Tribal water settlements: economic innovations for addressing water conflicts

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Abstract
This article highlights examples of innovative approaches in regional water problem-solving contained in tribal settlements, providing readers with a sense of the possibilities that tribal participation brings to western water management. Many tribal settlements use economic incentives in ways useful to consider in a broader water management context. The article highlights economic components of several specific settlements and concludes by summarizing ways in the economic principles and incentives they illustrate can be more broadly applied in addressing water challenges. Figure 1 lists the tribal nations that are referred to in this article and shows the area where these tribes' reservations are located.

Introduction and Background

The role of Native American tribal nations in the western water arena has evolved over the past several decades. Tribal participation has evolved in many regions from primarily being viewed as a litigious threat to non-Indian water allocations, to negotiators and co-implementers of settlements that quantify tribal water rights and address regional water challenges (Deol and Colby, 2018). Along with other water management components in settlements, tribes are initiating innovations which incorporate economic incentives. Tribal nations have legal status as sovereign governments not ruled by state water law and able to enact their own regulations over water use, water quality and watershed protection. Tribal nations often have senior water entitlements that date back to the establishment of the tribal land reservation. These entitlements are more reliable during drought than junior rights held by non-Indian farms, industry and cities and this puts tribes in a unique position (Colby et al, 2005), and allows for innovations when crafting solutions to regional water problems.

Native American nations have legal entitlements to water resources, recognized by U.S. courts in 1908 when the Fort Belknap Indian Community in Montana was developing a reservation irrigation project. During dry periods, there was inadequate water for the tribal project, so the U.S. government sued upstream water users on behalf of the tribe in Winters v. U.S. (Colby et al, 2005, Landry and Quinn 2007). The Supreme Court recognized

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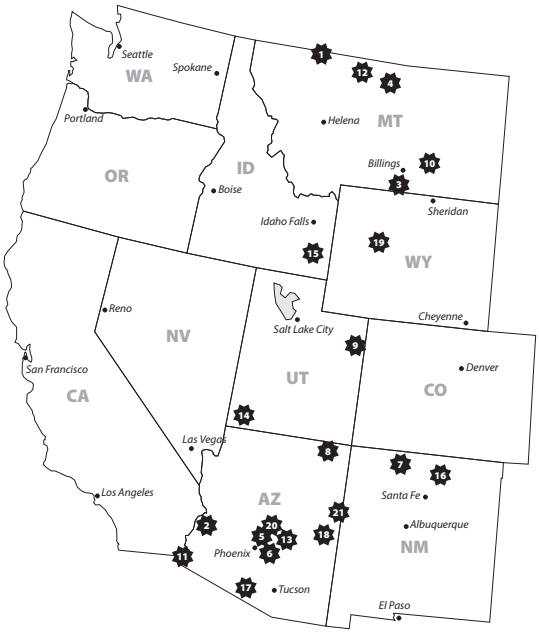
tribal nations have rights to use and manage water in order to fulfill the purposes of their land reservations. While tribes have strong legal entitlements to water, the quantification of those rights and provision of water supplies to tribal nations has been slow, costly and pain-staking, ongoing process.



Tribal Nations Referred to in Article

1. Blackfeet Tribe (2015 Settlement)
2. Colorado River Indian Tribes (1963 Arizona v. California Court Decree)
3. Crow Tribe (2010 Settlement)
4. Fort Belknap Indian Community (2001 Settlement)
5. Fort McDowell Yavapai Nation (1990 Settlement)
6. Gila River Indian Community (2004 Settlement)
7. Jicarilla Apache Nation (1992 Settlement)
8. Navajo Nation (2010 Settlement)
9. Nez Perce Tribe (2004 Settlement)
10. Northern Cheyenne Tribe (1991 Settlement)
11. Quechan Tribe, Fort Yuma (1963 Arizona v. California Court Decree)
12. Rocky Boy's Chippewa-Cree Indians (1999 Settlement)
13. Salt River-Pima-Maricopa Indian Community (1988 Settlement)
14. Shivwits Band, Paiute Indian Tribe (2000 Settlement)
15. Shoshone-Bannock Tribes (1990 Fort Hall Settlement)
16. Taos Pueblo (2010 Settlement)
17. Tohono-O'Odham Nation (2004 Settlement)
18. White Mountain Apache Tribe (2010 Fort Apache Settlement)
19. Wind River Arapahoe and Shoshone Tribes (1992 Big Horn Court Decree)
20. Yavapai Prescott Tribe (1990 Settlement)
21. Zuni Tribe (2003 Settlement)

