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SURFACE WATER & GROUNDWATER IN TEXAS

DIFFERENT STORIES OF A COMMON RESOURCE: TEXAS WATER LAW

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Introduction

By next year, Texas is projected to be home to around 30 million people. By 2070, that number is expected to jump to over 50 million. Most of our new neighbors are bringing cars (especially to Austin), but few are bringing water. Simply put, we're going to need more water. The more we need, the more important the resource becomes, and the more important the law is that defines and protects it.

As a physical substance we generally understand water to be part of a single hydrologic "system." It might stand to reason that Texas water law would see it the same way. It doesn't. In fact, it's not too much of an oversimplification to say that water found above ground has nothing to do with water found below ground when it comes to Texas water law. In Texas, understanding water rights, water ownership, and legal uses of surface water and groundwater to a large degree depends on understanding the history of water development in the State — from Spanish rule to a state of 30 million people.

The Historical Development of Texas Surface Water Law

Texas contains 15 major river basins and eight coastal basins. Of those, five basins are subject to interstate or international agreements. Surface water — the water that collects in and flows down those basins — is owned by the people of Texas and held in trust by the State for our benefit. Today, use of surface water in Texas is managed by the Texas Commission on Environmental Quality, an agency of the State of Texas.

Texas surface water law began with the arrival of Cortez and the conquest of Mexico in 1519. The significance of the conquest cannot be overestimated for all land, water, forests, and so forth were made part of the royal patrimony, that is, they belonged to the king. As was noted by Lasso de la Vega in his *Reglamento*, "No one can take public waters upon his private grounds for irrigation without Royal permission." Dobkins, *The Spanish Element in Texas Water Law*, University of Texas Press, 1959, p. 99. The Spanish system was one whereby the Crown or its officials made specific grants of water rights. *Valmont Plantations v. State of Texas*, 355 SW2d 502 (Tex. 1962). It was quite simple. All land was classified (and paid for) according to its value for irrigation, dry land farming, or pastureland. If the land was classified as irrigable, the grant would state the measure of water to be accorded to it. Irrigable land was the most expensive and pastureland the cheapest.

Mexico successfully revolted against Spain in 1821. While the government changed, the system of water rights did not. As the Supreme Court concluded in *Valmont*, Spanish and Mexican land grants did not have appurtenant riparian irrigation rights. *Valmont Plantations* at 503.

Texas Water Law

Riparian Rights

Prior Appropriation

Relation Back

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Four years after securing her independence from Mexico, the Republic of Texas adopted the English common law, which brought with it riparian surface water rights vis-a-vis the 1856 case of *Haas v. Choussard*, 17 Tex. 588 (1856).

The Texas Supreme Court concluded in *Haas* that:

> Every proprietor of lands on the banks of a river, has naturally an equal right to the use of the water which flows in the stream adjacent to his lands, as it was wont to run, (currere solebat,) without diminution or alteration. No proprietor has a right to use the water to the prejudice of other proprietors above or below him, unless he has a prior right to divert it, or a title to some exclusive enjoyment. He has no property in the water itself, but a simple usefruct while it passes along. Aqua currit et debet currere is the language of the law (Water runs and ought to run as it has used to run). Though he may use the water while it runs over his land, he cannot unreasonably detain it, or give it another direction, and he must return it to its ordinary channel, when it leaves his estate. Without the consent of the adjoining proprietors, he cannot divert or diminish the quantity of water which would otherwise descend to the proprietors below, nor throw the water back upon the proprietors above, without a grant or an uninterrupted enjoyment of twenty years, which is evidence of it.

Haas at 589-590.

This holding set the stage of creating a dual system of surface water rights which prevailed in Texas until the adoption of the Water Rights Adjudication Act of 1967. Tex. Water Code §§ 11.301-11.341.

While the courts continued with expounding the riparian doctrine, the Texas Legislature took a different course. Motivated by a drought cycle that had halted westward expansion of agriculture and had imperiled the pastoral economy of the western portions of the State, the 21st Texas Legislature in 1889 adopted the first Irrigation Act based on the doctrine of prior appropriation. Davenport, *Development of the Texas Laws of Waters*, 21 Vernon's Annotated Revised Civil Statutes, XIII, XXIV. The Act declared that all the unappropriated waters of every river or natural stream within the arid portion of the State to be the property of the public and that the use of said waters may be obtained by appropriation. Acts 1889, 21st Leg., R.S., p. 100. The method for acquiring an appropriation was by filing an affidavit for recordation in the office of the county clerk where the head water of the diversion was to be located, along with a map. The affidavit was to show: the name of the ditch or canal; the point at which the head water is situated; the size of the ditch or canal in width and depth and its carrying capacity in cubic feet per second; the name of the stream from which the water is taken; the time when work was commenced; and the names of the owners of it. The map was to show the route of the ditch or canal. Acts 1889, 21st Leg. R.S., § 5, p. 101. By complying with the Act, a claimant's right to use water related back to the time when the work of excavation or construction was commenced. Acts 1889, 21st Leg. R.S., § 8, p. 101. The Texas Legislature modified the Act in 1893 and 1895 without significant difference. All three acts were limited to the arid portions of the State. However, the map and statement process of acquiring a water right remained the same.

Significant events were occurring in Texas in the last decade of the Nineteenth Century and the first decade of the Twentieth. There was the institution of rice agriculture in southeastern Texas; the beginning of large scale irrigation in the Lower Rio Grande Valley due to the development of the modern irrigation pump; a series of damaging floods on the Brazos River in 1899 and the Lower Rio Grande in 1904; and the increased use of Rio Grande water in Colorado and New Mexico, imperiling historical irrigation in the El Paso area. Furthermore, there was the problem of control over the statutory appropriators in protecting prior appropriators. There was no central depository of water rights since the maps and affidavits were filed on a county basis. As a result, the Legislature completely revamped the water rights system in 1913, by the adoption of the "Burges-Glasscock Act." The map and affidavit system was abandoned and a new state agency, the Board of Water Engineers, was created to administer a permit system. Acts 1913, 33rd Leg. R.S., Ch. 171, p. 358. The permit system remains with us to this day as the manner by which new surface water rights are obtained.

In 1917, Texas took a significant step forward in the management of her water resources with the ratification of Article XVI, Section 59 of the Constitution — known as the "Conservation Amendment." The Conservation Amendment created for the first time a public constitutional right to the management of the natural resources of Texas, which included water resources. Furthermore, the amendment placed upon the Legislature the exclusive power and obligation to manage these resources. The Conservation Amendment has become perhaps the most significant component of the Texas water law story — for both surface water and groundwater.

Texas Water Law

"Highest Ordinary Flow"

Rio Grande Litigation

We now come to the year 1926 and the profoundly important case, which for many years was the epitome of Texas water law in the decades that followed: *Motl v. Boyd*, 286 S.W. 458 (1926). Riparian waters were held to be the waters of the ordinary flow and underflow of the stream. Riparian rights do not attach to waters that rise above the highest ordinary flow. "The line of highest ordinary flow" is defined by the court as "the highest line of flow which the stream reaches and maintains for a sufficient length of time to become characteristic when its waters are in their ordinary, normal and usual condition, uninfluenced by recent rainfall or surface run-off." *Id*. at 469-470. The influence of the case remains with us even today.

In 1954, Falcon Dam was completed on the Lower Rio Grande. In June 1954, an extraordinary rainfall in the Rio Grande watershed filled Falcon Reservoir to capacity. The United States share of the impounded water was approximately 1,300,000 acre-feet. Subsequent lack of rain and irrigation use resulted in the supply dropping to 50,000 acre-feet by June of 1956. Although earlier litigation had occurred over the water supplies of the Rio Grande, on June 23, 1956, litigation was commenced on what became generally known as the "Valley Water Suit." The State, acting through the Attorney General, joined by numerous cities in the Lower Rio Grande Valley, sued Hidalgo Water Control and Improvement District No. 18 and thirty-nine other water districts and over 650 private corporations and individuals, constituting the diverters from the Rio Grande below Falcon Dam. *State v. Hidalgo County Water Conservation and Improvement District No. 18*, 443 S.W.2d 728 (Tex. Civ. App.—Corpus Christi 1969, writ ref'd n.r.e.). The State requested the court to take judicial custody of the remaining waters in Falcon Reservoir and to enjoin all the defendants from diverting the waters released from the dam for other than domestic, municipal, and livestock purposes.

Texas Water Law

Adjudication of Rights

Claim of Water Right

Adjudication Strategy

Constitutional Act

Groundwater Ownership

Surface Owner

The court granted the injunction and appointed a special water master. This appointment began the use of water masters in Texas. A spin-off case, the *Valmont Plantations* case, resolved the question that Spanish-Mexican land grants did not have riparian rights to use water for irrigation. And, the water rights of the Lower Rio Grande Valley were judicially adjudicated. *See State v. Hidalgo County WCID No. 18*, 443 SW2d 728 (Tex. Civ. App—Corpus Christi 1969, writ ref'd n.r.e.).

The significance of the Valley Water Suit litigation cannot be overstated due to its time, expense, and ripple effects on surface water rights throughout the rest of the state. More than 90 lawyers appeared before the court; almost 3,000 pieces of evidence were introduced; 25,000 pages of testimony were produced; and the legal costs to the litigants were estimated at from five to ten million dollars. Texas Research League, *Texas Water Rights and Water Resource Administration*, 1965 pp. 9-10. It resulted in the general acceptance of the idea of an administrative adjudication of water rights.

The Legislature responded with the passage of the Water Rights Adjudication Act of 1967. *See* Tex. Water Code, Subchapter G. Under the Water Rights Adjudication Act, all persons who believed themselves possessed with a water right, except holders of permits and certified filings and domestic and livestock users, were required to file a claim of that right on or before September 1, 1969, based on beneficial use occurring during any calendar year from 1963 through 1967. A later filing was required of persons who desired recognition of a right based on use from 1968 to 1970. Tex. Water Code § 11.303.

The administrative agency adjudication strategy was to begin with the Middle Rio Grande (the area between Falcon Dam and Amistad Dam), then the Upper Rio Grande (from Amistad Dam to the Dave Gill Dam in Hudspeth County). From there the adjudication effort moved north into the remainder of Texas, from river basin to river basin. The method of approach was to break each river basin down into segments and adjudicate the basin segment-by-segment.

Although many expected a deluge of litigation to challenge the Water Rights Adjudication Act, the litigation created was slim. Indeed, it was not until the Guadalupe River was adjudicated that litigation reached the Supreme Court, and the constitutionality of the Adjudication Act of 1967 was finally declared. *In re the Adjudication of the Water Rights of the Upper Guadalupe Segment of the Guadalupe River Basin*, 642 S.W.2d 438 (Tex. 1982). With the adoption of the Water Rights Adjudication Act in 1967, and its constitutionality determined by the Supreme Court of Texas, the state finally had a comprehensive prior appropriation method of water rights recognition and management.

The Historical Development of Texas Groundwater Law: The Rule of Capture

As concerns water below the land surface, Texas recognizes the existence of nine major groundwater aquifers and 22 minor aquifers. Major aquifers are those that yield large amounts of water over large areas of the state. Minor are so labeled because they are understood to produce either small volumes of groundwater or have a more localized extent when compared to major aquifers. As will be discussed below, groundwater is owned by the surface owner — or the severed groundwater estate owner — as private property. Groundwater rights and production historically were governed by the rule of capture and doctrine of absolute ownership. Since the mid 20th Century, the resource has become regulated by locally controlled political subdivisions of the State, referred to as groundwater conservation districts.

The development of the law on groundwater in Texas contrasts significantly with surface water because, for the most part, it is contemporary. In terms of legal development, groundwater is a late comer.

Texas groundwater law, as we know it and apply it today, began with a dispute between a homeowner and a railroad company in Denison, Texas. W.A. East owned a homestead supplied by a hand-dug well measuring around five feet in diameter and thirty-three feet deep. He and his family used the well for domestic purposes. Houston and Texas Central Railroad Company owned six lots and, in 1901, dug a well twenty feet in diameter, sixty-six feet deep. The railroad placed a steam pump on the well and pumped about 25,000 gallons of water per day. The water was used in the railroad's locomotives and machine shops. The well was supplied entirely from percolating groundwater.

After the railroad dug its well and began pumping from it, the East well dried up. East blamed the railroad and sued for damages in the amount of $206.25. The district court ruled for the railroad and East appealed. The court of civil appeals reversed the district court and the railroad appealed to the Texas Supreme Court.

The Supreme Court was persuaded by reasoning articulated in the English case of *Acton v. Blundell*, 12 M. & W. (1843), which stated that "the person who owns the surface may dig therein, and apply all that is there found to his own purposes at his free will and pleasure; and that if, in the exercise of such right, he intercepts or drains off the water collected from the underground springs in his neighbor's well, this inconvenience to his neighbor falls within the description of damnum absque injuria, which cannot become the ground of an action." *Houston & Texas Central Railroad Company v. East*, 81 S.W. 279, 280 (Tex. 1904).

Texas Water Law

Rule of Capture

Secret & Occult

The Court also quoted from a decision by the Ohio Supreme Court's opinion in *Frazier v. Brown*, explaining that the reason for the rule of capture is because:

> "In the absence of express contract and a positive authorized legislation, as between proprietors of adjoining land, the law recognizes no correlative rights in respect to underground waters percolating, oozing, or filtrating through the earth; and this mainly from considerations of public policy: (1) Because the existence, origin, movement and course of such waters, and the causes which govern and direct their movements, are so secret, occult and concealed that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would therefore be practically impossible. (2) Because any such recognition of correlative rights would interfere, to the material detriment of the commonwealth, with drainage of agriculture, mining, the construction of highways and railroads, with sanitary regulations, building, and the general progress of improvement in works of embellishment and utility."

