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Quantifying *Winters* Rights

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QUANTIFYING *WINTERS* RIGHTS

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ABSTRACT

All reservations of federal land, including Native American reservations and national forests, have water rights. These rights are referred to as "*Winters* rights" after the seminal U.S. Supreme Court case. That case recognized such rights' existence, but it did not quantify the amount of water of those rights. Federal courts have applied various approaches to quantifying *Winters* rights. Recent decisions in Arizona state courts have taken new and different approaches to quantification of both tribal and non-tribal *Winters* rights. These state court decisions have important implications for federal water rights throughout the United States. This Article examines these new approaches to quantifying *Winters* rights, evaluates them for their impact on equitable and sustainable water policy, and proposes reforms to better adapt the adjudication of *Winters* rights to responding to water variability caused by climate change.

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INTRODUCTION

"How much water is enough water?" This question lies at the heart of water policy and is a central concern in strategies to adapt to climate change. As climate change increases water variability, more people will confront extremes in drought and flood. Governments and water providers must plan for a changed world, requiring better data, more accurate models, and greater legal certainty about which parties own what quantities of water. More accurate information will allow policymakers to make better determinations of how much is enough.

How much water is enough is a difficult question, even without the complications of climate change. It is naïve to think the answer is "enough water to live." There are only two kinds of people in the world—people with enough water to stay alive, and dead people. Everyone alive already has enough water to live, evidenced by the fact they're living. A better answer to the question is "enough water to live a dignified life." However, even that answer can only be partial, because it only addresses human water needs while failing to account for how much water is needed to support ecosystem services and critical habitat.

In the United States, the answer to the question "how much is enough," and how that answer relates to both human and environmental water needs, is answered in part under the *Winters* doctrine. In the U.S. Supreme Court case *Winters v. United States*, any reservation of federal land for any purpose—whether for a homeland for Native American tribes or the creation of a military base or national park—implicitly reserves a water right.[1] How that water right is quantified varies and includes complex determinations of a variety of factors, including the irrigation potential of tribal land and the minimum amount of water necessary to satisfy the primary purpose of a national forest.[2]

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[1] 207 U.S. 564, 577 (1908).

[2] *See* Arizona v. California, 373 U.S. 340, 345 (1963) (establishing the practicably irrigable acreage standard for quantifying tribal water rights); United States v. New Mexico, 438 U.S. 696, 710, 716 n.3 (1978) (establishing the "primary purpose"/minimum amount standard for quantifying the water rights of a national forest).

State court proceedings in Arizona have taken novel approaches to quantifying rights held by federal and tribal parties under *Winters*. In recent trials adjudicating the *Winters* rights of the Navajo Nation and Hopi Tribe to the Little Colorado River, the Maricopa County Superior Court in Arizona has relied on a new quantification method.[3] This method was created by the Arizona Supreme Court in 1999, but only applied for the first time in these recent trials.[4] Not only are these trials the first to apply this quantification method, they represent the first time a court in the United States has departed from the U.S. Supreme Court's established quantification methodology for tribal water rights based on irrigation. Additionally, the Maricopa County Superior Court has recently quantified the *Winters* rights held by the U.S. Bureau of Land Management in relation to its management of the San Pedro Riparian National Conservation Area ("SPRNCA"), protecting one of the last free-flowing rivers in Arizona and its riparian habitat.[5]

These approaches to quantifying *Winters* rights in Arizona have important implications for how such rights might be quantified throughout the country. If these quantification methods prove legal, workable, and equitable, they may spread into other water rights adjudications. If they fail to improve water management or achieve equitable allocations, or are struck down on legal or constitutional grounds, quantification methodologies may ossify throughout the country at the moment when climate change will require greater adaptability in water law. Additionally, the outcome of these cases may encourage more settlements of *Winters* claims outside of court, for better or worse. Furthermore, examining these cases allows a deep consideration of how best to answer the critical question of "how much water is enough" in a climate-changed world.

This Article proceeds in three parts. In Part I, I provide necessary background on the *Winters* doctrine, basic water law principles, and

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[3] Final Report and Recommended Decree at 153–54, *In re* Gen. Adjudication of All Rts. to Use Water in the Little Colo. River Sys. & Source (Ariz. Super. Ct. 2022) (No. 6417-203) [hereinafter Hopi Special Master Report], https://www.superiorcourt.maricopa.gov/superiorcourt/generalstreamadjudication/docs/final-report-6417-203-05-25-2022.pdf [https://perma.cc/A359-9LFN].

[4] *In re* Gen. Adjudication of All Rts. to Use Water in Gila River Sys. & Source (*Gila III*), 989 P.2d 739, 747 (Ariz. 1999).

[5] Order Quantifying Federal Reserved Water Rights for San Pedro Riparian National Conservation Area at 54, *In re* Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source (Ariz. Super. Ct. Aug. 24, 2023) (No. W1-11-232) [hereinafter San Pedro Order], https://www.superiorcourt.maricopa.gov/superiorcourt/generalstreamadjudication/docs/W1-11-232-brain-or-fed-res-rights-8-25-23.pdf [https://perma.cc/RN9X-S9F2].

general stream adjudications. In Part II, I describe and evaluate recent court decisions in Arizona quantifying the federal and tribal water rights under the *Winters* doctrine. In Part III, I suggest some possible reforms to facilitate the settlement of these tribal and federal water rights claims to achieve greater water certainty and equity.

I. WATER RIGHTS, ADJUDICATION, AND QUANTIFICATION

This Part provides background on the legal principles underlying the quantification of federally reserved rights in the western United States under the *Winters* doctrine.

A. The Complexities of Water Law

Like most arid states in the West, Arizona allocates surface water rights based on the doctrine of prior appropriation.[6] Under prior appropriation, a water user who appropriates a certain quantity of surface water and puts it to beneficial use has superior priority to that quantity of water over any subsequent water user—a "first-in-time" regime.[7] Superficially, this legal regime appears to be relatively straightforward. However, various doctrines and exceptions have developed over the decades that make priority determination extremely complicated.

For example, prior to 1919, surface water appropriators could perfect a water right by intending to divert water, diverting the water, and putting it to beneficial use.[8] These earliest rights have high priority but given their age and the minimal requirements to perfect the right, they often have the least reliable evidentiary basis.[9] In 1919, Arizona enacted a comprehensive prior appropriation code that required filing a notice of intent and issuance of a certificate to perfect a water right.[10] This reform

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[6] Peter L. Reich, *The "Hispanic" Roots of Prior Appropriation in Arizona*, 27 ARIZ. STATE L.J. 649, 649 (1995).

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

[8] Rhett Larson & Kelly Kennedy, *Bankrupt Rivers*, 49 U.C. DAVIS L. REV. 1335, 1350 (2016); *see also* Sean E. O'Day, San Carlos Apache Tribe v. Superior Court*: Rejecting Legislative Favoritism in Water Rights Allocations*, 4 U. DENV. WATER L. REV. 29, 35 (2000).

[9] *See* Kurtis Alexander, *New California Law Takes Aim at Injustices in Water Rights System, but Barely*, S.F. CHRON., https://www.sfchronicle.com/california/article/new-california-law-takes-aim-injustices-water-18415174.php [https://perma.cc/4KGS-6S4R] (Oct. 10, 2023).