Figure 1 Locations of Tribal Nations Mentioned in This Article

A water settlement agreement typically involves negotiations between a tribal nation, federal agencies, states, water districts, and other water users in the area where the tribe is quantifying their water rights. Negotiated water settlements aim to resolve conflict among water users by allowing parties to specify water allocations, provide water supply assurances, and reduce litigation. Negotiated settlements with tribes have become an important part of western water institutions (Deol and Colby, 2018). Tribal water right claims are senior in priority to many water rights held by non-Indians, and so recognition and development of tribal rights threatens non-Indian water users that would be "bumped" downward in priority. This stark possibility provides impetus for negotiating settlement of Indian water right claims. Since the 1970s, over three dozen tribal water right settlements have been formalized in the U.S., with Arizona and Montana settlements accounting for a large share of these (see Table 1). The Montana settlements have focused on achieving mutual state-tribal advantages such as improvement in water management (Crow Tribe, Blackfeet Tribe), reservoir storage and dam safety (Northern Cheyenne Tribe), and domestic water supplies (Rocky Boys Chippewa-Cree Indians). In Arizona, urban interests have been motivated to collaborate on settlements in order to enhance their long-term water supply reliability through access to tribal water.

Negotiated settlements of tribal water entitlements produce a wide range of benefits, as compared to absence of a settlement and ongoing regional uncertainty and litigation over tribal rights (Colby, 2006). Settlements can contribute to addressing poor access to water resources for tribal communities and low income and high unemployment on tribal reservations, and provide some redress for historic injustices. Specific regional benefits include funding for new water projects and infrastructure improvements and improved collaboration between tribal and non-tribal water interests in addressing the water management challenges of their region. Economic development programs included in settlements stimulate local economies. Environmental provisions of settlements aim to restore streams, wetlands and other wildlife habitat that contribute cultural and recreational values along with other ecosystem services.

In addition to their many benefits, tribal water settlements are costly in both financial and water commitments. The federal government (and thus U.S. taxpayers) incurs significant financial obligations under most settlements, as do state governments, cities and other non-tribal water users. Commitments of water also are significant. Several Arizona settlements (Gila River Indian Community, Salt River Pima-Maricopa Indian Community) are based on the transfer of previously decreed water rights or on federal project water from non-Indian users to an Indian community. The amount of water quantified for tribes in settlements varies greatly. Entitlements of over 500,000 AFY are recognized for reservations in Montana, Utah, Nevada and Idaho. Other settlements—located in the arid Southwest—quantify tribal water at smaller annual amounts; 40, 000 to 100,000 being a typical range in Arizona and New Mexico. Some settlements involve very small amounts of water, but include important water and economic development funds: Yavapai Prescott Tribe (Arizona), 1,550 acre-feet per year, and Shivwits Band of Paiute Indian Tribe (Utah), 4,000 acre-feet per year.

The northern settlements are principally based on surface water sources, with groundwater included as a secondary source for reservation needs. Storage arrangements specified in settlements make smaller entitlements more reliable during dry years for tribal water users. The southern settlements rely on a more complex mix of water sources. Surface water is usually made available through an existing water development project, water from the CAP in most Arizona settlements. Due to heavy reliance on groundwater in the most populated areas of the state, Arizona settlements pay special attention to groundwater. Several Arizona settlements require tribal governments to place limits on tribal groundwater use in order to protect surface water rights that could be depleted by groundwater pumping. Some Arizona settlements add restrictions on non-tribal water users pumping water from wells located near the tribal reservation, in order to protect groundwater resources underlying tribal lands. These provisions create a buffer zone of additional protection not only for groundwater, but also for reservation streams and wetlands that rely on maintaining the elevation of the groundwater table.

State	Number of Tribal Water Rights Settlements	Number of Litigation Cases Quantifying Tribal Rights*	Total: Settlements Plus Court Decrees
Arizona	9	4	**13**
Colorado	2	0	**2**
Idaho	1	1	**2**
Montana	6	0	**6**
Nevada	6	0	**6**
New Mexico	6	1	**7**
Oregon	1	0	**1**
Utah	2	0	**2**
Washington	1	4	**5**
Wyoming	0	1	**1**
Totals	**34**	**11**	**45**

*This column refers to litigation cases with a final court decree quantifying tribal water rights, cases that are NOT part of a negotiated settlement process. In this column, litigation has been the primary process to quantify the tribal water entitlement. Most negotiated settlements (second column above) require an accompanying court decree as part of settlement implementation, and/or had earlier rounds of litigation prior to achieving a negotiated settlement.