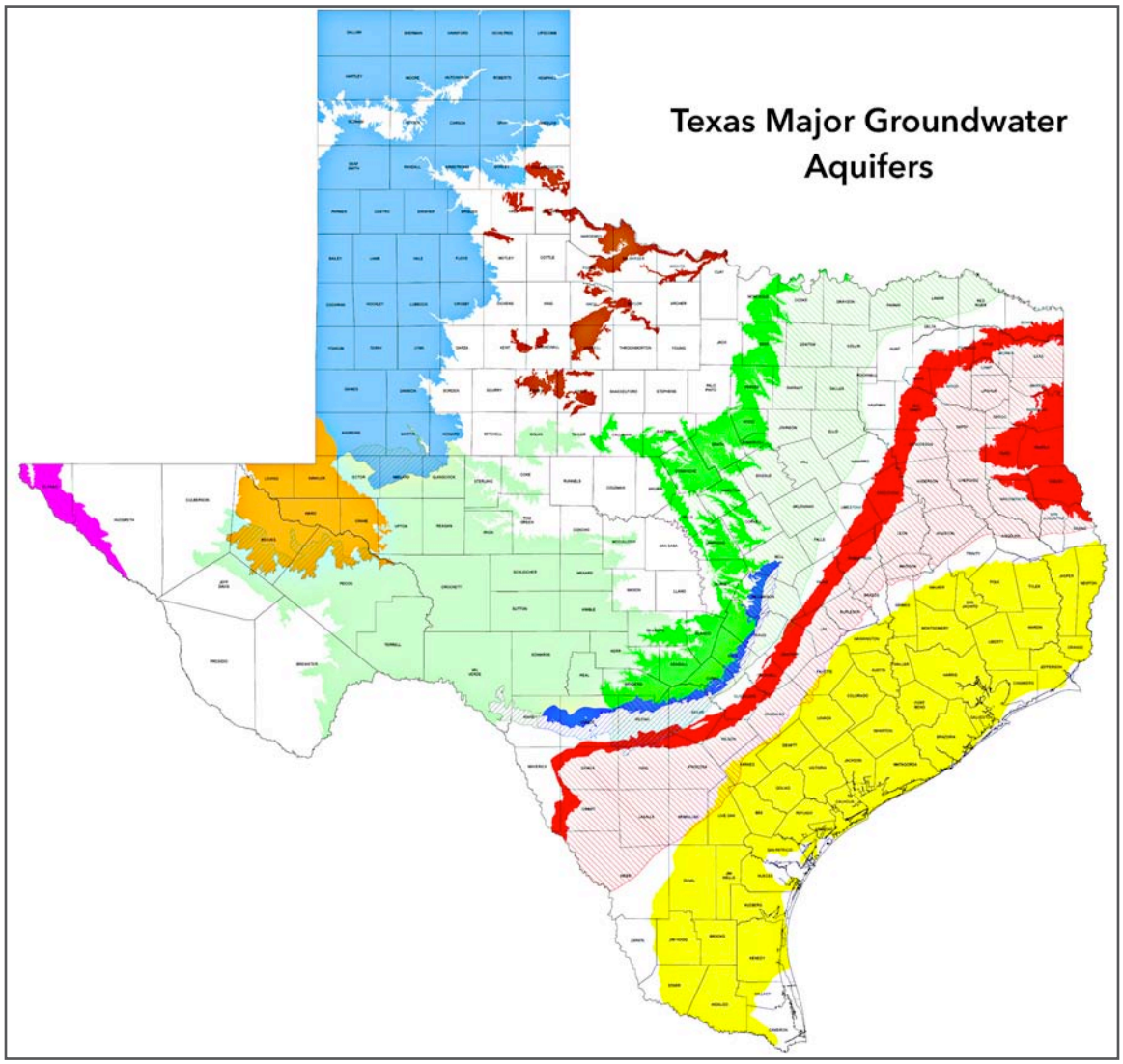
East at 280-281.

No Liability

Finding that the railroad had no liability for draining Mr. East's well dry, the Supreme Court reversed the court of civil appeals. And thus, was born the "rule of capture" in Texas. [Editor's Note: *See* Frownfelter, TWR #1 for additional information on the rule of capture and the Edward Aquifer Authority].

Percolating Water (Burden)

A quarter century later, the Texas Supreme Court determined that a judicial presumption exists that all water under the ground is percolating — i.e., groundwater. *Texas Co. v. Burkett*, 296 S.W. 273 (Tex. 1927). Over the course of the next several decades, courts made clear that the complainant carries the burden to prove that the water is legally distinct from groundwater. *Pecos County Water Control and Improvement District No. 1 v. Williams*, 271 SW2d 503 (Tex. Civ. App—El Paso 1954, writ ref'd n.r.e.); *Denis v. Kickapoo Land Company*, 771 SW2d 235 (Tex. Civ. App.—Austin 1989, no writ).



Texas Water Law

Absolute Property Right

The Texas Supreme Court was given another opportunity in the mid-1950s to reconsider the rule of capture in groundwater law in *Corpus Christi v. Pleasanton*, 276 S.W.2d 798 (Tex. 1955). The City of Corpus Christi relied on the Nueces River for its water supply. It had a saltwater barrier dam at the mouth of the river and a small dam, the Mathis Dam, upstream. However, with the historic 1950s drought tightening its grip on South Texas, the impounded water was virtually exhausted.

Fearful of running out of water, Corpus Christi went upstream and pumped groundwater from wells into a tributary of the Nueces to flow down to the city's water treatment plant. While the discharged groundwater ultimately reached the city, large quantities were lost in transit. The city was sued based on an allegation that the city was committing waste of the water by virtue of the channel losses.

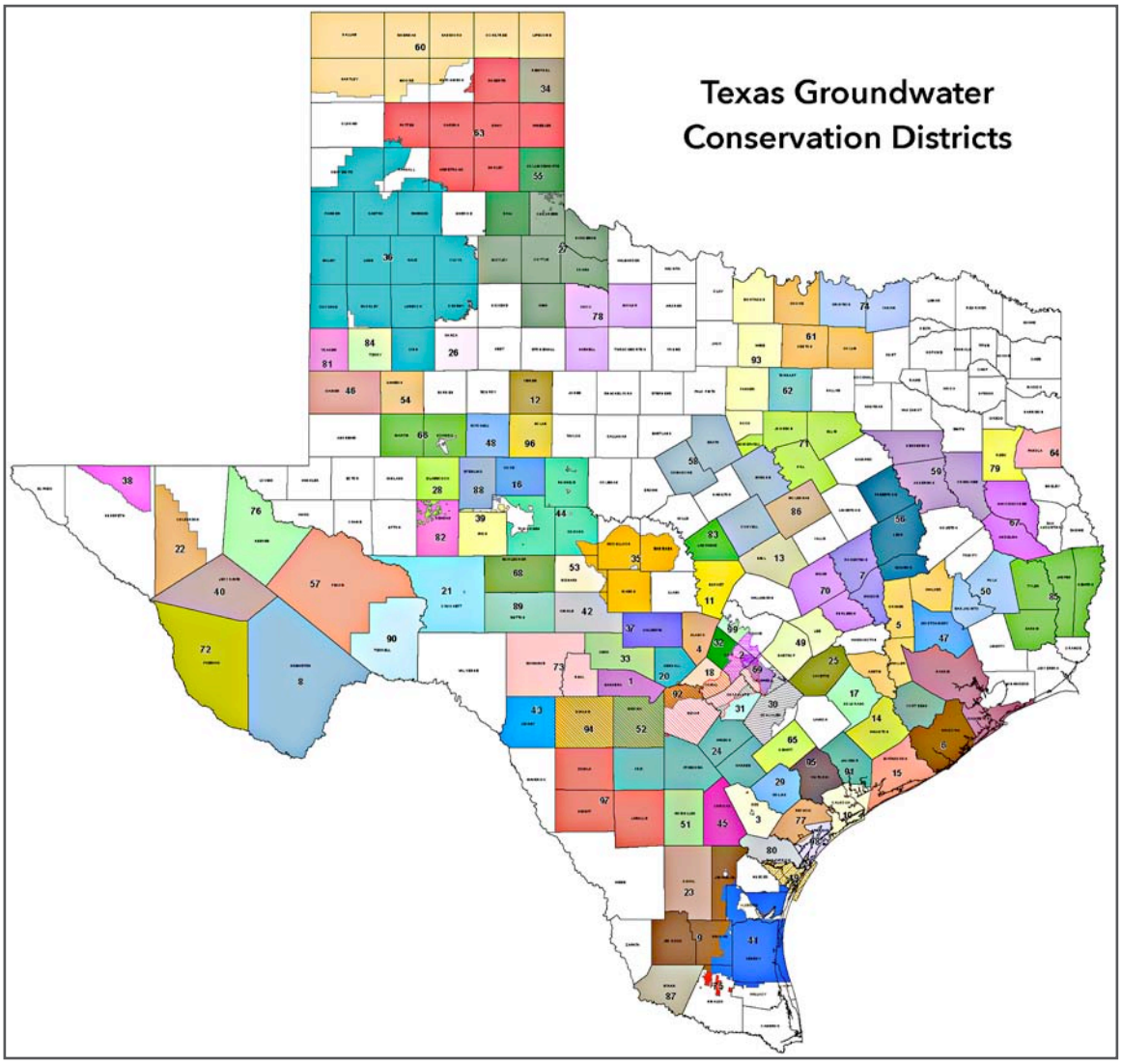
The case was appealed to the Texas Supreme Court. After discussing *East*, the court concluded:

> It thus appears that under the common-law rule adopted in this state an owner of land could use all of the percolating water he could capture from wells on his land for whatever beneficial purposes he needed it, on or off of the land, and could likewise sell it to others for use off of the land and outside of the basin where produced, just as he could sell any other species of property. We know of no common-law limitation of the means of transporting the water to the place of use.

Id. at 802. The decision made clear that the Supreme Court had no interest in abandoning the rule of capture.

Rule Exceptions

Over the course of the several years that followed, the Court refined the scope and breadth of the rule of capture, finding exceptions to the rule for willfully wasteful withdrawals, or groundwater pumping for the purpose of malicious injury to a neighbor, and negligent subsidence of the land of others. *Friendswood Development Company v. Smith-Southwest Industries*, 576 S.W.2d 21, 30 (Tex. 1978).



Texas Water Law

Water Regulation

While the rule of capture was created and refined by Texas courts, the citizens of Texas ratified the Conservation Amendment to the state Constitution in 1917 that placed the burden of natural resources regulation into the lap of the Texas Legislature. The Conservation Amendment was, and remains today, perhaps the most influential source of authority for water regulation in Texas.

One of the most significant exercises of that Legislative power came in 1949 with the passage of the Texas Underground Water Conservation Act. Codified at that time as Article 7880-3c, the law is now found in Chapters 35 and 36 of the Water Code.

This landmark legislation was developed as a response to concerns from agricultural producers on the Texas High Plains that the State of Texas would claim ownership of groundwater, and regulate its production and use, in the same manner as surface water. Irrigated agriculture had become the backbone of the economy for this region of Texas, made possible by an estimated 1,860,000 acre-feet of groundwater production from the Ogallala Aquifer each year. By contrast, the best estimates at the time indicated that the Texas-portion of the formation recharged at a rate of only 50,000 acre-feet annually. Arthur P. Duggan, *Texas Ground Water Law*, Water Law Conference, University of Texas, 1952, page 11, 12. Responding to the clarion call of "local control," the Act allowed for the creation of small political subdivisions that would be managed by locally appointed and elected boards. These districts are known today largely as groundwater conservation districts. The act gave them the ability to: issue permits; adopt rules; prohibit waste; provide for spacing of wells; establish proration requirements; and provide for education and planning.

"Local Control" of Groundwater

Conservation Districts

Initially, these districts were found primarily in the Panhandle and West Texas areas overlying the Ogallala Aquifer. Over the years, as the importance of groundwater availability transcended the arid parts of Texas, concerns about aquifer drawdowns, impacts to spring flows, competition for supplies, and other stimuli, the number and authority of groundwater districts began to expand.

Today, more than 100 exist across the state. Much of groundwater districts' authority is found in Chapter 36 of the Texas Water Code. But because most are statutorily created, they can also have their own individual nuanced delegations of authority.

Rule of Capture Lives

Despite the growing prevalence of groundwater districts across the state, the rule of capture was still a subject of controversy in areas where no district existed. In 1999, the Texas Supreme Court was presented with a dispute involving a remarkably similar set of facts as were presented in the *East* case almost a century prior. *See Sipriano v. Great Spring Waters of America, Inc.*, 1 S.W.3d 75 (Tex. 1999). Ozarka, a bottled water company, began pumping nearly 90,000 gallons of groundwater per day, seven days a week. Adjacent landowners found the water in their wells dropping and becoming exhausted. They sued Ozarka for negligently draining their wells.

The trial court granted summary judgment in favor of Ozarka and the Court of Appeals sustained the decision. Both courts expressed sympathy for the landowners but believed that any modifications to the common law rule of capture had to be made by the Texas Supreme Court or the Texas Legislature. The case was appealed to the Texas Supreme Court (Court), which was again presented with arguments for abandoning the rule of capture in favor of a reasonable use standard.