[10] Larson & Kennedy, *supra* note 8, at 1350.

improved the reliability of the evidence of appropriation but left open other difficult questions, like whether or not a use is truly beneficial and exactly what it means to be truly "first-in-time."[11]

For example, a water right holder's priority date may be when the right holder filed their notice of intent, when they began construction of their diversion, or when they first put the water to beneficial use, depending on the question of "diligence."[12]

> For example, imagine a man who filed a notice of intent to divert surface water with the state of Arizona on December 1, 1941, and began to dig a ditch to divert water to irrigate his farm. Shortly thereafter, he is drafted into the military and is away from his farm for three years. In those three years, several other parties file notices of intent and divert water for irrigation. Has our soldier lost his place in line, or does his priority date "relate back" to December 1, 1941? His priority date is December 1, 1941 only if he is considered to have been "diligent" during those years. Answering the question of diligence is a difficult, fact-specific inquiry, and introduces another layer of uncertainty with respect to priority dates, quantities, and uses for surface water rights.[13]

Under this "relation-back doctrine," parties could challenge each other's relative priority dates.[14] Competing water right holders could also challenge the legality of their respective water uses. Under Arizona's 1919 Water Code, all water must be put to a beneficial use, without waste, a concept that is the "basis, measure and limit to the use of the water" in the state.[15] Furthermore, a person might not only have their priority date and type of use questioned but could forfeit their right entirely through non-use.[16] In Arizona, if a water right holder fails to use their surface water

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[11] *Id.*
[12] Dennett L. Hutchinson, *Determining Priority of Federal Reserved Rights*, 48 U. COLO. L. REV. 547, 554 (1977).
[13] Rhett Larson & Bryan Payne, *Unclouding Arizona's Water Future*, 49 ARIZ. STATE L.J. 465, 471 (2017) (citation omitted).
[14] Barton H. Thompson, Jr., *Uncertainty and Markets in Water Resources*, 36 MCGEORGE L. REV. 117, 118 (2005).
[15] ARIZ. REV. STAT. ANN. § 45-141(B) (2023).
[16] *See* Janet C. Neuman & Keith Hirokawa, *How Good Is an Old Water Right? The*

for a period of five years, the holder forfeits that portion of their right that went unused.[17] The threat of forfeiture encourages full development of an appropriative water right but can discourage water conservation.[18]

Compounding these complexities is the potential that, in some narrow circumstances, junior water right holders may take out of priority. Normally, under prior appropriation, when stream flows are insufficient to meet the quantities claimed by all right holders, a senior right holder places a "call on the river" to ensure its relative priority is recognized and satisfied first.[19] In some circumstances, a junior right holder may claim such action is a "futile call," meaning that even if all junior right holders agreed to forebear, the senior would receive no water, and thus juniors are permitted to take out of priority under the rationale that it is better someone can use the water than no one.[20]

Partly because of these legal nuances, Arizona and other western states continue to experience intractable disputes over water rights, both in determining their relative priority as well as adjudicating their respective quantities.[21] A facially simple "first-in-time, first-in-right" legal regime has become a quagmire of complexity and uncertainty.

B. The Winters *Doctrine*

In a regime founded on the principle of "first-in-time, first-in-right," one might think indigenous people would be uniquely privileged. In addition to the complexities added by the relation-back doctrine, beneficial use requirements, and the risk of forfeiture, some surface water rights do not fit perfectly within Arizona's prior appropriation framework. Native American tribal water rights and water rights held by federal lands, such as national parks, include elements of prior appropriation

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Application of Statutory Forfeiture Provisions to Pre-Code Water Rights, 4 U. DENV. WATER L. REV. 1, 2–3 (2000) ("A central tenet of the prior appropriation system is 'use it or lose it.'").

[17] *Id.* at 14.

[18] Sharon Megdal, Joanna Nadeau & Tiffany Tom, *The Forgotten Sector: Arizona Water Law and the Environment*, 1 ARIZ. J. ENV'T L. & POL'Y 243, 289 (2011).

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

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

[21] *See generally* Larson & Kennedy, *supra* note 8, at 1337 (providing an overview of the challenges involved in Arizona's general stream adjudications).

but are also grounded in federal law that does not apply to other water rights.[22] When the federal government reserves land, including for Indian reservations or national parks, it implicitly reserves the minimum amount of water necessary to meet the primary purpose of the reservation.[23] These rights are often called *Winters* rights. In *Winters v. United States*,[24] the U.S. Supreme Court created the doctrine of federal reserved water rights. These *Winters* rights fit within the state priority system by assigning them a priority date, including a priority of "time immemorial" for certain aboriginal water uses,[25] or the date the reservation was established for other federal reservations, including tribal reservations and national parks.[26]

With respect to quantifying tribal *Winters* rights, the Court established its methodology in *Arizona v. California*, under which it allocated water based on the tribal reservation's practicably irrigable acreage ("PIA").[27] Under this approach, a court determines how much of a tribe's land is arable, then the engineering feasibility of irrigating that land, and then the economic feasibility of growing certain crops on that land.[28] Once the court has determined the PIA of the tribe based on arability, engineering feasibility, and economic feasibility, the court then assigns an irrigation duty to each acre and multiplies that irrigation duty by the PIA to determine the quantity of the tribe's water right.[29] This is a relatively straightforward and objective approach to quantification. However, it makes assumption of the tribe's interest in large-scale irrigation. A tribe with a river running through a lot of arable land and the potential for successful agricultural production could favor PIA. However, an

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[22] *See* CYNTHIA BROUGHER, CONG. RSCH. SERV., RL32198, INDIAN RESERVED WATER RIGHTS UNDER THE *WINTERS* DOCTRINE: AN OVERVIEW 1–3 (2011).
[23] Arizona v. California, 373 U.S. 546, 601 (1963); Winters v. United States, 207 U.S. 564, 577 (1908); Cappaert v. United States, 426 U.S. 128, 129, 141 (1976); *see also* United States v. New Mexico, 438 U.S. 696, 718 (1978).
[24] *See* 207 U.S. at 577–78.
[25] United States v. Adair, 723 F.2d 1394, 1414 (9th Cir. 1983).
[26] *Cappaert*, 426 U.S. at 138.
[27] 373 U.S. at 600–01. Included in calculating PIA are total acreage, arability of the land, and engineering and economic feasibility. *In re* Gen. Adjudication of All Rts. to Use Water in the Big Horn River Sys., 753 P.2d 76, 101 (Wyo. 1988), *aff'd by an equally divided Court*, Wyoming v. United States, 492 U.S. 406, 407 (1989).
[28] REID PAYTON CHAMBERS & JOHN E. ECHOHAWK, IMPLEMENTING *WINTERS* DOCTRINE INDIAN RESERVED WATER RIGHTS: PRODUCING INDIAN WATER & ECONOMIC DEVELOPMENT WITHOUT INJURING NON-INDIAN WATER USERS? 5 (1991).
[29] Arizona v. California, 373 U.S. at 601.

upland tribe more interested in ecotourism, mining, or semiconductor production could prefer an alternative approach to quantification.

The Arizona Supreme Court has declined to rely on PIA as the only quantification method, relying instead on the evaluation of reservation-specific factors like tribal culture, population, and water use plans.[30] The Arizona justices adopted this approach in an interlocutory appeal under the Gila River General Stream Adjudication in 1999, in a case called *Gila III*.[31] On the one hand, this approach could allow for a more nuanced quantification that provides more water to tribes lacking significant PIA. On the other hand, it is a fairly subjective, multifactor standard that could be implemented in ways prejudicial to tribes with less ground for technical objections than under PIA.

The quantification of non-tribal, federally reserved rights is far less jurisprudentially developed.[32] The standard for quantification, however, may explain why the method is underdeveloped. For non-tribal *Winters* rights, the only guidance courts have in quantifying the right is that the federal land has a right to the minimum amount of water necessary to meet the primary purpose of the reservation.[33] This vague standard can be incredibly difficult to apply. For example, the Multiple-Use Sustained-Yield Act of 1960 provides that "national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes."[34] Which of these purposes are the primary purpose? These are potentially conflicting purposes. Also, how can a court possibly know with any degree of certainty the minimum amount of water necessary to protect changing recreational and timber uses within a changing climate?