Table 1 Western U.S. Cases: Quantified Tribal Water Rights (excluding California)

Tribal Innovations in Regional Water Management
Water transfers and exchanges involving tribes

Water transfers of various types are used to provide settlement water for on-reservation water needs, and to generate revenues for tribes from leasing their water. The opportunity to earn revenues by leasing out their water provides an important incentive signal to all water right owners. Lease prices give an indication of water values and can motivate improved water management practices and other measures that create "saved water" to lease. Farmers growing lower profit crops, in particular, are responsive to opportunities to lease water so long as laws protect the security of their water rights.

The settlement of Zuni Tribe claims in Arizona's Little Colorado River Basin involved purchase and retirement of surface water rights held under state law in order to restore streams and habitat on Arizona lands held by the tribe. In the Fort McDowell Yavapai Nation settlement (Arizona), a portion of the tribe's water supply comes from transfer of water previously held by irrigation districts. Arrangements for off-reservation leasing of tribal water are prevalent in Arizona settlements; which include complex agreements that allocate CAP water, surface water, groundwater, and treated effluent among Indian and non-Indian water users.

Exchanges among water sources can provide improved water supply reliability and a better match of water quality with water user needs. The Northern Cheyenne settlement involves exchanges among native surface flows and water stored in federal reservoirs to provide a reliable supply for the tribe. The water supply arrangements associated with the Navajo Indian Irrigation Project (NIIP), negotiated many decades ago, provide upstream surface water storage for reservation (and other nearby) water users in the Colorado River Basin.

In some cases, off-reservation leasing is a material part of the agreement, as in several Arizona settlements under which Phoenix-area cities lease tribal CAP water for 99 years. In Idaho, off-reservation leasing must occur through the state's water bank. The Fort Peck Tribes are authorized to engage in out-of-state marketing, but must first afford Montana state government an opportunity to share in the sale. States generally vigorously oppose interstate marketing of tribal water rights, believing this would disrupt carefully crafted interstate apportionments. The Jicarilla Apache Settlement and many Arizona settlements include prohibitions on interstate marketing.

In some basins, a tribe's full use of its reserved rights would disrupt non-Indian water users only in times of shortage and dry year water use contracts are attractive. The tribe agrees to share shortages with non-Indian water users rather than to exercise the full seniority of their right, protecting non-Indian water users during dry years. The Navajo Nation's agreement in the 1960s with proponents of the San Juan-Chama Project involves sharing shortages when flows are insufficient to satisfy both the San Juan-Chama Project and the Navajo Indian Irrigation Project. The Wind River Arapahoe and Shoshone Tribes and the State of Wyoming entered into a 1989 interim agreement for equally sharing surpluses and shortages in the basin.

The Gila River Indian Community (GRIC) tribes have been practicing irrigated agriculture in central Arizona for over 2,000 years. In the late 1800s, non-Indian communities upstream of the GRIC reservation developed significant water usage that led to water shortfalls and sharp losses in tribal crop production. GRIC and other Arizona water interests developed the 2004 Arizona Water Settlements Act, which provides for an annual tribal water entitlement of 635,000 acre-feet. In 2012, GRIC and the Salt River Project initiated a water banking system to store over 2 million acre feet in aquifers underlying GRIC lands, with a system of long-term storage credits, 100 year leases, and dry year options to use the stored groundwater and tribal CAP water. The credits are easily traded, compatible with state water banking rules, incur no evaporation losses and are available for areas of high predicted growth. Buyers include cities, private water companies, mining companies and golf courses (Gila River Water Storage, 2013, (Woods, 2017). The tribe used money available through the water settlement to upgrade a dam so that it could divert water into the aquifer, which can hold 40,000 AF. The tribe is in the process of taking over operations of this recharge system and expanding it to replenish the aquifer more efficiently. This tribal water banking initiative highlights tribal roles in providing drought buffers to junior non-Indian water users through market mechanisms.

The Jicarilla Apache Nation, which governs a large reservation in northwestern New Mexico, crafted a settlement with leasing provisions specified to provide revenues from its water rights. The Tribe has implemented

10 long-term leases, supplying 32,000 AFY to off-reservation parties. This generates $3.5-$4 million in annual income for the tribe, with protections built into the contracts that provide for changes necessary for the tribe to develop new on-reservation uses (Nyberg, 2015.)