"Reasonable Use" Rejected

The Court passed on the invitation. It reasoned that the Conservation Amendment placed an exclusive duty on the Legislature to regulate groundwater. The Court noted that in response to omnibus water legislation passed just two years prior to the Court's decision, the Legislature appeared to be leaning heavily on the groundwater district method for regulating the resource. It determined that a "sweeping change" to the common law on the heels of a major legislative action to regulate the resource — known as Senate Bill 1 — was not an appropriate role for the Court. *Sipriano*, 1 S.W.3d at 80. Thus, with *Sipriano*, the rule of capture was again firmly ensconced in Texas water law, and the modern role of groundwater districts was judicially recognized.

Takings Issue

There still remained a lingering but significant question, however. State ownership of surface water was well understood. But how Texas courts viewed the issue of groundwater ownership was much less clear. It was thought by many that the Texas Supreme Court's treatment of groundwater ownership in *Texas Co. v. Burkett*, 296 S.W. 273 (Tex. 1927), strongly implied, if not outright supported, that groundwater was owned by the surface owner. The issue manifested in questions regarding the ability of groundwater districts to restrict groundwater production without violating the takings clauses of the U.S. and Texas Constitutions.

Surface Ownership

The Texas Supreme Court finally resolved the question of ownership of groundwater in place in 2012 in *Edwards Aquifer Authority v. Day*, 369 S.W.3d 814 (Tex. 2012). For the first time, the Court determined that surface ownership includes an ownership interest in the groundwater beneath it. The Court rejected arguments that the rule of capture precludes ownership of groundwater in place because it provides the surface owner with no possessory interest from which others can be excluded. *Id*. at 830. Instead, the Court found analogy in Texas oil and gas law.

Texas Water Law

Groundwater Ownership

Restrictions & Compensation

Dividing Lines

Quoting from a 1948 decision regarding ownership of minerals, the Court stated:

> "'In (Texas) the landowner is regarded as having absolute title in severalty to the oil and gas in place beneath his land. The only qualification of that rule of ownership is that it must be considered in connection with the law of capture and is subject to police regulations. The oil and gas beneath the soil are considered a part of the realty. Each owner of land owns separately, distinctly and exclusively all the oil and gas under his land and is accorded the usual remedies against trespassers who appropriate the minerals or destroy their market value.' We now hold that this correctly states the common law regarding the ownership of groundwater in place."

Id. at 831-832.

The *Day* decision makes clear that regulatory restrictions on the production of groundwater can require the regulator to pay adequate compensation to the property owner for constitutional takings violations. [Editor's Note: For additional information on the *Day* decision *see* McCarthy, *TWR* #99].

Following this direction from the Texas Supreme Court, there is an important dividing line that now separates acceptable groundwater regulation on the one hand from overreaching (i.e., compensable) restrictions on the use and enjoyment of private property on the other hand. Thus, the Legislature and courts have built a lighthouse for landowners and regulators alike in Texas groundwater law, but its optic remains far from clear. As a consequence, the sometimes competing interests between landowners and regulators in Texas to keep the ship right is still often a struggle.

Conclusion

Two different histories have brought two different approaches to the rights and regulations governing the same resource. Texas defines state water as the flood and ordinary flows of a watercourse, including subsurface water directly influenced by surface flows in a watercourse, such that the flows are "confined within a space reasonably defined and having a direction corresponding to that of the surface flow." Tex. Water Code § 11.021(a); 30 Tex. Admin. Code § 297.1(56). Groundwater, on the other hand, is water that is percolating below the surface of the earth that is not underflow. Tex. Water Code Ann. § 36.001(5); 30 Tex. Admin. Code § 297.1(21).

These lines of demarcation, easily written but not always so easily determined, mark the dividing lines in Texas between who owns the resource, who is responsible for regulating the resource, and the body of law that governs the resource.

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Jason Hill's experience in water started on his family's irrigated cotton and sorghum farm on the Texas High Plains. After graduating from Texas Tech University, Jason served as an agriculture and natural resources policy advisor in the Texas Senate. Jason started his career in Texas water law after graduating from Baylor Law School in 2004. Today he manages JT Hill & Co. — his solo practice with offices in Austin and San Angelo, Texas.

AMBOS NOGALES EFFLUENT

INSTITUTIONAL FRAMEWORKS FOR EFFLUENT WATER USE IN THE AMBOS NOGALES REGION

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Ambos Nogales

Effluent Discharges

Wastewater Treatment

Mexican Wastewater & River Flows

Introduction

Perennial flows in the United States of America (US) portion of the Santa Cruz River downstream from the Nogales International Wastewater Treatment Plant (NIWTP) depend on its effluent discharges. The US portion is subject to high variability in flows, due to both wastewater overflow events resulting from heavy rainfall, and decreases in flow resulting from treatment and discharge of Mexican wastewater by Mexico.

The diversion of wastewater generated from NIWTP has the potential to have social, institutional, hydrological, and ecological effects to the Ambos Nogales region (Nogales, Arizona and Nogales, Sonora). Coupled with this change in discharge are potential stressors due to climate variability. The difference in institutions and legal frameworks north and south of the US/Mexico border further complicates water management efforts.

The following analysis focuses on the institutional setting for wastewater treatment and effluent in the Santa Cruz Aquifer Basin. The article describes the physical and legal background of the region and how those factors will impact future management decisions. The article closes by discussing future plans regarding effluent water on both sides of the border.

Information for this article was gathered from a literature review on NIWTP, the Santa Cruz River Aquifer, and policies in the US and Mexico. Five interviews were conducted with representatives from Mexican and American government agencies operating in the Ambos Nogales region.

Ambos Nogales Region Wastewater System

Since 1951, wastewater generated in Nogales, Sonora has been piped into the US through the International Outfall Interceptor pipeline (IOI) and treated at the Nogales International Wastewater Treatment Plant (NIWTP) (Varady et al. 1995). Perennial flows in the US portion of the Santa Cruz River *downstream* from the NIWTP largely depend on the effluent discharges from the plant.

NIWTP has a capability of 14.7 **m**illion **g**allons per **d**ay (MGD), of which 9.9 MGD is received from Nogales, Sonora and 4.8 MGD from Nogales, Arizona (for reference, 1 MGD is equivalent to 1120.1 acre-feet per year). About 10,000 acre-feet per year of reclaimed water discharge in the Santa Cruz River comes from Nogales, Sonora, of which approximately 7,000 acre-feet per year infiltrates into the aquifer (Fabritz-Whitney et al. 2012).

Figure 1: Wastewater overflow in Nogales, Mexico. Photo courtesy of Hans Huth.

The total amount of water reaching NIWTP can vary on an annual or seasonal basis. During the period of 2011-12, an excess of 2.1 MGD provided by Nogales, Sonora represented an environmental and economic challenge to both nations as an overload on the NIWTP — combined with heavy rainfall — resulted in wastewater overflows (Figure 1) that could discharge directly into the Santa Cruz River (Valles 2014).

Ambos Nogales

Effluent Flows

In response to the overflow, the Mexican government commissioned Los Alisos Wastewater Treatment Plant (Los Alisos WTP or Los Alisos) in 2012 to treat a portion of the wastewater generated from the city of Nogales, Sonora. The operation of Los Alisos has already changed the quantity of wastewater treated downstream at the NIWTP. The construction of Los Alisos and the subsequent reduction of wastewater flows raises questions about the future of effluent flow in the region. The effluent flow, though possibly problematic due to water quality issues, is now relied upon for ecological and recharge functions in Arizona. It is unclear how climatic changes, institutional changes, and future management plans on both sides of the border can alter the social, hydrological, and ecological regime.

Santa Cruz River

Physical Background

The headwaters of the Santa Cruz River (*see* Figure 2) are located in the San Rafael Valley in southern Arizona. From there, the river flows southward into Sonora, Mexico, recrossing the US-Mexico border near Ambos Nogales. The river is an ephemeral tributary that drains into the Gila River, which then flows into the Colorado River. The city of Nogales, Arizona has about 20,000 people, while Nogales, Sonora has been officially listed as having 200,000 residents, though this is likely an undercount — the actual population may be closer to 350,000. The undercount in population means that Nogales, Sonora may receive a smaller budget for water provisions and other infrastructure needs, as the Mexican federal government bases funding allocation on population estimates. With the increase in population, Nogales, Sonora has expanded southward up hillsides. These settlements generally lack services, including water and sewer, due to the costs and difficult logistics associated with building infrastructure on the steep hillsides (Wilder et al. 2012).

Population Impacts

In Nogales, Sonora, Organismo Operador Municipal de Agua Potable Alcantarillado Y Saneamiento de Nogales (OOMAPAS), supported by Comisión Nacional del Agua (CONAGUA, the Mexican water authority), is responsible for planning and implementing water and sanitation services (Milman and Scott 2010). Forty-seven percent of Nogales, Sonora's water comes from the Santa Cruz River Aquifer, while 34 percent of Nogales, Sonora's water is sourced from the Los Alisos watershed and 19 percent comes from the Nogales Aquifer (OOMAPAS 2017).

Water Sources

Figure 2: The Santa Cruz Aquifer, Nogales International Wastewater Treatment Plant (NIWTP), Los Alisos Wastewater Treatment Plant (LAWTP). & Santa Cruz Active Management Area (AMA)

Ambos Nogales

The Santa Cruz area is mostly rural aside from Nogales on the US side of the border. It is comprised of cattle ranching, retirement communities, and wilderness areas (Milman and Scott 2010). Around 50% of Nogales, Arizona's potable water supply comes from the Santa Cruz Aquifer (Sprouse 2005). The Potrero Creek well field, northwest of Nogales, Arizona, is the other main source of water for the city (Wilder et al. 2012).

Two Wet Seasons

The climate of the Santa Cruz River watershed is characterized as arid to semi-arid. The area experiences two wet seasons: the summer monsoon (July-September) and winter (November-March). While summer can produce intense rainfall events over a short time period and accounts for most of the annual precipitation, winter storms may last for days, with persistent rain over a more widespread area. It is predicted that there will be an increase in the frequency of dry summers and a decrease in the frequency of wet summers in future years (Shamir et al. 2015). The bimodal rainfall patterns lead to streamflow regimes that fluctuate, thereby enhancing the basin's sensitivity to variable climate conditions and increasing its vulnerability to effects of climate change (Norman et al. 2010). Future climate projections predict a decline in water reliability, decreased groundwater recharge, and an increase in the long-term water deficit (Shamir et al. 2015).

Climate Change Impacts

Riparian Vegetation

Riparian vegetation along the Santa Cruz River has increased with the construction of NIWTP. The effluent has allowed for dense vegetation areas to increase from 6,200 acres in 1954 to 8,600 acres in 1995 due to higher effluent volumes (Wilder et al. 2012). Nearly all of the Santa Cruz River's riparian vegetation is downstream of NIWTP (Varady et al. 1995).

On the Mexican side of the border, the Santa Cruz Basin had a net loss of about 7,134 acre-feet of water per year in 2011, based on an average 6.2 MGD inflow from the Los Alisos Basin and a 12.5 MGD outflow to the NIWTP (Prichard and Scott 2014).

Legal Background

Mexico' Management

In addition to the physical challenges of the region, the differences in institutions and legal frameworks north and south of the border further complicate water management efforts in the Santa Cruz Aquifer Basin. Mexico's water governance is more centralized than that of the US but is going through a process of decentralization. Mexico's national water commission, Comisión Nacional del Agua (CONAGUA), holds the authority for all activities related to use, management, and protection of "national water." The commission is also responsible for conducting studies to determine water availability and for administering permits for water abstractions, diversions, and discharge.

The Mexican section of the International Boundary and Water Commission (IBWC), known as Comisión Internacional de Límites y Agua (CILA), is charged with diplomatic negotiations. IBWC doesn't implement water management activities aside from operating and maintaining infrastructure designed specifically in foreign agreements (Milman and Scott 2010). Locally, Nogales, Sonora regulates water quality through an industrial and commercial pre-treatment program since 2003 to control on-site contamination. OOMAPAS inspects and monitors discharges and works with the binational technical committee to improve the quality of discharge.

US Governance

The US has a more decentralized system for water governance; water governance and management are primarily conducted at the state level. As in Mexico, no entity is solely responsible or mandated for addressing transboundary aspects of groundwater management. The allocation of jurisdiction across federal and state agencies leads to ambiguities over who is responsible for which aspects of water management at which scale (Milman and Scott 2010). Within the US, the federal government is responsible for establishing regulations on drinking water quality and any water discharged in the US, the standards of which are set by the US Environmental Protection Agency (EPA) (Megdal and Scott 2011).

Drinking Water

ESA Concerns

EPA (through enforcing the federal Endangered Species Act) and the Arizona Department of Fish and Game (through the Project Evaluation Program) are responsible for ensuring that projects authorized at the federal or state level do not negatively impact critical habitat for endangered species, including the Gila topminnow and the southwestern fly catcher (Milman and Scott 2010). Internationally, the IBWC holds authority over most international water resources issues along the US-Mexico boundary, with few exceptions (Mumme et al. 2012).

Arizona Water Law (100-Year Supply)

At the state level, the Arizona Revised Statutes designate the Arizona Department of Water Resources (ADWR) to administer Arizona water law (including the implementation of groundwater management law) and ensure adequate supplies of water for the state in the long-term. The mission of the ADWR is to ensure "an adequate quantity of water of adequate quality for Arizona's future" (ADWR 2002). This is defined as "assured water supply" — 100 years of meeting current and future demands of customers. ADWR's main functions include administering and enforcing Arizona groundwater code and surface water rights laws. The agency does not have authority to address water transfers out of or into the state, nor to conduct international agreements (Milman and Scott 2010).