Another example of how difficult quantification of non-tribal *Winters* rights can be is a military base. Fort Huachuca in southeastern Arizona was established in 1877, and thus has a very early priority date.[35]

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

[31] Alyssa Lankford, Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water District*: A Tribe's Successful Fight for Federally Reserved Water Rights*, 43 AM. INDIAN L. REV. 203, 216–18 (2018).

[32] Larson & Kennedy, *supra* note 8, at 1365.

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

[34] 16 U.S.C. § 528.

[35] Terry Sprouse, Book Review, 43 NAT. RES. J. 918, 920 (2003) (reviewing CARL STEINITZ, HECTOR ARIA, SCOTT BASSETT, MICHAEL FLAXMAN, TOMAS GOODE, THOMAS MADDOCK III,

Even if we assume its primary purpose is to serve as a military base and agree on the meaning of that purpose, should we measure the fort's purpose as it was understood in 1877, a small desert cavalry outpost? Or should we measure purpose as it is currently understood, a highly technologically advanced military installation with hundreds of soldiers and support staff? Uncertainty regarding the quantity of water of such a high priority right cascades through the entire river basin as all junior water right holders are left to wonder what might remain of the river for them if such senior *Winters* rights are fully quantified.

C. General Stream Adjudications

This sort of widespread uncertainty can stifle efforts to reform water policy, an adaptive capacity all the more critical in the face of climate change. One widely used tool to resolve basin-wide uncertainty over water rights is the general stream adjudication ("GSA"). A GSA is a single proceeding that determines the status of all claims to a particular stream or river basin, including the attributes of claimed water rights such as priority, type of use, and quantity.[36] Rather than rely on ad hoc lawsuits between individual water claimants, a state initiates a broad proceeding that attempts to adjudicate all water rights collectively.[37] This approach has some advantages, including avoiding the need to reconcile different court decisions over competing water rights claims, but it can lead to decades of litigation and mass confusion.[38]

A simple story can help illustrate the risk of confusion and contention surrounding a GSA. Imagine in 1993, thousands of people visiting Disneyland were asked to evacuate the park. As people departed, they were handed a voucher saying they would be given free admittance for a special day in 2023 and put back in line in the order they were in when the park closed. Thirty years later, those visitors, and some of their heirs and beneficiaries—as well as people who bought those vouchers—return to the park. Some people have kept their vouchers, others have lost them but believe they can prove they were at the park in 1993 and

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DAVE MOUNT, RICHARD PEISER & ALLEN SHEARER, ALTERNATIVE FUTURES FOR CHANGING LANDSCAPES: THE UPPER SAN PEDRO RIVER BASIN IN ARIZONA (2003)).

[36] Lawrence J. MacDonnell, *Rethinking the Use of General Stream Adjudications*, 15 WYO. L. REV. 347, 350 (2015).

[37] *Id.*

[38] *Id.* at 351 & n.25.

part of the evacuation. Disneyland employees then attempt to put everyone back in line for the various rides in the order they had been in when the park closed thirty years ago. Some people have photographs or video; others have witnesses. Arguments break out over who left the line or whether families could save places in line. Equitably and efficiently lining everyone up again is a nearly impossible task. Now, imagine that same process, but for tens or hundreds of thousands of parties across tens of thousands of square miles covering over a century of history. And imagine that, rather than a place in line to ride Space Mountain or It's a Small World, the stakes are the fundamental molecule of life in a desert growing ever dryer in the face of climate change. That's the quagmire of the modern GSA.

The general adjudication of all water rights in the Gila River basin in Arizona is perhaps the most complex GSA in U.S. history.[39] The Gila River GSA is now over forty years old, and includes over 38,000 parties with nearly 100,000 claims.[40] The Gila begins in the highlands of southwestern New Mexico and stretches over 600 miles west through Arizona, traversing the Gila River Indian Community and the Phoenix metropolitan area, finally joining the Colorado River near Yuma.[41] The river drains nearly half of the entire State of Arizona.[42] Many of the most significant rivers in Arizona are tributaries to the Gila, including the San Pedro River, Salt River, Agua Fria River, and Verde River.[43] The Gila is the second largest river in Arizona next to the Colorado River, and provides around twenty percent of the water used in Arizona.[44] The Little Colorado GSA, the other GSA in Arizona, involves fewer parties and a smaller area, but has nevertheless also persisted for over forty years and leaves uncertainty over water rights for the Navajo Nation, Hopi Tribe, Grand Canyon National Park, and many cities, towns, ranches, and farms.[45] Resolving these GSAs is essential to clarifying water rights for improved water management to better respond to water variability.[46]

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[39] Larson & Payne, *supra* note 13, at 477.
[40] *Id.*
[41] Larson & Kennedy, *supra* note 8, at 1349.
[42] ENV'T DEF. FUND, RIVER OF THE MONTH SERIES: AUGUST 2012 THE GILA RIVER, http://www.edf.org/sites/default/files/gilariverfactsheet.pdf [https://perma.cc/4V5T-NHG2].
[43] Larson & Payne, *supra* note 13, at 478.
[44] Joseph M. Feller, *The Adjudication That Ate Arizona Water Law*, 49 ARIZ. STATE L.J. 405, 408–09 (2007); *see also* JIM TURNER, ARIZONA: A CELEBRATION OF THE GRAND CANYON STATE 43 (2011).
[45] Larson & Kennedy, *supra* note 8, at 1354.
[46] *Id.* at 1355; Larson & Payne, *supra* note 13, at 468.

Like the majority of western states, Arizona relies on GSAs to resolve basin-wide water rights disputes.[47] While Arizona's GSAs are among the most complex and stubborn, many states in the West have water uncertainty due to languishing GSAs.[48] These proceedings would be enormously complex under even more simplified conditions. But in an attempt to allow such proceedings to be more integrated and comprehensive, Congress passed the McCarran Amendment in 1952, waiving federal sovereign immunity in state water rights disputes involving an entire river system—effectively allowing federal and tribal parties to have their water rights adjudicated in state courts so long as the proceeding was sufficiently comprehensive.[49] The McCarran Amendment means that federal and tribal parties must adjudicate the priority and quantity of their *Winters* rights in state court when those state courts oversee comprehensive GSAs.[50] On the one hand, the McCarran Amendment allows the GSAs to pursue their ostensible aim—a truly integrated proceeding that avoids contradictory decisions over water rights within the same river basin between different courts. On the other hand, federal and tribal parties have their rights adjudicated in state courts that may be less receptive to their arguments than a federal or tribal court, particularly if the state judge is elected and must answer politically to a constituency, the majority of which likely does not want more water allocated to federal and tribal parties.

GSAs are comprehensive proceedings extending across a large geographic area, and thus tend to be prolonged and expensive.[51] The Gila

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[47] *See* ALASKA STAT. §§ 46.15.065–.169 (2016); ARIZ. REV. STAT. ANN. §§ 45-251 to -264 (2016); CAL. WATER CODE §§ 2000–2900 (West 2016); COLO. REV. STAT. §§ 37-92-101 to -602 (2016); IDAHO CODE §§ 42-1401 to -1428 (2016); MONT. CODE ANN. §§ 85-2-201 to -243 (2015); NEB. REV. STAT. §§ 46-226 to -231 (2016); NEV. REV. STAT. ANN. §§ 533.090-.320, 534.100 (West 2015); N.M. STAT. ANN. §§ 72-4-13 to -19 (2016); N.D. CENT. CODE §§ 61-03 -15 to -20 (2016); OKLA. STAT. ANN. tit. 82, §§ 105.6–.8 (2016); OR. REV. STAT. §§ 539.010 -.350, 541.310-.320 (2016); S.D. CODIFIED LAWS §§ 46-10-1 to -13 (2016); TEX. WATER CODE ANN. §§ 11.301–.341 (West 2015); UTAH CODE ANN. §§ 73-4-1 to -24 (West 2016); WASH. REV. CODE ANN. §§ 90.03.110–.245 (West 2016); WYO. STAT. ANN. §§ 41-4-301 to -331 (West 2016).