The Shoshone-Bannock Tribe quantified water rights in the 1990 Fort Hall Indian Water Rights Agreement. In 2014, the tribe entered into agreements with junior-water rights holders to address water supply shortfalls for non-Indian water users. The agreements include a tribally managed water bank and help address Snake River in-stream flow and groundwater replenishment needs that are of concern to water users throughout the area (Bovee et al, 2015).

Other innovations: storage, forbearance, improved irrigation, water for the environment, mitigating shortage risks

Provisions in tribal settlements are providing improved flexibility in water storage and use and new ways to address water shortage risks. Provision of water for environmental needs is a feature of many settlements. Table 2 provides examples of innovative features included in specific tribal water settlements.

Settlement Features	Examples in Specific Settlements**
Dry year options, shortage-sharing	Navajo Nation San Juan Chana Project agreement, White Mountain Apache, Shoshone-Bannock, Northern Cheyenne
Tribal forbearance of water development	Quechan
Stream and habitat restoration	Zuni Pueblo, Northern Cheyenne, Jicarilla Apache, Nez Perce
Exchanges among water sources	Fort McDowell, Salt River Pima-Maricopa,
Water Banking	Gila River Indian Community Shoshone Bannock
Provisions for managing future conflicts	Taos Pueblo
Off-reservation leasing by tribe	Northern Cheyenne, Fort Peck, Fort McDowell
Improved agricultural water management	Crow, Blackfeet
Restricting groundwater pumping to preserve aquifer levels, wetlands and streams	Zuni Pueblo, Gila River Indian Community

** Examples only, not an exhaustive list.

Table 2 Settlement Feature and Examples

The Nez Perce Tribe, with a 750,000 acre reservation in Idaho, settled their water rights claims to the Snake River in a 2004 agreement (U.S. Department of the Interior, Office of the Secretary, 2004). The settlement includes provisions to provide water to protect endangered salmon and steelhead fish species and specifies tribal responsibilities towards managing fish species and hatchery facilities (Idaho Water Resource Board, 2004). The Tribe has 200,000 AFY of stored water to manage flows to protect endangered fish. Settlement funds allow the tribe to acquire land, water rights, protect habitat, and pursue agricultural and water resource development (Idaho Water Resource Board, 2004).

As a part of settling litigation, in 2005 the Quechan Tribe (Fort Yuma Reservation) and Metropolitan Water District (MWD) of Southern California entered into an agreement that specified amounts of water decreed for

the Fort Yuma (Quechan) Reservation. One unique component of the settlement, the Forbearance Agreement, specifies that if the tribe limits development of its water entitlement, MWD will pay the tribe for reduced water usage (Morisset, 2015). This suggests a pathway for tribes to earn revenues from their senior water entitlements without needing to incur the expense of building storage and conveyance facilities to withhold the water in order to extract payment from other water users. A pragmatic problem facing tribes who wish to lease their water is the lack of incentive for non-Indians to pay for tribal water they already are using without cost. This situation is prevalent because many tribes lack capital to develop new on-reservation irrigation and other water-intensive projects. The Quechan Tribe - MWD agreement indicates that motivated parties can find a way to pay for tribal forbearance, though agreements of this type are currently uncommon.

The Crow Tribe, with a 2.3-million-acre reservation in Montana, entered into a 2010 settlement which provides funding for new irrigation on the reservation, as well as for a Municipal, Rural, and Industrial water system to serve the communities. (U.S. Department of the Interior, 2012). The tribe has water allocation and storage for 300,000 AFY through Reclamation projects.

The Blackfeet Tribe governs a reservation in Montana spans 1.5 million acres. In 2015, the tribe, state of Montana, and the federal government agreed to the Blackfeet Water Rights Settlement Act of 2015, which adjudicated 800,000 AFY to the tribe, as well as $470 million for water-related projects (State of Montana Governor's Office, 2013). The projects include habitat protection, land purchases, community water systems, and irrigation upgrades (U.S. Department of the Interior, 2016). The tribe is upgrading their existing irrigation projects, initiating new irrigation projects, repairing the dam, increasing water storage and expanding clean water systems for drinking water access.