Ambos Nogales

Federal & State Authorities

EPA sets water quality standards across the country through mechanisms such as the Safe Drinking Water Act and the Clean Water Act's National Pollutant Discharge Elimination System (NPDES). However, as is true in most states, Arizona has had the authority to adminster water quality discharge permits delegated to it by EPA. The state can promulgate its own water quality standards so long as EPA deems them to be at least as protective as federal standards.

Water Quality Violations

NIWTP operates under an Arizona Pollutant Discharge Elimination System permit (AZPDES) granted by the Arizona Department of Environmental Quality (ADEQ). ADEQ regulates water quality discharges of NIWTP into the Santa Cruz River and has issued Groundwater Protection Permits (subsequently Aquifer Protection Permits) to NIWTP. NIWTP has been given Notices of Violation in the past for: failing to renew permits on time; not sampling biosolids in a timely manner; failing to provide lab results; and other reasons (ADEQ).

Santa Cruz AMA

The Arizona region across the international border and directly downstream of Nogales, Sonora is part of the Santa Cruz Active Management Area (SCAMA), which was created from a portion of the Tucson Active Management area in 1994 to address its own unique water management problems. These include hydrologic conditions, such as severe overdraft of water, and international issues (ADWR 1999; Shamir et al. 2015). In Arizona, Active Management Areas (AMAs) are subject to regulation pursuant to the 1980 Arizona Groundwater Act (*see* Staudenmaier, *TWR* #33). ADWR administers AMA programs in a manner consistent with meeting the state's groundwater goals. In the SCAMA, the management goal is to maintain a safe-yield condition and to prevent local water tables from experiencing long-term declines. "Safe-yield" is defined as a "groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area" (A.R.S. § 45-561(12)).

"Safe-Yield"

Effluent Effects

The Santa Cruz River has received effluent water generated from the plant since the construction of NIWTP in 1972 (Figure 3). The effluent has had both positive and negative effects on the SCAMA. One area where SCAMA has seen benefits is that the state can use the amounts delivered for environmental benefits and aquifer recharge when the effluent is present. However, it should be noted that Arizona cannot rely upon delivery of effluent to meet assured water supply rules and therefore cannot use it for planning purposes (ADWR 2007; Interview conducted by Elia M. Tapia, March 20, 2019). To earn recharge credits, an entity would have to first apply for and receive an underground storage facility permit and a water storage permit. The permits would not be granted unless the applicant could prove that they have the legal right to the water that the applicant wants to use for recharge (Personal communication, email message to author, May 15, 2019). Nogales, Arizona could claim its legal right to the portion of effluent that it owns.

Legal Right to Effluent

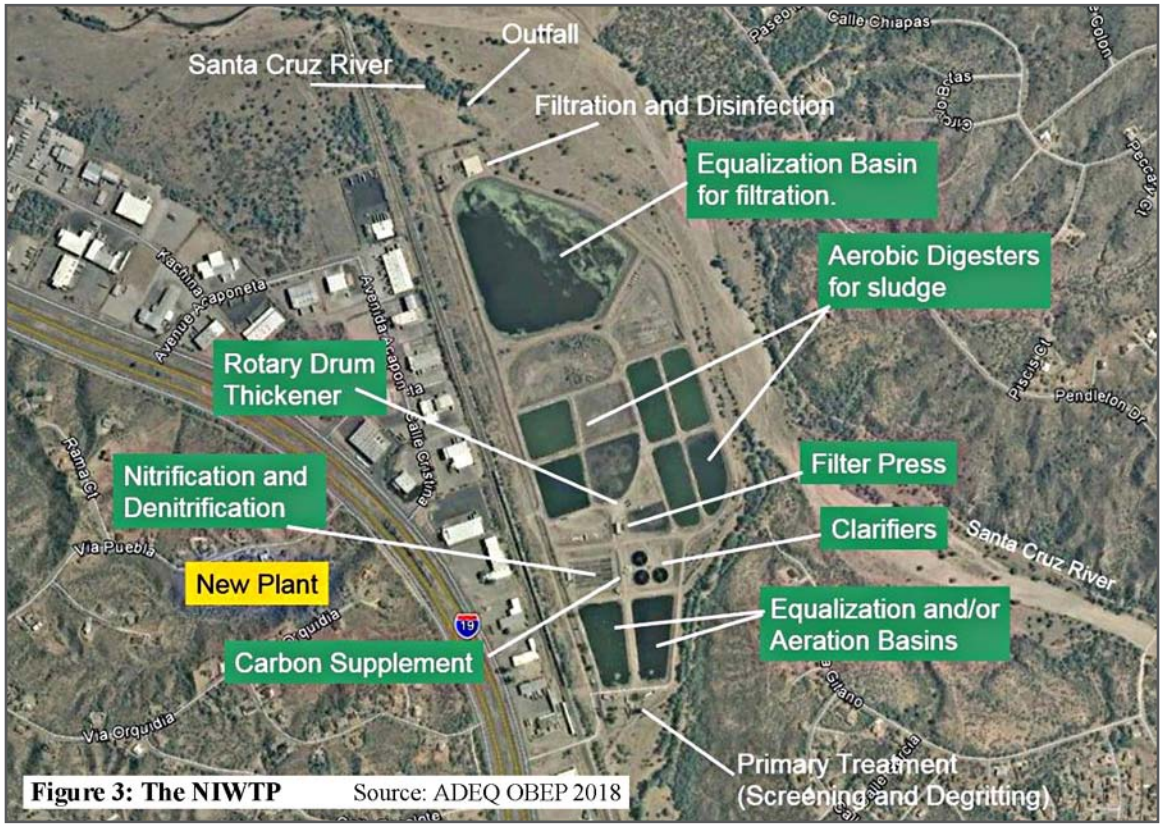

Figure 3: The NIWTP Source: ADEQ OBEP 2018

Ambos Nogales

River Flow

Binational Commission

Shared Groundwater

Technical Issues

Sanitation "Minutes"

Water levels downstream from the NIWTP have subsequently increased in part due to effluent discharge, though the levels have decreased in more recent years after Los Alisos was commissioned in 2012 (Sonoran Institute 2019). This in turn, at times aided by higher than normal precipitation and natural surface flow, has led to the expansion of riparian habitat along the Santa Cruz River (Figure 4). The effect of effluent discharge on water levels appears to diminish close to the northern Santa Cruz AMA boundary (ADWR 1999).

Binational Context

Established through the Convention of 1889 between the US and Mexico, the International Boundary and Water Commission (IBWC), or la Comisión Internacional de Límites y Aguas (CILA) in Mexico, is one binational organization with Mexican and US sections. The US section is part of the US State Department. The Mexican section is part of the Secretaría de Relaciones Exteriores. The binational organization was designed as a diplomatic outlet for Mexico and the US for developing "Minutes" — i.e., executive agreements made for implementing the 1944 Treaty — to search for solutions to water-related problems between the two countries (Mumme and Moore 1999).

While the US and Mexico have an extensive history of formal cooperation over their shared surface waters, they have not signed a formal agreement regarding shared groundwater, aside from one agreement to limit groundwater pumping near the Yuma, Arizona/San Luis Rio Colorado, Sonora border region with the signing of Minute 242 (IBWC 1973).

ADWR participates in the Environment & Water Committee of the Arizona Mexico Commission, a forum where Arizona and Sonora can discuss current and future water management plans. ADWR "is attempting to use this forum to gain additional insight into Sonora's plans" for its wastewater sent to NIWTP (Fabritz-Whitney et al. 2012, p. 18). NIWTP's pretreatment program also has a binational technical committee, made up of: the US and Mexican sections of the IBWC/CILA; EPA; ADEQ; ADWR; City of Nogales, Arizona; CONAGUA; and OOMAPAS. The committee reviews data and exchanges technical information every two to three months. The primary purpose of the committee is to identify sources of contamination and to prevent contaminating discharges into the collection system (IBWC 2005).

Sanitation issues such as NIWTP's have already been recognized within a binational context. A few binationally agreed-upon minutes have specifically addressed sanitation issues, including Minutes 206, 227, 261 and 276. Minute 206 established joint operation and maintenance of the Nogales International Sanitation Project in 1958 (IBWC 1958). Minute 227 established that Mexico has no responsibility for operation and maintenance costs of a section of sewer line that would extend from the original wastewater treatment plant to its new location of Rio Rico, Arizona (IBWC 1967). The minute also states that Mexico may dispose "a part or of all" the sewage emanating from Nogales, Sonora (IBWC 1967). Minute 261 of 1979 states: "That in each case where the approved course of action provides that a border sanitation problem be jointly corrected by the two Governments, the Commission develop the plans and designs for the works necessary therefor, as well as the division of work and cost between the two countries, submit them for approval of the two Governments, and upon such approval, each Government through its Section of the Commission proceed to carry out the construction, operation and maintenance, with the greatest speed and timeliness possible" (IBWC 1979).

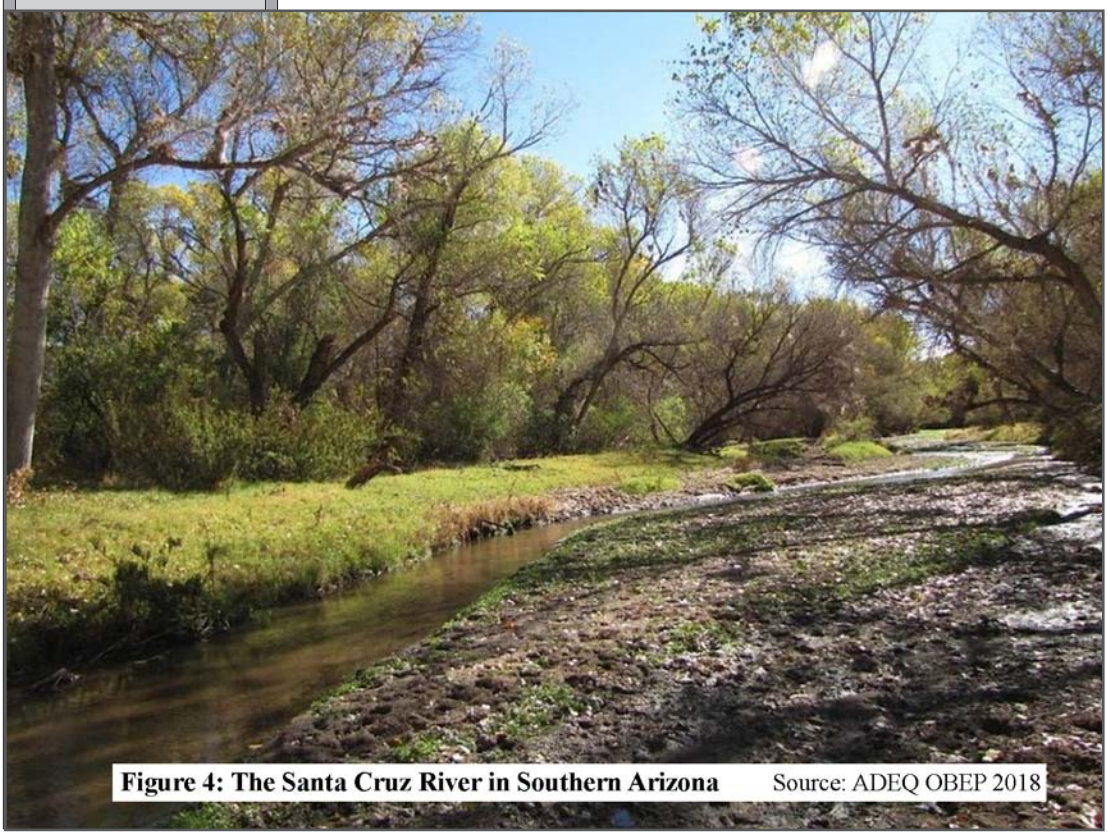

Figure 4: The Santa Cruz River in Southern Arizona Source: ADEQ OBEP 2018

Ambos Nogales

Aquifers Assessment

In 1988, Minute 276 reiterated that Mexico "reserves the right to dispose of part or of all of the Nogales, Sonora sewage, in its own territory or return for reuse, in its own territory, the effluent from the international plant that is part of the sewage inflows corresponding to Nogales, Sonora" (IBWC 1988). The Minute also restates that Article No. 3 of the 1944 Treaty stipulates that the two Governments "agree to give preferential attention to the solution of all border sanitation problems" (IBWC 1988). Minute 276 established the total capacity of NIWTP allotted for Nogales, Sonora (9.9 MGD; 0.045 MCM).

The US and Mexico have also cooperated scientifically through the Transboundary Aquifer Assessment Program (TAAP). TAAP is guided by the Joint Report of the Principal Engineers Regarding the Joint Cooperative Process United States-Mexico for the Transboundary Aquifer Assessment Program (IBWC 2009). The Joint Report guides the binational study of four transboundary aquifers: the Santa Cruz and San Pedro (shared between Arizona and Sonora), and the Mesilla and Hueco Bolson (shared between New Mexico, Texas, and Chihuahua). This cooperation, as the Joint Report states, is "solely for the purpose of expanding knowledge of the aquifers and should not be used by one country to require that the other country modify its water management and use" (IBWC 2009, p.3).

Infrastructure, Economic and Environmental Concerns

International watersheds such as the Santa Cruz often encounter difficulties in managing shared infrastructure and environmental concerns. Wastewater difficulties in the Ambos Nogales region have been formally recognized by both countries for over 80 years. The first international wastewater treatment plant constructed in the Nogales, Arizona area was authorized by the US Congress in 1935 and completed by the IBWC in 1951 with federal funds from both the US and Mexico. It was built in Arizona because engineers did not find an area near the border on the Mexican side that was suitable for a treatment plant solely dedicated to treating wastewater from Mexico (Varady et al. 1995). A new, larger facility was completed in 1972 but soon became overburdened by an increasing population. The US and Mexico signed an agreement in July 1988 for the construction of a new plant in Rio Rico, Arizona (Varady et al. 1995). Mexico pays its proportional share of operational and maintenance costs of the plant (IBWC 2008).