[48] *See* MacDonnell, *supra* note 36, at 348.

[49] 43 U.S.C. § 666 (2012); *see* Aubri Goldsby, *The McCarran Amendment and Groundwater: Why Washington State Should Require Inclusion of Groundwater in General Stream Adjudications Involving Federal Reserved Water Rights*, 86 WASH. L. REV. 185, 185–86 (2011); *see also* Reed D. Benson, *Deflating the Deference Myth: National Interests vs. State Authority Under Federal Laws Affecting Water Use*, 2 UTAH L. REV. 241, 268–69 (2006).

[50] Larson & Kennedy, *supra* note 8, at 1346.

[51] *Id.* at 1347–48.

River GSA officially began in 1974, and over forty years later remains unresolved.[52] This legal quagmire now includes over 38,000 parties with nearly 100,000 claims.[53] There are several reasons why the Gila River GSA has proved so difficult to resolve, including the number and diversity of parties involved, the resource constraints within the relevant agencies and courts, and the need to address other water policy priorities such as management of groundwater withdrawals or transboundary sharing of the Colorado River.[54] Despite the myriad complexities of a proceeding like a GSA, I believe the greatest obstacle to resolving the Gila River GSA is the subflow challenge.

Arizona has a bifurcated water rights regime, in which surface water rights are treated as legally distinct from groundwater rights.[55] Surface water is governed by prior appropriation, while groundwater is governed by a separate and equally complex set of rules and legal doctrines.[56] Arizona's GSAs apply only to surface water rights.[57] Anyone with a basic understanding of hydrology knows there is no obvious, non-arbitrary hydrologic line between surface water and groundwater.[58] Consider the following example:

> A shallow well drilled near a river may be pumping mostly water from the river itself. A deeper well located further from the river may be pumping mostly water from an aquifer in the phreatic zone, but could nevertheless still be taking some water more closely associated with the surface. Water associated with the surface must have a priority date and be adjudicated as part of the GSA, and a well pumping 'surface water' may be taking that water out of priority.[59]

The concept of "subflow" is a judicially crafted attempt to distinguish where the laws of surface water apply (including the jurisdiction of the

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[52] *Id.* at 1348.
[53] *Id.*; *see also General Description of Adjudications Program*, ARIZ. DEP'T WATER RES. (Feb. 1, 2017), http://www.azwater.gov/adjudications [https://perma.cc/Y2W7-UUMD].
[54] Larson & Payne, *supra* note 13, at 477.
[55] Larson & Kennedy, *supra* note 8, at 1342 nn.32–33.
[56] *See* Larson & Payne, *supra* note 13, at 483–88 (providing an overview of Arizona groundwater law).
[57] Larson & Kennedy, *supra* note 8, at 1342.
[58] *See* Robert Glennon & Thomas Maddock III, *In Search of Subflow: Arizona's Futile Effort to Separate Groundwater from Surface Water*, 36 ARIZ. L. REV. 567, 570–74 (1994).
[59] Larson & Payne, *supra* note 13, at 480.

GSA) and where the laws of groundwater apply.[60] After an initial attempt to draw this line failed to garner the support of the Arizona Supreme Court,[61] "subflow" was defined as water drawn from the "saturated floodplain Holocene alluvium" and thus more closely associated with surface water, requiring a priority date and falling under the jurisdiction of the GSA.[62] As such, wells pumping from the subflow zone, or with cones of depression intersecting the subflow zone, should be included in the GSA. An enormous amount of time and energy is expended determining who is subject to the GSA and who is excluded as solely pumping groundwater.[63]

Thus, an already complex and obtuse process is made all the worse by having courts draw scientifically indefensible lines between surface and groundwater. The subflow line has grown all the more relevant—and all the more frustrating—as courts have recognized the rights of federal and tribal parties to groundwater under the *Winters* doctrine.[64] Given the high priority many of these parties have, uncertainty regarding their rights leads to uncertainty regarding all rights, creating a pressing need to resolve GSAs and quantify *Winters* rights so that a clearer sense of water rights ownerships might facilitate greater adaptive capacity in water policy as it responds to climate change.

II. QUANTIFYING *WINTERS* RIGHTS IN ARIZONA

The sheer spatial and temporal scope of GSAs, combined with the complexity of water law and the inherent challenges of quantification standards for *Winters* rights, pose significant hurdles to the timely and equitable resolution of the GSA proceedings and thus to improved adaptive capacity in water policy. Despite these challenges, Arizona courts have begun to make more headway in recent years in reaching decisions quantifying *Winters* rights as part of the GSAs.[65] However, these court

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[60] Glennon & Maddock III, *supra* note 58, at 570–71.
[61] *In re* Gen. Adjudication of All Rts. to Use Water in Gila River Sys. & Source (*Gila II*), 857 P.2d 1236, 1239–40, 1248 (Ariz. 1993).
[62] *In re* Gen. Adjudication of All Rts. to Use Water in Gila River Sys. & Source (*Gila IV*), 9 P.3d 1069, 1083 (Ariz. 2000).
[63] *See, e.g.*, Feller, *supra* note 44, at 421–23. The Hydrographic Survey Report for Silver Creek was completed by the Arizona Department of Water Resources in 1990 to catalog claims, diversion points, uses, and subflow zones. *Id.* at 421. "In the ensuing 180-day objection period [established for the draft report], 3,456 objections to the draft were filed." *Id.*
[64] *See, e.g.*, Agua Caliente Band of Cahilla Indians v. Coachella Valley Water Dist., 849 F.3d 1262, 1272–73 (9th Cir. 2017); *In re* Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source (*Gila III*), 989 P.2d 739, 742–43, 751 (Ariz. 1999).
[65] Hopi Special Master Report, *supra* note 3, at 31.

decisions regarding quantification may give rise to just as many questions as they answer. This section will address the quantification proceedings for the Navajo Nation and Hopi Tribe, as well as the decision quantifying the rights of the federally owned and operated SPRNCA, and evaluate how these decisions impact water policy as it responds to climate change.

A. The Navajo Nation and Hopi Tribe Quantifications

Given the risks of adjudicating water rights in state courts under the McCarran Amendment, and the uncertainty, legal costs, and protracted nature of GSAs, most Native American tribes in Arizona have settled their water rights claims.[66] These settlements require careful negotiation not just between tribes and other competing water users, but with state and federal agencies, and approval through Congressional legislation.[67] While these settlements take various forms, they often involve the tribe agreeing to less water than it might otherwise be adjudicated and quantified in the GSA in exchange for water infrastructure financing and development, a moratorium against groundwater pumping around tribal land, diversification of the tribe's water supply portfolio, and authorization of off-reservation leases of tribal water.[68]

Not all tribes have settled their claims. A group of tribes in the Colorado River Basin, including the Chemehuevi, Cocopah, Yuma, Colorado River, and Fort Mohave, had their water rights quantified under PIA and decreed by the U.S. Supreme Court in 1963 in *Arizona v. California*.[69] Two prominent examples of tribes that have neither settled nor had their rights decreed are the Navajo Nation and the Hopi Tribe. Both of these tribes have been in trial within the Little Colorado River GSA to quantify their rights since 2018.

The first phase of the Hopi quantification trial was conducted between September and December of 2018.[70] The second phase, delayed by the COVID-19 pandemic, was conducted between September 2020 and February 2021.[71] On May 25, 2022, the special master in the Little Colorado River GSA, Susan Harris, filed the final report recommending the quantification of the Hopi Tribe's water rights in the Little Colorado

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[66] Rebecca Glenn, *Unrealized Federal Indian Water Rights in the Colorado River: An Opportunity for Equity and Conservation*, 25 U. DENV. WATER L. REV. 287, 297 (2022).
[67] *Id.*
[68] *Id.* at 296–98.
[69] 373 U.S. 340, 344–45 (1964)
[70] Hopi Special Master Report, *supra* note 3, at 13.
[71] *Id.* at 15.

