, tying augmentation and water markets together may be the best method to bring water where it is needed or valued most. Water markets and water augmentation could significantly address the challenges of uncertainty, scarce resources, transaction costs, and collective action problems afflicting general stream adjudications.

CONCLUSION

Ultimately, the challenges of a general stream adjudication mirror those of a large, complex bankruptcy proceeding. In water scarcity or money scarcity, with multiple claimants with relative priorities, there are three possible solutions. The first is to find a way to mitigate the scarcity by making more resources available. The second is to give those with the highest priority all of the scarce resources, and leave nothing for those with lower priorities. The third is that some or all of the claimants must accept less than they are owed. In a general stream adjudication, these three solutions form the foundation of a menu of possible means to facilitate resolution. We can find ways to increase water supplies (desalination, additional federal project deliveries, improved water markets). We can honor the legal rights established by a first-in-time, first-in-right system, which has the advantage of clarity

and simplicity but may sacrifice equity and magnanimity. Or we can facilitate settlements for lower amounts than those claimed and have all claimants share in scarcity.

Of course, establishing and implementing these solutions can be problematic. Bankruptcy was intended to avoid two problems in the realm of debtor/creditor rights that also plague water rights and as such, theories underlying bankruptcy may assist in achieving equitable and efficient resolution of general stream adjudications. The first problem is that of hold-outs — some people will refuse to accept anything less than what they feel they are owed, no matter the consequences.[299] The second problem is that of collective action — even when it is in the best interest of all claimants to reach a consensus on an equitable and sustainable solution, the economic and political costs of communicating and compromising preclude mutually advantageous solutions.[300] Perhaps measures aimed at facilitating communication and compromises are the most important measures we can take to address the general stream adjudication challenge. Such measures can be aided by reforming general stream adjudications to lower transaction costs and avoid hold-outs, and at the same time increasing available water through water markets or augmentation to offset losses in the adjudication.

Despite bankruptcy and general stream adjudications' similarities, there are relevant differences. Water is fundamentally different than money. It has a cultural, aesthetic, and environmental value unique amongst resources, and is the foundational need for all life on earth. The nature of water does not lend itself well to simple solutions, as evidenced by the challenges associated with subflow. It is not easy to draw lines in water that do not move or are not subject to good faith disagreement. We must, therefore, recognize the fundamental importance of resolving water rights disputes and respect that no path to resolution will come without costs and compromises.

[299] *See* Kimhi, *supra* note 191, at 362-69 (discussing the creditor hold-out problem).

[300] Rasmussen & Thomas, *supra* note 196, at 288-89.