Treatment Plant History

Shared Costs

NIWTP was upgraded in 2009 to mitigate excess ammonia, nitrates, and biological oxygen demand discharged to the river (IBWC). However, wastewater discharges from Nogales, Sonora have exceeded the allotted 9.9 MGD on occasion, at times by more than 3 MGD. NIWTP is currently designed to treat 14.74 MGD, with a peak operational capacity of 17.2 MGD (Norman et al. 2013). Occasionally, NIWTP experiences issues stemming from the maquiladora industry and other businesses not properly disposing waste, dumping chemicals into the sewage system. The IBWC has engaged in efforts to help OOMAPAS evaluate and educate the businesses and industry, but occasionally improper disposals happen (Interview, January 23, 2019). The IBWC was sued in 2012 for State of Arizona permit and Clean Water Act violations for failing to implement a program designed to stop industrial waste entering domestic sewage (ADI News Service 2012). The IBWC then filed a third-party suit against the City of Nogales, Arizona claiming that the city was liable if violations were established (Woodhouse 2016).

Improper Disposals

As the population of Nogales, Sonora has grown over the years, NIWTP has been treating, on average, an excess volume of Mexican wastewater — 126% over the binationally authorized volume of 9.9 MGD (Prichard and Scott 2014). During 2005, 69% of the wastewater influent originated from Nogales, Sonora, with the remainder originating from Nogales, Arizona. The average volume was 14.8 million gallons (IBWC 2005). The treatment plant consists of preliminary treatment to remove debris such as sand and trash from wastewater, then the wastewater is delivered to manmade lagoons where it is aerated for secondary treatment. The wastewater then enters other lagoons for settling of other materials and microorganisms (IBWC 2005).

Excess Volumes

Maintenance Issues

NIWTP receives water from Nogales, Arizona through a conveyance known as the International Outfall Interceptor (IOI). Operating since 1972, the concrete structure of the pipeline has developed cracks, substantial erosion, and deterioration. The Santa Cruz basin experiences severe flood events during the North American monsoon, during which stormwater may build up sediment and trash, causing more damage by scouring the IOI. Sometimes, these high rainfall events have included infrastructure leaks where a small percentage of wastewater leaks out of the IOI, or, in more rare cases, complete failures where wastewater has flooded residential streets and the Nogales Wash; repairs have been costly to fix these leaks (LaBrie 2016). These sanitary sewer overflows also impact water quality, resulting in repeated detections levels of E. coli, copper, cadmium, chromium, lead, zinc, and chlorine in the Nogales Wash (ADEQ OBEP 2016). The metals were also detected in the blood and feathers of song sparrows along the Nogales Watch and Santa Cruz River (Lester and van Riper 2014).

Conveyance Pipeline

Stormwater Overflows

ADEQ's Office of Border Environmental Protection listed several recommendations to help prevent spillages and other issues associated with international wastewater infrastructure. The recommendations include: recommending that municipalities should be required to develop operation and maintenance plans; develop municipal pretreatment requirements for oversight and monitoring; and require immediate binational notification for failures of international wastewater infrastructure (ADEQ OBEP 2015).

Infrastructure Proposals

Ambos Nogales

International Spillage

The Binational Technical Committee has also implemented strategies for reacting to international wastewater spillage. The Committee agreed to a protocol in December 2018 to formalize an agreement that would identify which people will be available at all times on each side of the border for monitoring and advising when spillages occur. The agreement, however, has not been formalized as of this writing. There is also a notification protocol for events that might cause flooding (Interview January 23, 2019). According to interviews, most of the city of Nogales, Sonora's sanitary structure is damaged, old, or working over its capacity. This causes sewage overflows during the rainy seasons.

Conveyance Repair Issues

Economic Arrangements

In 1953, the IBWC and the City of Nogales, Arizona (City) created an arrangement where the maintenance of the sewer line is a shared responsibility. In 1965, the City requested that the IBWC negotiate an agreement with Mexico to move the plant from Nogales to Rio Rico. The Rio Rico plant was completed in 1972 (IBWC). The IBWC took over the plant's operation in 1996 (Pineda 2017). However, the IBWC and the City have argued over who owns the IOI and is therefore responsible for paying to repair it. Perhaps in part due to its binational nature and controversy over who is responsible for funding its maintenance, the IOI has a reputation of lacking proper maintenance and upkeep. In 2004, a US district court settlement ruled that Nogales, Arizona would pay 23% of the operation costs of the treatment plant, despite producing only 14% of the sewage treated by the plant. The court also ruled that the City must pay to replace the IOI. Estimates for the costs of repair range from $30 to $100 million (Kapoor 2017). The US House of Representatives passed an amendment in June 2019 to the IBWC budget to redirect $4 million to cover the maintenance and operation of the IOI. This will add to the $2.6 million allocated by the 2019 Arizona state budget for repairs, and $21 million that the IBWC already has to fix the line (Nogales International 2019).

Mexico Annual Payments

The current arrangement allows Mexico to send its wastewater to the US in exchange for annual payments (IBWC 1988). Mexico pays a penalty fee for wastewater in excess of 9.9 MGD (Fabritz-Whitney et al. 2012). While that may be more economically efficient with both countries benefiting from the current arrangement (Sprouse and Villalba Atonodo 2004), treating wastewater in Mexico and conducting aquifer recharge could also be positive for both countries, as it would reduce the effects of Mexico's groundwater use (Milman and Scott 2010).

Penalty Costs & Mexican Treatment Plant

The Mexican government built Los Alisos Wastewater Treatment Plant (Los Alisos) partly as a response to wastewater overflows, and has created plans for its expansion. If this expansion of Los Alisos is to go forward, it will come at a significant cost, as lift stations are needed to deliver sewage to Los Alisos. Treating wastewater at Los Alisos is less expensive than paying the penalty costs that accrue when exceeding the 9.9 MGD (0.045 **m**illion **c**ubic **m**eters (MCM)) threshold ($0.16 USD/MCM to treat at Los Alisos, compared to $0.206 USD/MCM after exceeding the threshold) (Valles 2014). Estimates suggest that the cost of treating the sewage at Los Alisos will be greater than the cost of treatment of the base volume of effluent at NIWTP (Fabritz-Whitney et al. 2012) ($0.16 USD/MCM compared to $0.047 USD/MCM; which is what Mexico pays for the sewage sent below the threshold quantity) (Valles 2014).

Effluent Recharge v. Guaranteed Flow

Options for Conducting Recharge in the Santa Cruz Aquifer

Both countries have options for conducting aquifer recharge of the Santa Cruz Aquifer. In the past, Mexican officials have expressed the desire to retain control of the effluent generated on their side of the border and treated at NIWTP for their potential use, as demonstrated in previous Minutes. This has created a barrier to making progress towards negotiating a guaranteed flow of influent from Mexico to the US (Brown et al. 2003). In addition to negotiating guaranteed flow, another issue is that the US could consider the possibility of increasing treatment costs to fund: maintenance and operation of the wastewater treatment plants; delivery infrastructure; and potential environmental remediation due to environmental degradation caused by the effluent (Norman et al. 2013). In other words, Mexico could pay more to send its wastewater downstream to NIWTP. Alternatively, one option for the US is that it could pay Mexico to guarantee future releases. Norman et al. (2013) estimated that 12 MGD of effluent water is valued at $2.12 million/year when considering domestic water and recharge.

Mexican Treatment Impacts

Mexico commissioned the Los Alisos Wastewater Treatment Plant in August 2012 with $8 million in grant support from EPA's US-Mexico Border Environment Infrastructure Fund and the North American Development Bank to treat part of the wastewater generated in Nogales, Sonora (NADB 2010; Norman et al. 2013). According to Prichard and Scott (2014), the plan — once Los Alisos became operational — was for Mexico to deliver 9.9 MGD of municipal wastewater (the limit specified in the binational agreement) to NIWTP, with the remainder to Los Alisos. The plant wwould then discharge the entirety of its effluent into the Los Alisos River. The two phases of Los Alisos were expected to be completed in 2015, with a capacity of 7.5 MGD (8,437 acre-feet/year) but have not been completed as of this writing. If Mexico revises their stated intentions, thereby reducing the volume of reclaimed water in the Santa Cruz, less water will consequentially be available for downstream recharge, demands of near-stream well users, and possibly the Tucson AMA (Fabritz-Whitney et al. 2012). As of 2019, Los Alisos is receiving around 2.3-2.7 MGD, partly due to some problems with the engines that pump water to Los Alisos Wastewater Treatment Plant.

Ambos Nogales

Los Alisos Aquifer

Aquifer Proposals

Reuse?

Four of the five pumps used to transport wastewater over a hill and to the plant have been malfunctioning since mid-January 2019 (Jones 2019). At this point, however, Mexico does not have a plan to reclaim its share of inflow from NIWTP but does want to send more waste to Los Alisos, which would decrease the exceedance of allotted volumes sent to NIWTP (and subsequent penalties).

Nogales, Sonora also draws some of its drinking water from the Los Alisos Basin. With the Los Alisos WTP, Nogales, Sonora is now taking freshwater and then releasing its wastewater back into the Los Alisos River near Cíbuta, Sonora. The use of the Los Alisos aquifer by OOMAPAS has resulted in a decrease in the water table (Prichard and Scott 2014).

Currently, the effluent water generated from NIWTP is discharged entirely within Arizona. However, as noted above, Arizona state law (A.R.S. § 45-576) restricts relying on effluent in state water planning due to Mexico's ownership (Sprouse and Villalba Atondo 2004; ADWR 2007). There have been ideas proposed for recharging the Santa Cruz Aquifer using NIWTP's effluent via the Mascareñas well field just south of the international border. This would allow the effluent to recharge the aquifer and then groundwater would be pumped back for use in Sonora (Sprouse and Villalba Atondo 2004).

The addition of the Los Alisos WTP, recharging effluent into the Los Alisos Basin, would allow for reuse of some of the effluent by Mexico. There are no current plans to fund the expansion of Los Alisos WTP according to Mexican officials. It has been observed that there are now drier portions in the Santa Cruz River in the US downstream of NIWTP due to the decrease of effluent discharge being sent down the river because of the Los Alisos WTP (Sonoran Institute 2019).

The IBWC does not monitor recharge; it only monitors static groundwater levels at groundwater monitoring stations (Interview, February 11, 2019). The City of Nogales, Arizona could use effluent generated from its wastewater for long-term storage credits (Personal communication, email message to the author, July 12, 2019). As of March 2019, no entities have set up long-term storage accounts in the Santa Cruz AMA (ADWR 2019).

The effluent discharged from NIWTP now supports around 17 miles of flow and 460 acres of forest along the river, starting in southern Rio Rico and flowing past Tubac (Weber et al. 2016). The wastewater treatment was upgraded to tertiary-level standards in 2009; odor has been reduced and the river now supports small fish (Weber et al. 2006). The treatment plant now has three bioreactors with "anoxic zones and aeration zones, new secondary clarifiers, existing sand filters, a new UV disinfection system with chlorination/dichlorination as backup, aerobic digester, a sludge belt filter press, and waste activated sludge storage pond" (AZPDES Fact Sheet, 2013). Any dramatic increase of Mexico recapturing its effluent, however, could result in negative consequences for the riparian area in Arizona, including damaging habitat for the Gila topminnow and the southwestern willow flycatcher, both of which are federally ESA-listed endangered species in the US (Sprouse 2003).

Conclusions

Every drop of water is important in the semi-arid Santa Cruz River Aquifer Basin. The increases in population and withdrawals on the Mexican side of the border may lead to future expansion of wastewater treatment plants in Nogales, Sonora. Mexico has the legal entitlement to the effluent water resulting from treatment of wastewater that originates within its territory or boundaries, as reaffirmed in several Minutes between the US and Mexico. As the aquifer levels in the Los Alisos, Nogales, and Santa Cruz basins continue to drop at increasing rates, the option to recharge aquifers with treated wastewater will undoubtedly become more attractive to Mexico. At this point, Mexico has no plans to expand Los Alisos WTP beyond 5.0 MGD (0.023 MCM), or to build new wastewater treatment plants. In the meantime, determining who is responsible for funding maintenance on infrastructure continues to create difficulties. The City of Nogales has asked Congress to address the issue through a congressional act, which has not been introduced as of this writing (Jones 2019). Though it appears that nothing will alter the status quo in the short term, wastewater and treated effluent in the dynamic Santa Cruz River Aquifer will continue to bring both challenges and opportunities for cooperation for both countries.

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Karla Nemeth CDWR

CALIFORNIA WATER RESOURCES

AN INTERVIEW WITH CALIFORNIA DEPARTMENT OF WATER RESOURCES DIRECTOR KARLA NEMETH

Interview by Lisa Beutler, Stantec (Sacramento, CA)

Lisa Beutler

Introduction

In late August, California Department of Water Resources (DWR) Director Karla Nemeth graciously set aside some time to talk with us about the Department she leads and its role in confronting California's water challenges. The wide-ranging interview included background information about the Department and discussion of a significant list of issues she is charged with addressing. Topics included: plans for DWR's workforce; the response to the Oroville Dam spillway crisis; the Governor's proposal for a California Water Resilience Portfolio and the administration's approach to management of the Sacramento-San Joaquin Delta (Delta) — among other things.