River Basin.[72] Many parties are adverse to the Hopi in their quantification trial, including the Navajo Nation, various agencies of the U.S. government, and a consortium of cities, towns, ranches, farms, and mines referred to collectively in the proceedings as the Little Colorado River Coalition ("LCRC").[73]

The Hopi people have occupied a vast portion of what is now northeastern Arizona for over a thousand years. Their reservation was created by treaty and executive order in 1882, on a much smaller area than they traditionally occupied, and completely surrounded by the reservation of the Navajo Nation.[74] The Hopi people use water for obvious domestic and municipal purposes, as well as for farming, ranching, mining, energy development, and tourism.[75] According to the Census Bureau's 2018–2022 American Community Survey, the population of the Hopi Reservation is 7895 people.[76]

The Hopi face unique water challenges beyond location in an arid region with highly variable rainfall and limited surface water resources. Much of the groundwater underlying the Hopi Reservation has been contaminated by historic uranium mining.[77] Many Hopi people live in small, widely distributed communities lacking the economies of scale associated with centrally treated and distributed piped drinking water.[78]

The trial held in the Little Colorado River GSA to quantify the Hopi Tribe's water rights was the first to apply the Arizona reservation-specific standard established in *Gila V* rather than the U.S. Supreme Court's PIA standard. The special master who heard the case largely relied on a PIA approach in quantifying the Hopi's irrigation claims, but she heard from a variety of expert witnesses from all parties in determining the quantity of other aspects of the Tribe's *Winters* rights.[79]

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[72] *Id.* at 288–89.
[73] *Id.* at 9.
[74] Pat Sekaquaptewa, *Evolving the Hopi Common Law*, 9 KAN. J.L. & PUB. POL'Y 761, 762–63 (2000).
[75] Hopi Special Master Report, *supra* note 3, at 8.
[76] *My Tribal Area*, U.S. CENSUS BUREAU (based on Hopi Reservation and Off-Reservation Trust Land, AZ 2018–2022 American Community Survey 5-Year Estimate), https://www.census.gov/tribal/?aianihh=1505 [https://perma.cc/TV37-PKDF] (last visited May 6, 2024).
[77] EPA, HEALTH AND ENVIRONMENTAL IMPACTS OF URANIUM CONTAMINATION IN THE NAVAJO NATION FIVE-YEAR PLAN 2, 4 (2008).
[78] Ian James, *"We Need Water to Survive": Hopi Tribe Pushes for Solutions in Long Struggle for Water*, ARIZ. REPUBLIC (Dec. 14, 2020), https://www.azcentral.com/in-depth/news/local/arizona-environment/2020/12/14/hopi-tribe-pushes-solutions-many-without-clean-drinking-water/3731341001 [https://perma.cc/M7KN-8QRY].
[79] *See* Hopi Special Master Report, *supra* note 3, at 28.

With respect to domestic, cultural, municipal, and industrial ("DCMI") uses, the special master reviewed various claims about the current and future population of the Hopi Tribe. Evidence and predictions were presented by the various parties, including the Hopi Tribe, LCRC, and federal government regarding the present and projected future population of the Tribe.[80] The special master generally sided with the LCRC regarding population projections.[81] Regarding the gallons per capita per day ("gpcd"), the special master also agreed with the LCRC for a lower amount than that argued by the Hopi and a lower amount than the average gpcd of nearby towns like Winslow and Cottonwood located in surrounding counties.[82]

For irrigation, the Hopi claimed 20,600 acre-feet per year ("af/y") for a coal liquefaction plant, 12,000 af/y for cattle, and 6500 af/y for a solar farm.[83] The LCRC argued for 18,897 for agriculture, and the special master agreed.[84] Ultimately, the special master's report made recommendations to the court closer to those suggested by the LCRC rather than by the Hopi Tribe.[85] Importantly, the average annual flow of the Little Colorado River from Flagstaff to Springerville in Arizona has never exceeded 100,000 acre-feet in recorded history.[86] Objections were filed on the special master's report on November 21, 2023, and responses to those objections are due by January 23, 2024. The special master's report will then go before the Maricopa County Superior Court judge overseeing the Little Colorado River GSA.[87]

The Hopi Tribe faced considerable headwinds in their quantification trial, with well-funded opposing parties hiring well-qualified experts, and the special master's report largely held in favor of the positions of those adverse parties. It will now fall to the Maricopa County Superior Court to determine if the special master appropriately applied the *Gila V* standard, while tribes around the country look to this case to see if this new quantification approach is worthy of broader adoption or strong

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[80] *Id.* at 90–110.
[81] *Id.*
[82] *Id.* at 135, 145, 194.
[83] *Id.* at 37 n.10 (explaining one acre-foot is one acre flooded to one foot deep, or 325,851 gallons or 1,233.48 m^3); *id.* at 8, 200, 234.
[84] *Id.* at 289.
[85] *Supra* note 3.
[86] *Little Colorado River near Cameron, AZ*, U.S. GEOLOGICAL SURV., https://waterdata.usgs.gov/monitoring-location/09402000/#parameterCode=00065&period=P7D&showMedian=true [https://perma.cc/E599-CEQ7] (last visited May 6, 2024).
[87] Hopi Special Master Report, *supra* note 3.

opposition. Lawyers and judges will also look on with curiosity. Can a state court adopt a wholly unique approach to quantifying federal *Winters* rights? Should the U.S. Supreme Court's approach to quantification and its application of the PIA standard preempt and supersede any other state approach? Should the Court reconsider its quantification method as too narrowly focused on irrigation potential, and see *Gila V* as the way forward? These are important legal and water policy questions, but go beyond the scope of this Article.

This Article's focus is on a narrower but no less important and unique feature of the *Gila V* quantification of the Hopi's *Winters* rights. The *Gila V* standard explicitly considers cultural uses of water.[88] Indeed, *Gila V* states the purpose of a reservation is to provide Native American peoples with a "permanent home and abiding place" that is a "livable environment."[89] The Arizona Supreme Court's opinion goes on to state that:

> A tribe's history will likely be significant. Deference should be given to practices requiring water uses that are embedded in Native American traditions. Some rituals may date back hundreds of years, and tribes should be granted water rights necessary to continue such practices into the future. An Indian reservation could not be a true homeland otherwise.[90]

Growing corn and other traditional crops, such as squash, is a central aspect of Hopi society and religious practice. The corn varieties are distinctive in size and color, with each type have a specific ceremonial use. For example, blue corn is used to make ceremonial foods, whereas a perfect ear of white corn is placed beside a newborn infant when the baby is first brought home.[91] Corn cultivation is also religiously and culturally significant. Cultivation is adapted to the arid climate, planting in canyons with groundwater near the surface and near permanent artesian springs forming communal gardens.[92] These cultural practices are threatened by

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[88] *See In re* Gen. Adjudication of All Rts. to Use Water in the Gila River Sys. & Source (*Gila V*), 35 P.3d 68, 79–80 (Ariz. 2001).
[89] *Id.* at 74.
[90] *Id.* at 79.
[91] Dennis Wall & Virgil Masayesva, *People of the Corn: Teachings in Hopi Traditional Agriculture, Spirituality, and Sustainability*, 28 AM. INDIAN Q. 435, 436, 448 (2004).
[92] *Id.*; *see also* Deborah Prevost, Robert Ahrens & David Kriz, *Traditional Hopi Agricultural Methods*, 39 J. SOIL & WATER CONSERVATION 170, 170–71 (1984).