Taos Pueblo began negotiations in 1989 to identify and quantify it's water rights and a settlement was finalized in 2013 (Interstate Stream Commission/New Mexico Office of the State Engineer, n.d.) Under the agreement, the tribe can divert 2,215 AFY annually from the San Juan River and store it in Heron Reservoir. (Utton Transboundary Resource Center of University of New Mexico , 2015) The Pueblo continues to use the 315 acre-feet per year of groundwater presently withdrawn from its existing well fields. The settlement agreement requires the tribe to develop a water administration code that provides notice to water users in the Valley of actions taken on the Pueblo's rights (University of New Mexico Digital Repository, 2012). The tribal water code will specify a protocol for non-tribal users to object to uses of tribal water believed to threaten other water rights, with hearings and due process (University of New Mexico Digital Repository, 2012).

The White Mountain Apache Tribe has a reservation (Fort Apache Reservation) that stretches over 1.67 million acres in Arizona, with over 400 miles of streams (White Mountain Apache Tribe, 2011). In 2010, the Tribe settled a quantification of their water rights. They receive CAP water and other surface water (U.S. Department of the Interior, 2013), along with $200 million for creation of a clean water and $78.5 million to develop reservation fishing and recreational resources. The White Mountain Apache Tribe is building a dam to create a reservoir, building a water treatment plant, and developing water storage facilities (U.S. Bureau of Reclamation, 2013).

The Zuni Tribe has a reservation located in Arizona, near the Little Colorado River. They also have land in New Mexico, with a total land area of 450,000 acres (University of Arizona, 2016). The tribal lands in Arizona include a previously "lush riparian habitat, with springs, streams, and a sacred lake with religious significance to the tribe" (University of Arizona, 2016). Under the Zuni Tribe Water Rights Settlement Agreement, the land is being restored to its natural flow levels, which were diminished by non-Indian dams and water depletions (Arizona Department of Water Resources, 2014). The federal government, state of Arizona, and the Salt River Project collectively provided $26.5 million for restoration, including purchase and retirement of surface water diversions in the area (U.S. Department of Interior, 2004). Additionally, to help restore flows, a "Pumping Protection Agreement" included in the settlement restricts groundwater pumping by landowners in the protected area. Any new wells are limited in pumping capacity to 500 gallons per minute per section of land. (University of New Mexico Digital Repository, 2002)

Tribes are playing a key role in the Colorado River Basin System Conservation Pilot Program, which was initiated in 2014 by Reclamation and major municipal water interests to address shortage threats (Agreement, 2014). Funding for supply reliability projects comes from a combination of federal, municipal and foundation sources. Project water becomes a new category of "system water" that is stored in Lake Mead to avert hitting res-

ervoir levels that trigger a shortage declaration with its cascade of negative consequences for junior water users. Three tribes (Colorado River Indian Tribes, Gila River Indian Community and Tohono O'odham Nation) with reservation lands located in Arizona are among the participants contributing "system water" in return for payment (USBR, 2018).

Summary and Implications for Western Water Future

Tribal governments exercise sovereign jurisdiction over their water entitlements and often possess the most senior water in their basins (the water last in line to be cut off during shortage). Since they are not governed by state water law, tribes have been able to tailor innovative water management tools to address tribal concerns as well as to accommodate broader water challenges in their regions. Many innovations have been developed as part of the dozens of tribal water settlement agreements achieved over the past several decades. Other innovative approaches have arisen to settle litigation cases or have evolved as part of collaborative problem-solving discussions involving tribes and non-Indian water users. Examples include new forms of water leasing, dry-year shortage sharing, aquifer banking as a buffer against drought, groundwater pumping restrictions to protect stream flows and wetlands, revamped operation of storage and delivery systems, new dispute resolution approaches and improved agricultural water management.

The role of economic incentives and tradeoffs is central in tribal settlements and tribal participation in regional water problem solving. The benefit of reduced uncertainty over unquantified tribal water entitlements is a key motivation for settlements, which allow all parties to better plan how to address water shortfalls and for their overall future water needs. Significant amounts of money and water are invested in implementing settlements. Water leasing, banking and exchanges provide price signals to water users that can motivate improved water management and conservation. The economic and cultural contributions of water dedicated to restore streams and wetlands are central in many settlements.

The western U.S. wrestles with severe drought, extensive wildfire impacts on watersheds, changing snowpack patterns and increased demand for water to sustain stream and wetlands and growing cities. Innovations made possible through tribal participation in regional water problem-solving are playing an important role in addressing these challenges.

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