Background on DWR

ORGANIZATIONAL CONTEXT

Director Nemeth's recognition of the importance of organizational context is reflected by the massive organizational chart covering the wall adjacent to her desk. She began the interview talking about DWR's many responsibilities and programs.

From the beginning DWR has been a product of its time. A modern engineering organization capable of re-plumbing the State's natural infrastructure, for decades nothing seemed out of the question and some remarkable accomplishments ensued. It is a proud history and DWR operations have often set national standards. During our discussion Nemeth pointed to DWR's accomplishments and expressed her own admiration for the continuing professionalism and skill of the DWR staff.

DWR Tasks

California Department of Water Resources

DWR has a proud history dating back more than a half-century. Conceived as a response to deadly flooding in 1955, the organization is tasked with providing for overall statewide management needs and specifically the planning, designing, constructing, and overseeing of the nation's largest state-built, multi-benefit water conveyance system — the State Water Project (SWP).

Tasks include:

- Ensuring public safety, and preventing and responding to floods, droughts, and catastrophic events
- Informing and educating the public on water issues
- Developing scientific solutions and restoring habitats
- Planning for future water needs, climate change impacts, and flood protection
- Constructing and maintaining facilities, and generating power
- Providing recreational opportunities

Given the organization's responsibilities, many DWR leaders have been engineers. Nemeth is not. She is an accomplished public administrator (with degrees in that field as well as political science). She has been immersed in water policy work for most of her professional career. Her particularly relevant skill set was recognized by both Governor Jerry Brown (who tapped her to fill the directorship after several temporary appointments ended) and Governor Gavin Newsom (who recently reappointed her).

Returning to the present context, in recent years DWR's role has sometimes been called into question, most particularly with its management of the Sacramento-San Joaquin Delta (Delta), and with its response to significant spillway damage at Oroville Dam.

Preparation for the Job

Bay Delta Conservation Plan

Nemeth is extremely familiar with Delta issues. She spent over five years as a program manager for the Bay Delta Conservation Plan (a habitat conservation and natural community conservation planning effort focused on the Delta). This required serving as the principal in bilateral negotiations among state and federal fish and wildlife agencies, water project operators, and the stakeholder community at large. After demonstrating her policy chops in this role, she was elevated by Governor Brown to be Deputy Secretary for Water Policy in California's Natural Resources Agency where she continued as a negotiator and water resources policy advisor on behalf of the administration.

Karla Nemeth CDWR

Dam Failure

Critical Findings

Wake-Up Call

Needs Assessment

Response to the Oroville Spillway Damage Incident

While being asked to manage continuing discussions on the future of Delta management, Nemeth concurrently was tasked with guiding DWR during its recovery from the 2017 Oroville Dam incident.

Oroville Dam Incident

At 770 feet high, Oroville is the tallest dam in the United States. In 2017, heavy rainfall resulted in damage to a main spillway and an emergency spillway. Fears that accelerating erosion would lead to a spillway failure (which could have sent a 30-foot wall of water down the Feather River) led to a February 12, 2017, evacuation order by the Butte County Sheriff. This order displaced nearly 200,000 people who were evacuated from the low-lying areas along the Feather River Basin in three downstream counties.

DWR, supported by an interagency team, successfully prevented a flood disaster. However, along with the spillways, the relationships with downstream communities were severely damaged. An independent forensic investigation of the incident included highly critical findings, including a view that DWR needed to address its "safety culture." Further, Oroville Dam had just been inspected in 2016, indicating flaws in the inspection process. The impact of these disturbing findings on the organization and DWR morale was significant. The investigators also flagged the failures as a cautionary tale for the entire industry as DWR was long considered to be an international leader in dam safety. Many found it incomprehensible that this type of incident could occur under the watch of such accomplished professionals.

Nemeth was not hesitant in responding to questions about the Oroville incident. She was pragmatic about what needed to be done and cognizant of the organizational and water industry implications.

Nemeth explained the importance of Oroville to California's flood and water supply management systems. She noted that the crisis had served as something of an organizational wake-up call. In 2016 DWR had already initatied development of an assest management plan but following the spillway incident it also initiated a comprehensive needs assessment. *See*: https://water.ca.gov/Programs/State-Water-Project/Oroville-Dam-Safety-Comprehensive-Needs-Assessment

Karla Nemeth, Director, California Department of Water Resources

Karla Nemeth CDWR

Spillway Innovation

Infrastructure Portfolio

Transparency

She explained that the issues extended beyond infrastructure and described the need to improve data and management for precipitation forecasting and informed reservoir operations (dam operating rules). She also noted a key lesson learned was the need to fully appreciate the range of skills available in the water profession. As an example she pointed to how there are new investigation, design, and construction techniques available now that weren't used in the 1950s/60s that they were able to incorporate into the new spillway. One new innovation was epoxy coated rebar and improvements to erosion resistant concrete.

She also thought there may have been an over-reliance on just meeting State and Federal requirements rather than taking into account new information and technologies that may not always have been incorporated into those standards but that could improve decision-making.

Her response to the incident has been multi-faceted. First and foremost has been her leadership in evaluation all of DWR's infrastructure portfolio and ensuring on-time delivery of critical repairs to the Oroville spillways. Both flood and water supply managers are dependent on robust operations at the dam and this has been expertly managed.

Regarding relations with the community, she believes a key element of regaining trust is transparency. To her this means making decision-making processes as open and visible as possible and encouraging constructive feedback from stakeholders.

From her first days on the job, utilizing her public administrator's sensibility, she has also sought to encourage a more integrated DWR culture that capitalizes on the expertise of all the staff. This is in addition to plans to develop staff skills able to respond to 21st century challenges. She has implemented an organization reorganization designed to bridge DWR internal organization silos and to improve collaboration. She has also been engaged in obtaining funding for, and recruiting, needed staff with expertise in dam engineering and safety along with those with climate and forecasting expertise, economics, social science, and more.

DWR Workforce

Institutional Knowledge

Nemeth believes one key to organizational success will be responding to the needs of a millennial work force. Like most of the water industry, DWR is experiencing a "silver tsunami" as large segments of its aging workforce prepares to move into retirement. Millennials will fill the majority of newly created vacancies. Nemeth noted that this cohort of workers may have different goals and criteria for job satisfaction. Given the need for a skilled workforce, retention of these new employees will be a priority. Nemeth is equally aware of the need to transfer an extensive body of institutional knowledge as the torch is passed from one generation to the next.

Governor's Climate Resilience Water Portfolio Process

Executive Order: Climate Change

On April 29, 2019 Governor Newsom issued Executive Order N-10-19 directing State agencies to prepare a Climate Resilient Water Portfolio. *See*: www.gov.ca.gov/wp-content/uploads/2019/04/4.29.19-EO-N-110-19-Attested.pdf.

Coordinated Water Planning

Nemeth responded enthusiastically when asked about DWR's role in this effort. She noted that DWR had been leading a key task in the effort, the inventorying of existing water management programs in state government with an eye to improving coordination and creating better integration. Two agencies — DWR and the State Water Resources Control Board — are directly charged with formal water management and regulatory roles. However, multiple agencies are engaged in water planning as related to their own missions. California's Fish and Wildlife, Forestry, and Fire Departments are quick examples. Creating an such an inventory is no small task, as over 30 state boards, commissions, offices, and agencies and departments, participate in development of DWR's California Water Plan.

"Performance Dashboards"

Nemeth was also excited about the work DWR had been doing to develop "performance dashboards." Dashboards will improve transparency and streamline reporting on progress in achieving the final portfolio goals. She noted her department was the lead for implementation of the Open and Transparent Water Data Act (AB 1755). She felt a focus on data would be essential to successfully implementing a portfolio.

In discussing data, she relayed an insight originally offered to her by Marybel Batjer, the recently named President of California's Public Utilities Commission. Batjer observed that California was a state formed by a Gold Rush and timber extraction heritage but that instead of harvesting precious metals or lumber, the next "gold rush" would involve California's great skills in mining data.

Nemeth noted that the portfolio process also dovetails nicely with existing DWR programs, including: periodically updating its California Water Plan and Central Valley Flood Protection Plan; implementation of the Sustainable Groundwater Management Act; and operation of the State Water Project.

Managed Aquifer Recharge

She saw the Governor's directive creating even more opportunities for synchronization of planning processes and better integration of water investments to create multi-benefit project opportunities. One example she offered was DWR's efforts to increase utilization of flood flows for increased **m**anaged **a**quifer **r**echarge (MAR). Called "Flood MAR," what was once something that occurred through

Karla Nemeth CDWR

"MAR" Benefits

Delta Proposals

Delta History

Leverage Investments

Trade-Offs

Delta Solution Needs

unmanaged inundation and natural groundwater recharge can now be replicated in by improved water management systems. In promoting the program Nemeth has previously explained, "...the potential benefits of this are significant: groundwater replenishment, peak flood flow attenuation, additional values and uses for agricultural land, a potential source of instream flows during drought or other periods of critical environmental need, and finally, increased efficiencies from reservoir reoperation." *See*: https://water.ca.gov/Programs/All-Programs/Flood-MAR

Two additional, intertwined responsibilities Nemeth is personally focused on are a process called the Voluntary Settlement Agreements (see below) and continued work on infrastructure investments to improve California's conveyance systems — particularly in the Delta.

Delta Tunnels

Concerning water conveyance in the Sacramento-San Joaquin Delta, most current proposals center on changing the intake locations of existing systems that utilize natural and constructed infrastructure, moving water from Northern California through the Delta, and then withdrawing it into canals that deliver water to farmers and cities further south.

Sacramento San Joaquin Delta Water Conveyance

There have been decades of consensus that the Sacramento San Joaquin Delta water conveyance system is not sustainable. Governor Brown in his first term (during the 1980's), backed by the Legislature, proposed a peripheral canal that would move water around the Delta. This proposal was defeated at the ballot box after significant opposition from Northern California residents that viewed it as a "water grab" and a broader environmental community that was suspicious of adding more built infrastructure. A broad disagreement about the challenges and causes of problems with the system and the appropriate solutions continues.

The solution proposed during Brown's next administration was referred to as the "twin tunnels" and involved bypassing the Delta and taking upstream flows through pipelines for delivery south. A dual system was preferable as it would allow for more operational flexibility, particularly as tunnels would require periodic maintenance and repairs and the system would not need to shut down to accommodate that. This proposal was accompanied by ongoing efforts and additional plans and investments to improve the Delta watershed and its habitats. Nemeth was personally involved with improving Delta habitats earlier in her career.

Significant opposition to the twin tunnels emerged. Arguments were more complex but generally fell along the lines of earlier disputes and were enhanced by the fact that the Delta ecosystems were viewed as even more degraded than they had been in the 1980's.

The twin tunnels proposal was the one that Nemeth inherited, and dissent was already well established and vocal. Nemeth, herself, believed the proposal had challenges and supported the administration's decision (also supported by incoming Governor Newsom) to return to the drawing board and craft a new option for a downscaled project with one tunnel.

We asked Nemeth about this new proposal and her views about the potential for success in improving Delta habitat. Nemeth began by discussing the need to look at the Delta effort in the context of California's economic and social setting. She felt it was unrealistic to dismiss the need for the water conveyance from North to South, particularly given continued population growth and climate change. She also noted California's agricultural sector is among the most productive in the world and that Southern California's economic engine contributes to a State's economy equivalent to that of the world's most developed nations. She was genuinely frustrated by the views of some that existing conveyance structures should somehow be stranded or dismissed. She felt it essential to leverage the State's existing water management investments to the benefit of the whole State. Nemeth explained there was also need for a broader acknowledgement of the balancing of trade-offs that will occur in forging solutions.

As noted before, she did see challenges in earlier Delta proposals. Now that she was directly responsible for advancing a Delta solution, we asked her to tell us what was different about the one Nemeth, herself, will advance.

Good public administration, transparency, and solid science were at the center of her response. She began by explaining that this was a vastly scaled down proposal that was grounded in recognizing and reducing impacts. She believed that previous proposals may not have fully acknowledged and mitigated for their impacts. She also felt a need to better articulate project benefits and believes stakeholders should be given a more prominent role in expressing localized impacts. She thinks doing so will create better environmental impact reports and create the opportunity to mitigate through improved engineering and design. As an example she offered a need to recognize that just building the project might take 10 years and construction impacts should be accounted for and designs potentially even realigned to reduce community disruptions.

Karla Nemeth CDWR

Dam Operation Rules

Water Allocation

Voluntary Reduction & Regulatory Certainty

At the same time, a new project must be viable — it must be big enough to take "big gulps" when water is abundant and affordable. Engineering will also be critical. A new institutional arrangement, a Joint Powers Authority, composed of the key agencies funding construction has been formed with top talent recruited to lead it. DWR will be prominent in providing governance oversight for the authority and Nemeth's departmental reorganization includes a new Division dedicated to working with the Authority on implementation of Delta solutions.

Sensitive to criticism of current operations, the Director felt it would be important to address those operations and practices, including both the state's water managers and the operations of federal facilities. For example, she pointed to the State's dams as an area where improved operations would create greater water supply through smarter management of precipitation events. Current dam operating rules often require water releases at a time when there is capacity for flood flows to be captured. These releases occur when water suppliers would prefer that water stay behind the dam, knowing that a big storm is not a predictor of future storms. Better precipitation forecasting will be required as well as more operational flexibility.

Along the same lines, Nemeth saw a need to discuss the challenges of the current water allocation systems that lead some to believe that too much water is taken from natural systems necessary for fish and habitat. Nemeth was very committed to addressing this through a process called Voluntary Agreements.