climate change, which has resulted in hotter temperatures, more variable rainfall, and dryer soils.[93]

Quantifying such a cultural water right was unknown in American water law prior to the Hopi quantification trials. Opposing parties argued that cultural uses would be duplicative of other domestic or municipal uses or irrigation uses quantified in other categories, or that cultural irrigation should be subject to the same considerations as a normal PIA calculation.[94] The Hopi claimed 9471 af/y for cultural water uses.[95] The special master rejected this claim, and did not include any cultural water use within the calculation of the Hopi's *Winters* rights.[96] The special master rejected the contingent valuation methodology proposed by the Hopi and their experts as a means of valuing and quantifying a cultural water right, relying instead on the PIA standard.[97] The special master rejected the claim that new groundwater development was necessary to preserve these cultural practices, despite evidence that climate change has resulted in more frequent and severe droughts impacting historic cultivation methods.[98] Additionally, the trial was separated into two phases—one focused on past water uses, the other on future.[99] It is possible that by not integrating these considerations, past cultural water uses were discounted and the value of future cultural water uses was not connected to its history.[100]

A new special master in the Little Colorado River GSA, appointed after the conclusion of the Hopi quantification trial, concluded the first phase of the quantification trial of the Navajo Nation's *Winters* rights in the summer of 2023.[101] The Navajo Nation's reservation was created in

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[93] Barbara Cosens & Brian C. Chaffin, *Adaptive Governance of Water Resources Shared with Indigenous Peoples: The Role of Law*, 8 WATER 222, 225, 228 (2016).
[94] Hopi Special Master Report, *supra* note 3, at 194.
[95] *Id.* at 188–89.
[96] *Id.* at 178.
[97] *See id.* at 178–79.
[98] *Id.* at 182.
[99] *Id.*
[100] *See generally* An Economic Assessment of Future Water Needs on the Hopi Reservation, *In re* Gen. Adjudication of All Rts. to Use Water in the Little Colo. River Sys. & Source (Ariz. Super. Ct. 2022) (No. 6417-203), https://www.documentcloud.org/documents/7034820-H-W-Report-Combined-Rev-MH [https://perma.cc/BU32-RNNR] (expert report prepared by Michael Hanemann and Dale Whittington for the Hopi); Dale Whittington, *Ancient Instincts: Implications for Water Policy in the 21st Century*, WATER ECON. & POL'Y, June 24, 2016, at 1.
[101] *Little Colorado River Arizona*, NAVAJO NATION WATER RTS. COMM'N, https://nnwrc

1868 (although it has an earlier peace treaty dated 1849, raising interesting and complicated questions about the Navajo's priority date).[102] While the Navajo Nation is very different from the Hopi Tribe in certain ways, they face similar water challenges, including uranium contamination in groundwater, variable surface water sources impacted by climate change, and many small communities spread over a large area, making infrastructure development difficult.[103]

Phase I of the Navajo Nation trial quantifies only DCMI uses, with Phase II for irrigation, economic development, and cultural uses scheduled for 2027.[104] This new special master will apply the same *Gila V* standard applied in the Hopi quantification trial, but it remains to be seen how that standard might be applied differently given a different tribe and special master. The Navajo Nation, with a much larger reservation and population, has claimed significantly more for irrigation and in general based on its *Winters* rights to the Little Colorado River.[105] While the cultural practices related to irrigation of the Hopi are not the same for the Navajo, the Diné (Navajo people) hold the Little Colorado River to be one of the four sacred rivers used to delineate the Diné Bikéyah (Navajo homeland).[106] As such, in the second phase of the Navajo quantification trial, comparable questions of cultural water use, as those in the Hopi, will require adjudication and quantification.

B. The SPRNCA Quantification

It is not just tribal *Winters* rights facing complex new challenges to quantification. In the same way that courts struggle to quantify a cultural water use, courts also struggle to quantify a water use that is not solely human and not really consumptive or productive in the economic sense of those words.

.navajo-nsn.gov/basin-updates/little-colorado-river-arizona [https://perma.cc/K7DB-J5Y8] (last visited May 6, 2024).

[102] Arizona v. Navajo Nation, 599 U.S. 555, 559–60 (2023).

[103] *See* Mark S. Cladis, *Sacred Sites as a Threat to Environmental Justice? Environmental Spirituality and Justice Meet Among the Diné (Navajo) and Other Indigenous Groups*, 23 WORLDVIEWS: GLOB. RELIGIONS, CULTURE, & ECOLOGY 132, 135 (2019); Laura A. Bray, *Settler Colonialism and Rural Environmental Injustice: Water Inequality on the Navajo Nation*, 86 RURAL SOCIO. 586, 590–91, 594, 605–06 (2021).

[104] *Little Colorado River Arizona*, *supra* note 101.

[105] *Id.*

[106] Cladis, *supra* note 103, at 140.

The San Pedro River originates in Mexico and flows through southern Arizona as a tributary to the Gila River, and as such is part of the Gila River GSA.[107] It is one of the last free flowing rivers in the western United States and a critical habitat for endangered species and migratory birds.[108] Congress recognized its unique value when it created the San Pedro Riparian National Conservation Area in 1988.[109] In that Act, Congress expressly reserved "a quantity of water sufficient to fulfill the purposes" of SPRNCA.[110] Congress defined the purposes of a national conservation area as "conserving, protecting, and enhancing the riparian area and the aquatic, wildlife, archeological, paleontological, scientific, cultural, educational, and recreational resources of the conservation area."[111] The Bureau of Land Management oversees the operation and protection of SPRNCA.

One of the seminal cases establishing the approach for quantifying such non-tribal *Winters* rights was *Cappaert v. United States*.[112] In *Cappaert*, President Truman had used the American Antiquities Preservation Act to preserve Devil's Hole, a deep cavern on federal land in Nevada inhabited by a rare species of pupfish.[113] Nearby groundwater pumping caused the level of the pools in the cavern to decline and threaten the pupfish.[114] In holding that the purpose of the reservation included protection of the pupfish, the Supreme Court stated that the purpose could be inferred from the language of the reservation, and the quantity of water is only the minimum amount necessary to fulfill the primary purpose of the reservation.[115]

After years of briefings and hearings, the Maricopa County Superior Court, which oversees the Gila River GSA, quantified the *Winters* rights held by SPRNCA in a decision published on August 24, 2023.[116]

The SPRNCA case involves a unique circumstance in which water was explicitly reserved by Congress in creating a federal reservation. The superior court cited heavily to *Cappaert* to show that in creating SPRNCA, Congress used almost the exact wording of the *Cappaert* opinion to define

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[107] Larson & Payne, *supra* note 13, at 468, 488.
[108] *Id.* at 488.
[109] 16 U.S.C. § 460xx-1(d) (2018).
[110] *Id.*
[111] § 460xx1(a).
[112] *See* 426 U.S. 128, 129 (1976).
[113] *Id.* at 128–29, 136.
[114] *Id.* at 133–34.
[115] *Id.* at 129, 141.
[116] San Pedro Order, *supra* note 5, at 1.

the scope of the water right, namely that the right encompassed the amount of water "sufficient" to fulfill the purposes of the SPRNCA reservation.[117] The meaning of "sufficient" was contested by the parties, and the court held that *Cappaert* established only one standard for quantifying federally reserved rights, which is the "minimal need" standard.[118] Effectively, the court's decision on SPRNCA quantification is that the "sufficient" standard and the "minimal need" standard are one and the same—the amount "sufficient" to fulfill the purpose of a federal standard is defined as the "minimal need" required for the same. The superior court's decision uses this standard in quantifying various parts of SPRNCA's *Winters* rights, including both groundwater and surface water rights.[119]

Objections to the court's decision must be filed by January 22, 2024. The case is likely to be appealed to the Arizona Court of Appeals, where the approach of applying the *Cappaert* standard could face further refinement or reversal. If the decision stands, it suggests that minimal need is less the driving consideration than sufficiency and the primary purpose need not be whittled down from a multitude of stated and potentially inconsistent purposes, but can instead be inferred as a broad purpose for ecosystem protection, with all of the water uses that protection implies and promotes. Of course, unlike the nineteenth century priority dates of the Navajo and Hopi, SPRNCA's priority is 1988.[120] Thus, while the quantification of SPRNCA's *Winters* rights in the superior court decision seems a broad and protective interpretation of *Cappaert*, such quantification cannot spare SPRNCA the risk of the fundamental challenge of a first-in-time, first-in-right regime—being near the back of the priority line. Something more than equitable quantification will be needed to protect areas of unique natural, historic, or aesthetic value recognized by federal reservations, when those reservations have junior priority, particularly in the face of a more variable hydrology caused by climate change.

C. Why Quantifying Winters *Rights Matters*

The cases of quantifying the *Winters* rights of the Hopi Tribe, Navajo Nation, and SPRNCA show the enormous challenge of applying vague and often subjective standards. Even had these standards been more objective and grounded in science, those standards might already

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[117] *Id.* at 15–16.
[118] *Id.* at 15–17.
[119] *Id.* at 24, 37, 51–52.
[120] *Id.* at 8.

be antiquated given the rapid pace of climate change's impact on their respective water sources. However, these cases are examples of the importance of quantifying *Winters* rights in a way that is scientifically grounded, culturally sensitive, and adaptive to climate change.

The Navajo Nation and Hopi quantification trials are of critical importance given their respective early priority dates and how that quantification impacts other users sharing the Little Colorado River, including the Grand Canyon National Park as well as dozens of other communities needing certainty to plan for changes in water supplies. The Navajo Nation's quantification is all the more important in the broader interjurisdictional dispute over the Colorado River. The Supreme Court rejected the Navajo Nation's attempt to use a trust argument to induce the Department of the Interior to implement a plan to protect the Nation's claimed rights to the Colorado River.[121] The future of the Navajo Nation's claims to the Colorado River could be dictated by the quantity of the right the Nation holds in the Little Colorado River. If that quantity is deemed sufficient to meet the Nation's needs, future courts might be reluctant to decree a large quantity of early priority water rights to the Navajo Nation in an already hotly contested interstate and international river basin serving forty million people.

One concrete example of the importance of SPRNCA's quantification is the controversy surrounding real estate development in Sierra Vista, Arizona, located very close to SPRNCA.[122] Sierra Vista is a city of over 40,000 people located near the San Pedro River, within the Gila River basin, in southern Arizona.[123] Sierra Vista shares the San Pedro River with other users, including Fort Huachuca and SPRNCA, both of which have federally reserved water rights under *Winters*.[124] Developers in Sierra Vista sought a certificate of adequate water supply ("CAWS") from the Arizona Department of Water Resources ("ADWR").[125] The Arizona Groundwater Management Act requires a demonstration that there be 100 years of physically, legally, and continuously available water for a subdivision for the sale of subdivided land in many parts of Arizona, with the demonstration established through the CAWS.[126]

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[121] Arizona v. Navajo Nation, 599 U.S. 555, 564–65 (2023).
[122] *See* Larson & Payne, *supra* note 13, at 488–89 (providing an overview of the water controversy and its related judicial proceedings, political implications, and legislative interventions).
[123] *Id.*
[124] *Id.* at 488–90.
[125] *Id.* at 490–91.
[126] *Id.* at 483–87 (providing an overview of Arizona's Groundwater Management Act).

The Department of the Interior, representing the interests of SPRNCA, claimed that the water rights relied upon by developers in securing the CAWS are not groundwater rights, but instead might be subflow, and thus within the jurisdiction of the GSA.[127] ADWR issued the CAWS to the developers, and the issuance was challenged at the administrative level, and then in court.[128] The Maricopa County Superior Court rejected ADWR's position and that of the administrative law judge and held that ADWR must consider the impact of the development's pumping on SPRNCA's rights in determining if water is "legally available."[129] The developers then sought a legislative solution by lobbying state legislators to relax the adequate water supply requirements, but subsequent legislation was ultimately vetoed by Arizona Governor Doug Ducey.[130]

The Sierra Vista controversy illustrates the potential economic costs of the uncertainty surrounding *Winters* quantification.[131] Throughout the history of Arizona, the state's greatest innovations in water policy have often been sparked by legal controversies.[132] For example, the Salt River Project (a series of dams and conveyances built by the U.S. Bureau of Reclamation serving the Phoenix area) arose, in part, out of the water rights disputes that gave rise to the Kent Decree, a federal court declaration of water rights in the Salt River made in 1910.[133] The development of the Central Arizona Project (the canal transporting a large portion of Arizona's Colorado River allocation to its largest population centered around Phoenix and Tucson) was an innovation born out of the legal disputes between Arizona and California over the Colorado River.[134] The catalyst for the development of Arizona's Groundwater Management Act was a water rights dispute between pecan farmers, the City of Tucson, and mining interests in southern Arizona.[135] Perhaps the legal disputes surrounding development in Sierra Vista will also spur greater efforts to resolve the GSA and quantify outstanding, unsettled, or undecreed *Winters* rights held by tribal and non-tribal parties.

These cases of *Winters* quantification in Arizona have great significance for water policy throughout the country. Could *Gila V* prove to

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[127] *See id.* at 479–80.
[128] Larson & Payne, *supra* note 13, at 491–92.
[129] Silver v. Pueblo del Sol Water Co., 384 P.3d 814, 827 (Ariz. Ct. App. 2016).
[130] Larson & Payne, *supra* note 13, at 492–93.
[131] *Id.* at 494–96.
[132] *See id.* at 466–67.
[133] *See* Feller, *supra* note 44, at 405–06.
[134] *See* Larson & Payne, *supra* note 13, at 467–68.
[135] *See id.* at 483–84.

be a better quantification method than PIA, and if it is, is it constitutional for state courts to adopt a standard for quantifying federal rights in a way other than that prescribed by the U.S. Supreme Court? How can we better integrate the cultural and political value of water in the ways we allocate water rights? What good is a quantity of water if you are in the back of the line waiting to get it in a drying system? If we establish federally protected areas for the benefit of the public, but the water those areas need is subject to a call on the river, how can we effectively protect those shared public resources?

III. *WINTERS* QUANTIFICATION IN A CLIMATE-CHANGED WORLD

These important questions will require careful analysis, as their answers will often depend on the unique regional issues of an individual river basin. But the challenges associated with the quantification of *Winters* rights in Arizona give rise to potentially creative policy solutions that could be adapted to other parts of the world. This Part proposes and evaluates three possible water policy reforms related to the Hopi, Navajo, and SPRNCA cases.

A. Distributed Water Treatment and Water Augmentation

Two of the most significant water challenges confronting both the Navajo Nation and the Hopi Tribe are the need to treat contaminated or brackish groundwater and the need to develop water supplies for small remote communities.[136] Both reservations have populations that often defy the typical large urban model for drinking water treatment and distribution, where economies of scale allow for a centralized treatment system transporting water over a relatively short distance, with water rates kept low because they are spread out among a large customer base.[137] These tribal reservations need a distributed system allowing for localized treatment and distribution, supplemented by household level treatment and augmentation.