Voluntary Agreements

The Voluntary Agreements process is one where key state officials have been working with those with significant water entitlements to determine what voluntary reductions could be agreed to in exchange for regulatory certainty in the future. *See*: http://resources.ca.gov/voluntary-agreements/

This is a complex process involving the jurisdictions of several state agencies and the entitlements of multiple parties. The negotiation is being conducted under a framework presented to the State Water Resources Control Board (SWRCB) on December 12, 2018, by Nemeth and California Department of Fish and Wildlife Director Bonham respectively, as an alternative to the SWRCB's staff proposal requiring unimpaired river flows under the Bay Delta Water Quality Control Plan. According to official program descriptions, the state's restoration strategy "advances Governor Brown's goal to reach voluntary agreements with water users to improve river flows, restore habitat and help native fish populations."

Nemeth is an experienced negotiator and a key principal in the negotiation. In discussing the agreements, she was enthusiastic about the overall benefits of forging common ground, maintaining relationships, advancing holistic solutions, and, achieving voluntary, immediately implementable actions versus initiation of regulatory enforcement.

Closing

We concluded by asking what the Director hoped her legacy would be and her advice to someone new to the water resources field.

She responded to the legacy question by saying she wanted to be remembered for creating a reputation for DWR as a great place to work and ensuring Californian's had clean reliable water.

Her advice to those following her is that people make all the difference. She suggested finding role models that help set a marker for excellence and then "igniting your passion shamefully."

For Additional Information:
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Lisa Beutler specializes in helping organizations and communities reach decisions and create effective public policy. After a decade as the Associate Director of the Sacramento State University Center for Collaborative Policy she moved to Stantec, a global design and engineering firm. At Stantec she helps clients with strategic thinking, collaborative policy, and water resources and other planning. Earlier in her career she was a state park ranger and served in special offices of two governors. As an elected leader for the American Water Resources Association, her water management expertise and passion for excellence is well known. In addition to being the California Water Plan Executive Facilitator, she is also a nationally recognized practitioner in large group processes and continues to explore the use of technology to improve collaboration, transparency and decision making. Her expertise has also led to key roles in California's implementation of the Sustainable Groundwater Management Act. Internationally, she helped lead the team that engaged 400 global leaders of religious and spiritual communities to address the obligations of the faith community in providing clean, safe water to the people of the world at the 2004 Parliament of World's Religions in Barcelona, Spain. A popular presenter at professional conferences, her work is and has been studied extensively and as far back as reviews in the Public Productivity & Management Review (1996). She has also been featured in a variety of publications and books including *Planning in the Face of Conflict* by John Forester. With a proven track record leading numerous complex, high profile projects ranging from water, land-use, and energy planning to off-highway vehicles, technology, substance abuse, and religious conflict resolution, she is a go-to resource for agencies with wicked problems.

WATER BRIEFS

WOTUS RULE REPEALED US

CLEAN WATER ACT RULE

On September 12, EPA Administrator Andrew Wheeler and Department of the Army Assistant Secretary of the Army for Civil Works R.D. James announced that the agencies are repealing a 2015 rule that they claim impermissibly expanded the definition of "waters of the United States" (WOTUS) under the Clean Water Act. The agencies are also recodifying the longstanding and familiar regulatory text that existed prior to the 2015 Rule — ending a regulatory patchwork that required implementing two competing Clean Water Act regulations, which has created regulatory uncertainty across the United States. "Today, EPA and the Department of the Army finalized a rule to repeal the previous administration's overreach in the federal regulation of U.S. waters and recodify the longstanding and familiar regulatory text that previously existed," said EPA Administrator Andrew Wheeler. "Today's Step 1 action fulfills a key promise of President Trump and sets the stage for Step 2 — a new WOTUS definition that will provide greater regulatory certainty for farmers, landowners, home builders, and developers nationwide."

The rationale for the WOTUS repeal was summarized in the agency announcement as follows: "In this action, EPA and the Army jointly conclude that multiple substantive and procedural errors warrant a repeal of the 2015 Rule. For example, the 2015 Rule:

Did not implement the legal limits on the scope of the agencies' authority under the Clean Water Act as intended by Congress and reflected in Supreme Court cases. Failed to adequately recognize, preserve, and protect the primary responsibilities and rights of states to manage their own land and water resources. Approached the limits of the agencies' constitutional and statutory authority absent a clear statement from Congress. Suffered from certain procedural errors and a lack of adequate record support as it relates to the 2015 Rule's distance-based limitations."

The press release states that, "[W]ith this final repeal, the agencies will implement the pre-2015 regulations, which are currently in place in more than half of the states, informed by applicable agency guidance documents and consistent with Supreme Court decisions and longstanding agency practice." The final rule takes effect 60 days after publication in the Federal Register.

According to the agencies' press release, in December 2018, EPA and the Army proposed a new definition — Step 2— that would clearly define where federal jurisdiction begins and ends in accordance with the Clean Water Act and US Supreme Court precedent. In the proposal, the agencies provide a clear definition of the difference between federally regulated waterways and those waters that rightfully remain solely under state authority.

The final Step 1 rule follows President Trump's Executive Order 13778, "Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the 'Waters of the United States' Rule." Section 1 of the Executive Order states that "[i]t is in the national interest to ensure that the Nation's navigable waters are kept free from pollution, while at the same time promoting economic growth, minimizing regulatory uncertainty, and showing due regard for the roles of Congress and the States under the Constitution."

For info: www.epa.gov/wotus-rule

WOTUS RULE V. CHAOS US

WOTUS RULE REPEALED

The Trump Administration's recent repeal of the Obama Administration's "Waters of the United States" rule (aka WOTUS) resulted in widespread media coverage and either consternation or joy in the water world, depending on one's view of the proper scope of the Clean Water Act. (*See* Brief above on repeal). One imminent expert weighed in on his view of the repeal, under the banner of "Better a Rule Than Chaos."

Robert Glennon, Regents Professor at University of Arizona and renowned water law expert, noted that "the justification [for the repeal of WOTUS] is that it will bring clarity to the disarray caused by conflicting lower court decisions." Glennon explained his view of the rollback and what the future holds concerning WOTUS:

> But the rule merely interpreted a U.S. Supreme Court decision, which found the Court badly splintered. In *Rapanos*, the Court was faced with interpreting the Clean Water Act. The controlling fifth vote came from Justice Kennedy who announced that the Clean Water Act would apply not only to navigable bodies of water but also to non-navigable ones if the non-navigable stream or river has a "significant nexus" to the navigable body of water. The 13 years since *Rapanos* have seen the lower courts and EPA and the Corps of Engineers scratching their heads trying to figure out what is or is not a "significant nexus."
>
> Here's the kicker: repealing the rule does nothing to clarify what the law is. Rather, it displaces a lengthy administrative rule with...nothing. So the courts are back to guessing what Justice Kennedy may have had in mind.
>
> The Trump Administration boasts that the repeal has the support of the business community, but now no one knows when a Clean Water Act permit is required. As with the recent decision of automobile manufacturers to stick with tougher standards, the business community wants clear standards in order to make investment decisions. Better a rule you may have problems with than no rule at all.

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WATER BRIEFS

COLUMBIA RIVER CONFERENCE NW

ADAPTED FROM A NORTHWEST POWER & CONSERVATION COUNCIL NEWS RELEASE

Every five years since 1998, the Northwest Power & Conservation Council and its closest counterpart agency in British Columbia — the Columbia Basin Trust — have co-sponsored a conference on the international Columbia River. This year, the conference was in Kimberley, British Columbia from September 12th through 14th.

The event focused on key transboundary Columbia River issues that are being addressed in both countries. This time the issues were: the impacts of climate change; the future of the Columbia River Treaty; the problems caused by invasive species and the responses to them; reintroduction of anadromous fish to the Columbia above Chief Joseph and Grand Coulee dams and into British Columbia; the future of energy including aggressive development of renewable resources in both countries; and a proposal to improve and better coordinate governance of the river.

Key takeaways from the conference include:

Climate Change: The output of long-range climate models has not changed much in the last decade. The models show snowpack declining, winter rain and summer drought increasing, temperatures warming throughout the year, and more wildfires. With higher streamflows, habitat for fish and wildlife will be affected as higher runoff increases erosion and carries larger amounts of sediment. But, as Crystal Raymond of the University of Washington said in the climate change session, while the trends are clear, our confidence is high enough to act. There is still time to change the impacts.

Invasive Species: This is one of the biggest issues facing the western United States and Canada. There are impacts to the economy, the environment, and human health. The problem is more than just Zebra and Quagga mussels and Northern Pike. It's also aquatic plant species like flowering rush, and terrestrial species like feral pigs. Invasive species can change the ecosystem and affect irrigation, hydropower, and municipal water infrastructure. This is a human-caused problem, and people are hard to manage. What is needed is adequate funding for the fight, diligence to attack the problems, and coordination among agencies with authority to address them.

Energy: The morning and evening power-demand increase is a major challenge for utilities as they steadily move away from always-on, baseload electricity generated by fossil fuels. Solar power is proliferating, and it is cheap. But solar only generates during daylight, and so reliable backup power will be needed. New gas-fired plants, existing hydropower, and energy storage are the best options. What we want from our power system is flexibility, security, sustainability, reliability, affordability, and resilience. Balancing these qualities will be tricky, but it must be done. "We don't know what life is going to be like in 2045 or 2050," Ann Rendahl of the Washington Utilities and Transportation Commission said, "but there is a great deal of innovation in clean fuels, energy generation, and carbon capture to allow further decarbonization and energy storage."

Columbia River Treaty: Sylvain Fabi, who leads the Canadian team in the current negotiations over modernizing the treaty, highlighted the mutual respect and spirit of collaboration that exists among the negotiators for Canada and the United States. He said both countries want an equitable sharing of hydropower benefits, and both countries see flood risk management as a high priority, but exactly what constitutes "equitable" and the details of flood risk management remain matters for discussion. The Canadians brought First Nations into the negotiations, and while the US side has not done the same thing, the American negotiators have heard presentations from Columbia Basin Tribes. Katherine Dahani, the US consul general in Vancouver, said the US is eager to move forward to define how everyone will continue to benefit from the treaty. She said both countries benefit from coordinated flood control and hydropower operations, adding, "from our standpoint the treaty remains extremely important, but we can improve on it." She agreed with Fabi that the two countries seek an equitable sharing of benefits from hydropower operations, but that the two sides "need to agree on what is truly equitable."

Salmon Reintroduction: The Upper Columbia United Tribes presented some of the conclusions of their work to identify suitable habitat for anadromous fish above Chief Joseph and Grand Coulee dams, and potential stocks of fish that could be used for reintroduction. This work was completed with support from the Council's 2014 Columbia River Basin Fish and Wildlife Program strategy focused on mitigating for lost anadromous fish in blocked areas of the basin. Similarly, First Nations discussed their own work north of the international border to identify suitable habitat and stocks. Representatives of the Columbia Basin Tribes and First Nations agreed that managing the river and dams for ecosystem benefits in addition to hydropower and flood control, the two key missions of the original 1964 Columbia River Treaty, would assist efforts to reintroduce salmon, should that happen.

International River Governance: The policy experts who convened the governance session wrote a paper that presents a rationale for creating an International River Basin Organization (IRBO) for the Columbia River, modeled after other IRBOs in other river basins around the world. Climate change will force changes in dam operations in the Columbia River Basin, and also force changes in the Columbia River ecosystem. To adapt to these changes, governments and policies related to the river need to have the flexibility to change and adapt. The question is which ecological issues can be better managed through international coordination and cooperation as opposed to the existing legal scheme under the Columbia River Treaty? An IRBO would help identify and coordinate those issues, and others related to, for example, river operations. Next steps should include education and dialogue, modernizing the Columbia River Treaty, and establishing an IRBO, the session organizers said, and they also proposed the establishment of a forum to coordinate and address ecosystem-based function objectives as they relate to the use of storage water and river flows at the border.

For info: www.nwcouncil.org/news

WATER BRIEFS

WATER PURCHASE CO
HYDRO, STORAGE & FLOWS

On September 20, the Colorado Water Trust (CWT) announced that it has completed a water purchase agreement that benefits a notoriously troubled part of the Colorado River near Grand Junction called the 15-Mile Reach, in conjunction with partners, Grand Valley Water Users Association and Orchard Mesa Irrigation District, and the US Bureau of Reclamation. The agreement will send more water down the river at critical times through a creative arrangement that enhances environmental and recreational flows and also protects existing water rights.

The 15-Mile Reach is a stretch of the Colorado River known for low flows that can fail to support native federally endangered fish species. Flows often become low twice yearly — in early spring and in late summer through early fall (spring because the snowpack has not yet begun to melt, and Fall because it is the driest part of the year). Just upstream of the Reach is the Grand Valley Power Plant (GVPP), a hydropower plant that was built in the 1930s — which is operated by Grand Valley Water Users Association (GVWUA) and Orchard Mesa Irrigation District (OMID). GVWUA and OMID have senior irrigation water rights, and they also divert water for use in the power plant that returns to the Colorado River just upstream of the Reach.

CWT, GVWUA, and OMID recently completed an innovative agreement to allow CWT to buy water upstream to be delivered to the GVPP. That means that the water can be delivered to the plant, used to generate hydropower, and then returned to the Colorado River during times when the 15-Mile Reach is in need of flow.

CWT was able to lease excess capacity in the hydropower plant. OMID used the proceeds from this lease to help pay for renovations. By bringing clean power into the agreement, it operates under the umbrella of existing law to give water rights' owners flexibility to support the river ecosystem, without requiring a permanent change to those water rights. Thus, the agreement provides multiple benefits. First, the water is protected for instream flow benefits from the original point of use down to the hydropower plant. Then, the water is harnessed by the plant and converted to clean energy. Finally, the water continues downstream, augmenting the 15-Mile Reach and helping the river flow at healthier levels, which benefits fish.