An approach combining distributed treatment and household level augmentation could prove a catalyst for settling Hopi and Navajo water rights claims in the Little Colorado GSA. Small-scale reverse osmosis kiosks could be installed on local wells, treating elevated uranium and

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[136] *See generally* Kasha Halbeib, *Examining Uranium Mining in the Canyon Mine*, 40 PACE ENV'T L. REV. 357, 358–59 (2023).
[137] *Id.*

total dissolved solids to drinking water standards and meeting applicable maximum contaminant levels under the Safe Drinking Water Act. Such systems have been successfully implemented in remote rural communities in India, Lebanon, and Jordan and proven both effective in treating the water and affordable, with the systems being financially sustainable selling water at two cents per liter.[138] This improved water supply could be supplemented with household-level augmentation. Existing technologies already implemented around the world, including on Navajo land, use solar energy to condense atmospheric water vapor to produce up to seven liters per day of drinking water.[139]

With objections and appeals inevitable on the special master's report in the Hopi quantification, and with the second phase of the Navajo Nation's quantification trial scheduled for 2027 under a new special master and judge, all parties in the Little Colorado GSA face uncertainty. Parties adverse to the Navajo Nation and Hopi—including the federal government and the LCRC—could finance these distributed treatment and augmentation systems as part of a settlement package to resolve these disputes and provide certainty and equity in water management within the Little Colorado River Basin.

B. Groundwater Recharge for Ecosystem Preservation

These distributed water development projects could facilitate a settlement of tribal *Winters* rights claims in the Little Colorado GSA. But in the Gila River GSA, a different approach will be necessary to reach a settlement on SPRNCA's non-tribal *Winters* rights claims. As in the Little Colorado GSA, uncertainty impacts all parties around SPRNCA, and that uncertainty will persist as the Maricopa County Superior Court decision is appealed.

One possible approach is to formalize the work done by a partnership between SPRNCA and its neighbors into a settlement agreement that would protect SPRNCA's flows, reduce risks associated with its junior priority, and alleviate uncertainty for subflow pumpers around the San Pedro River. This partnership, facilitated by The Nature Conservancy,

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[138] Rhett Larson, *New Water for Water Dispute Resolution*, 4 TEX. A&M J. PROP. L. 193, 209 (2018).

[139] *Id.* at 209; *see also* Clara Migoya, *Water from Thin Air? It's One Possible Solution for Rural Arizonans Who Need Access*, ARIZ. REPUBLIC (Sept. 25, 2023), https://www.azcentral.com/story/news/local/arizona-environment/2023/09/25/solar-powered-technologies-in-arizona-make-a-dent-on-water-access/70867204007 [https://perma.cc/UD4E-33FG].

is called the Cochise Conservation and Recharge Network ("CCRN").[140] The CCRN's work involves using effluent (treated wastewater) and stormwater from the City of Sierra Vista to recharge aquifers near the San Pedro River and SPRNCA.[141] This recharge supports base flow in the San Pedro and thus preserves stream flow through SPRNCA.[142] Fort Huachuca, the Army base in the area, could be included in the formalization and expansion of this project. Under this possible settlement, Fort Huachuca and SPRNCA would have their *Winters* rights quantified with their priority dates decreed. Sierra Vista and Fort Huachuca would agree to use their effluent and stormwater to recharge aquifers to support the San Pedro, and by so doing, would have their wells protected from any potential decision holding the wells to be pumping subflow. As long as Fort Huachuca and Sierra Vista continue to recharge, their wells can continue to pump and SPRNCA should continue to have sufficient water to meet the primary purpose of its reservation.

As with the Navajo and Hopi proposal regarding distributed treatment and augmentation, this recharge project proposal would only be part of a broader settlement intended to facilitate resolution of these *Winters* claims. Funding is necessary to support the recharge project, and negotiations with Mexico on mining and municipal wastewater must be integrated within a broader management strategy for the San Pedro River. But a broadened and formalized version of the CCRN project could be part of how potential subflow pumpers like Sierra Vista, and junior priority *Winters* right holders like SPRNCA, can live together and share the river sustainably.

C. Specialized Water Judges

Proposals in both the Little Colorado GSA and Gila River GSA could help improve equitable water management and resolve *Winters* claims in those respective basins. These proposals are aimed at the unique challenges of those basins. But both basins and their GSAs face common challenges. One such challenge is the institutional competency and resources of the court overseeing the GSAs. The Maricopa County

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[140] *See Home*, CCRN, https://ccrnsanpedro.org [https://perma.cc/2SPR-HYX9] (last visited May 6, 2024) (providing more information on the CCRN).
[141] *Projects: Tour of Project Sites*, CCRN, https://storymaps.arcgis.com/stories/5110541947c54842958ad560ecdb334f [https://perma.cc/U2RX-QCN7] (last visited May 6, 2024).
[142] *See id.*

Superior Court has one judge overseeing both GSAs.[143] That judge has their own normal docket of cases, and they are occasionally rotated out of the GSAs and replaced with a new judge with the same duties and docket. That judge has one special master to manage both GSAs.[144] The sheer number of parties and temporal and spatial scope of these disputes would stagger any judge already busy with a normal docket. Add on the enormous legal complexity of water law, which calls for deep specialization, and the deep technical knowledge required to engage with experts on irrigation, mining, energy production, domestic water treatment and distribution, and cultural water uses.[145]

Colorado has used specialized water courts to address this challenge of institutional competency, continuity and institutional memory, and judicial resource efficiency.[146] Arizona and other states struggling to resolve GSAs and to quantify and decree *Winters* rights should follow this example. Even if these states do not create specialized water courts, at a minimum, they should have one judge assigned to each GSA, with a special master for each sub-basin with their own staff. To preserve continuity and transfer knowledge, the special master could prepare to replace the judge and the special master's staff could prepare to replace the special master. While this would require an expenditure of resources, it is likely less costly than all of the costs associated with the uncertainty and prolonged nature of adjudicating quantification and equitable allocation of rights to the most important resource in the desert.

CONCLUSION

Part of the struggle to equitably quantify cultural uses of water under *Winters* rights is the focus of American water law on economically productive water uses. Prior appropriation's focus on "beneficial use" has largely been defined by courts and statutes as being related to irrigation,

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[143] *Little Colorado River Adjudication Pending Cases and Decisions*, MARICOPA CNTY. SUPERIOR CT., https://www.superiorcourt.maricopa.gov/superiorcourt/generalstreamadjudication/littlecolorado.asp [https://perma.cc/S9BD-4RLL] (last visited May 6, 2024).

[144] *Arizona General Stream Adjudication Bulletin*, MARICOPA CNTY. SUPERIOR CT., https://www.superiorcourt.maricopa.gov/superiorcourt/generalstreamadjudication/adjudicationbulletin/index.asp [https://perma.cc/DZU7-JAY4] (last visited May 6, 2024).

[145] Judges face numerous challenges in adjudicating Arizona GSAs. *See* Larson & Payne, *supra* note 13, at 507–09.

[146] Barbara Cosens, *Resolving Conflict in Non-Ideal, Complex Systems: Solutions for the Law-Science Breakdown in Environmental and Natural Resource Law*, 48 NAT. RES. J. 257, 296–98 (2008) (evaluating the impact of specialization in Colorado's water courts).

domestic, industrial, mining, agricultural, or storage uses, with in-stream uses often based more on fishing, hunting, hydroelectric, and transportation uses. The Supreme Court's reliance on PIA is another example of how American water law conceives of water uses being related to development or production of economic goods or perhaps to human health in drinking, hygiene, and sanitation. Quantification of *Winters* rights is the frontier in which American water law confronts the unique values associated with water. Water is everything that gold, or oil, or wheat is—a valuable, saleable commodity. But it is also everything that sovereignty, and faith, and family is. After all, we don't mist each other with gasoline in the summertime, or throw lumps of coal in the wintertime, or use uranium in religious ceremonies. Water is unique among natural resources in its political and cultural meaning, and its value beyond human uses. That value must be carefully integrated in the quantification of water rights held under the *Winters* doctrine, and into water law and policy generally. Failure to integrate water's cultural, political, and natural values into water law and policy will only make managing this resource all the more challenging under the stress of climate change.