Despite snowpack levels not seen since at least 2011, and a wet early summer, the Colorado and many other rivers in Colorado suffered severely decreased flow due to a very hot, dry August. Even the GVPP wasn't getting enough water to operate to its current capacity. CWT had the legal agreement in place and had raised money to buy water in the Colorado, so CWT decided — why not use it now?

By quickly purchasing water owned by the Colorado River District from a nearby reservoir, CWT helped boost flows in the 15-Mile Reach and generated clean electricity for six days. The storage releases complemented the water dedicated to the river by the US Fish and Wildlife Service's Recovery Program and the Historic Users Pool, a group of Colorado water users that release water from Green Mountain Reservoir.

CWT is now working on long-term funding for these purchases, from Coca Cola and others, and in cooperation with the US Fish and Wildlife Service, the Colorado River District, and their two water user partners, to help keep the river healthy for many years to come. CWT also thanked its crucial project partner, the Walton Family Foundation, which originally suggested the idea and supported its development.

For info: http://coloradowatertrust.org/

MAUI CWA SETTLEMENT HI
GROUNDWATER CONVEYANCE

On September 20, the Maui County Council voted 5-4 to settle *Hawai'i Wildlife Fund v. County of Maui (Maui)*, a decision to avoid a standoff in the US Supreme Court that could jeopardize clean water across the United States. Earthjustice, which sued the County of Maui and is representing Hawai'i Wildlife Fund, West Maui Preservation Association, Surfrider Foundation's Maui Chapter, and Sierra Club-Maui Group in the case, views the settlement as a win. "The Maui County Council showed true leadership today in its decision to settle outside of court and not risk a historic standoff over the future of America's clean water at the Supreme Court. This decision is a win not only for Maui, but for the country at large," said Isaac Moriwake, Managing Attorney, Mid-Pacific Office, Earthjustice.

The primary issue in the case was whether a Clean Water Act NPDES permit is required when pollutants originate from a point source, but are then conveyed to navigable waters by a nonpoint source, such as groundwater. The federal courts of appeals are split on the issue. Settlement of the case, before the US Supreme Court makes a decision on the issue, results in continued uncertainty over whether an NPDES permit is required in such a situation. At this point, the Ninth Circuit's ruling that the Clean Water Act does require an NPDES permit where the discharge of pollutants to the Pacific Ocean did not flow directly from the point source to the ocean, but indirectly through groundwater, stands. The Ninth Circuit's expansive ruling prevents the County of Maui from ignoring the Clean Water Act by simply discharging pollutants indirectly via groundwater, which it cannot do directly from its point source. *See Hawai'i Wildlife Fund v. County of Maui*, 881 F.3d 754 (9th Cir.2018*)*. For additional background on the *Maui* case: Robb & Leas, *TWR* #170 and Robb, *TWR* #177.

The Water Report is planning a full article on the *Maui* case and settlement in next month's issue.

For info: Liz Trotter, Earthjustice, 305/ 332-5395 or https://earthjustice.org/features/supreme-court-maui-clean-water-case

CANNABIS REMOVAL CA
ILLEGAL GROWS/PUBLIC LAND

A broad-based coalition of conservation organizations, tribes, elected officials, law enforcement agencies, federal land managers, and the legal cannabis industry on September 4th announced the formation of the Cannabis Removal of Public Lands (CROP) Project. CROP is an organization dedicated to taking back

WATER BRIEFS

California's public lands from **d**rug **t**rafficking **o**rganizations (DTOs). CROP will address the environmental devastation and community safety risk posed by criminal cannabis-growing operations on public lands by cleaning up grow sites and restoring them.

"We must take immediate action to protect and restore our public lands," said Rich McIntyre, director of the CROP Project. "Ninety percent of illegal cannabis grows on public lands are controlled by drug trafficking organizations and these criminal organizations are poisoning our water, our wildlife and cannabis consumers." California's federal public lands — which include national forests, Bureau of Land Management (BLM) lands, designated wilderness areas, and tribal lands — make up nearly 45% of the California. Illicit cannabis grows on public lands are difficult to identify and remove due to their remote locations and a lack of resources for local, state and federal agencies and organizations that are responsible for detection and cleanup. According to the Office of National Drug Control Policy and the US Forest Service, the cannabis grown illegally on public lands accounts for up to 70% of the illicit cannabis sold in California.

CROP is initially seeking funding to clean and reclaim up to 2,000 grow sites and increase the number of US Forest Service rangers in California's national forests. It costs an average of $40,000 to reclaim each site, requiring law enforcement support, hiking into remote areas with trained crews, and often air support from the National Guard in order to remove tons of materials.

The effects of growing illegal cannabis on public lands impacts residents across the state, since more than 60% of California's water comes its national forests. Based on law enforcement estimates of the illegal cannabis grown on public lands, more than 9 billion gallons of water per year are illegally diverted by DTOs. This is equivalent to a yearly water supply for 35,000 homes.

Congressman Jared Huffman (CD2) stated, "CROP is the first broad-based effort to take back our public lands from trespass grow operations, an urgent problem that I will continue to address in my work in Congress. That includes passing HR2250 (the Northwest California Wilderness, Recreation, and Working Forests Act), which identifies this problem."

The CROP Project was founded by the Community Governance Partnership and the California Wilderness Coalition (CalWild). CROP's advisory board includes representatives from the US Forest Service, Karuk Tribe, Integral Ecology Research Center (IERC), Mendocino National Forest, Trinity County Board of Supervisors, Humboldt County Board of Supervisors, Mendocino Board of Supervisors, Humboldt County Growers Association, Northcoast Environmental Center, and Weedmaps.

For info: Suzette Riley, 971/ 229-0544, sriley@ cplusc.com or cropproject.org

ENDANGERED SPECIES ACT US

STATES V. FEDS

On September 25th, the attorney generals of seventeen states filed suit challenging the Trump Administration's recent amendments to the federal Endangered Species Act. The plaintiffs' attorney generals brought the action under the Administrative Procedures Act seeking declaratory and injunctive relief. The action challenges the decision by the Secretary of the Interior and the Secretary of Commerce, acting through the U.S. Fish & Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) to promulgate three separate **f**inal **r**ules (Final Rules) that undermine key requirements of the federal Endangered Species Act (ESA), 16 U.S.C. §§ 1531 *et seq*.

The plaintiffs' 54-page Complaint set forth the details of the states' position, which were essentially summarized in paragraph two of the Complaint, as follows: "The Final Rules violate the plain language and purpose of the ESA, its legislative history, numerous binding judicial precedents interpreting the ESA, and its precautionary approach to protecting imperiled species and critical habitat. The Final Rules also lack any reasoned basis and are otherwise arbitrary and capricious under the Administrative Procedure Act ('APA'), 5 U.S.C. §§ 551 *et seq*. Moreover, the Services have failed to consider and disclose the significant environmental impacts of this action in violation of the National Environmental Policy Act ('NEPA'), 42 U.S.C. §§ 4321 *et seq*." *State of California, et al. v. David Bernhardt, U.S. Secretary of the Interior, et al*., Case No._____ (N.D.Cal) (Sept. 25, 2019).

The states challenging the rules are California, Massachusetts, Maryland, Colorado, Connecticut, Illinois, Michigan, Nevada, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont and Washington. New York City and the District of Columbia are also plaintiffs.

For info: Complaint at: https://oag.ca.gov/system/files/attachments/press-docs/ESA%20Complaint%20Final%2009-24-19.pdf

KEYSTONE XL PIPELINE MT

TREATY ISSUES

Battles over construction of the Keystone XL Pipeline continued on September 12th as the United States District Court for the District of Montana, Great Falls Division, heard oral arguments in *Rosebud Sioux Tribe v. Trump*. At the hearings, the US government argued that the treaties that the US signed with tribal nations are not relevant to the Keystone XL Pipeline. Representatives for the Tribes maintained that the treaties were created *specifically* for this sort of violation.

On September 10, 2018, the Rosebud Sioux Tribe (Sicangu Lakota Oyate) and the Fort Belknap Indian Community (Assiniboine (Nakoda) and Gros Ventre (Aaniiih) Tribes) sued the Trump Administration for numerous violations of the law in the Keystone XL pipeline permitting process. The Tribes are asking the court to rescind the illegal issuance of the Keystone XL pipeline presidential permit.

NARF Attorney Natalie Landreth highlighted the importance of the case in a June 7, 2019 statement: "People must understand that the Ogalalla Aquifer that this pipeline will cross covers 8 states and waters 30 percent of American crops. It is the largest underground water source in the United States. And the President and TC Energy would like to run a pipeline of highly toxic, cancer-causing sludge called 'tar sands' right through it. The Tribes are taking a stand for their people, their culture, their water and their future, but they also are taking a stand for YOU."

For info: NARF website at: www.narf.

CALENDAR

October 17 CA
Association of California Water Agencies Annual Regulatory Summit: "Riding the Regulatory Wave in California", Sacramento. Hilton Sacramento Arden West. For info: www.acwa.com/events/

October 17-20 CA
27th Annual Environmental Law Conference at Yosemite, Yosemite. Tenaya Lodge. Presented by the California Lawyers Assoc. For info: https://calawyers.org/Yosemite

October 18 OR
US v. Oregon 50th Anniversary Symposium (Treaty Fishing Rights), Portland. Lewis & Clark Law School, 10015 SW Terwilliger Blvd., 8 am - 6 pm. Presented by Lewis & Clark Law & the Columbia River Inter-Tribal Fish Commission. For info: https://law.lclark.edu/programs/environmental_and_natural_resources_law/symposium/

October 20-23 MO
Water Infrastructure Conference & Expo, St. Louis. Hyatt Regency. Presented by American Water Works Assoc. For info: www.awwa.org/Events-Education/Water-Infrastructure

October 21-24 Spain
Quest for Sustainability of Heavily Stressed Aquifers at Regional to Global Scales - AGU Chapman Conference, Valencia. International Participants from the Hydrology, Policy, Economics & Social Science Communities. For info: https://connect.agu.org/aguchapmanconference/upcoming-chapmans/aquifers-sustainability or Jim Butler, U-Kansas, jbutler@kgs.ku.edu

October 22 DC
Environmental Law Institute Annual Award Dinner, Washington. Omni Shoreham Hotel. Presented by Environmental Law Institute. For info: www.eli.org

October 23-24 CA
7th Annual World Water-Tech North America, Los Angeles. Ritz-Carlton Marina del Ray. For Practicioners, Innovators & Investors. For info: https://worldwatertechnorthamerica.com

October 23-24 CA
26th Annual California Aquatic Bioassessment Workgroup & 7th Annual Meeting of The California Chapter Society of Freswater Sciences, Davis. UC Davis Activities & Recreation Center Conference Facility. For info: Shuka Rastegarpour, 916/341-5556 or shuka.rastegarpour@waterboards.ca.gov

October 23-24 TX
The Annual US Water Treatment Conference, Dallas. Hosted by LMN Power. For info: Daniel Craig, 312/ 544-0023 or daniel.craig@lmnassets.com

October 25 WA
Washngton Toxics Conference: Laws/Science/Policy, Seattle. Washington Convention Center. Presented by the Environmental Law Education Center. For info: Holly Duncan, 503/ 282-5220, hduncan@elecenter.com or www.elecenter.com

October 28-31 FL
Association of Safe Drinking Water Agencies Annual Conference & Expo, Tampa. Hilton Downtown. For info: www.asdwa.org/event/asdwa-annual-conference-2019/

October 29-30 CO
Endangered Species & Other Wildlife Special Institute, Denver. Sheraton Downtown Hotel. Presented by the Rocky Mountain Mineral Law Foundation. For info: RMMLF website: www.rmmlf.org/ or info@rmmlf.org

October 29-30 TX
The Annual US Water Treatment Conference, Dallas. Crowne Plaza Dallas Downtown. For info: https://lmnpower.com (Conferences)

October 29-30 MD
Grey to Green Conference, Silver Spring. Tommy Douglas Conference Center. For info: https://greytogreenconference.org/

October 30 CA
Water Education Foundation's 36th Water Summit: "Water Year 2020: A Year of Reckoning", Sacramento. Embassy Suites Riverfront. For info: www.watereducation.org/wefsummit2019

November 1 WA
Streamflow Restoration Competitive Grants Applicant Workshop, Lacey. Ecology HQ, Auditorium, 300 Desmond Drive, 9 am. Presented by Department of Ecology. For info: https://ecology.wa.gov/Events/WR/WRSRP2020/SWRO

November 3-6 UT
2019 AWRA Annual Water Resources Conference, Salt Lake City. Sheraton Salt Lake City Hotel. Presented by American Water Resources Association. For info: www.awra.org

November 4 Netherlands
Aquatech Innovation Forum: Mastering Water's Digital Transformation, Amsterdam. RAI Amsterdam. For info: www.aquatechtrade.com/innovation-forum/

November 4 WA
Streamflow Restoration Competitive Grants Applicant Workshop, Spokane. Eastern Regional Office, 4601 N. Monroe, 9 am. Presented by Department of Ecology. For info: https://ecology.wa.gov/Events/WR/WRSRP2020/ERO

November 5 WA
Streamflow Restoration Competitive Grants Applicant Workshop, Union Gap. Central Regional Office, 1250 West Alder Street, 9 am. Presented by Department of Ecology. For info: https://ecology.wa.gov/Events/WR/WRSRP2020/CRO

November 5-8 Netherlands
Aquatech Amsterdam 2019 Trade Show, Amsterdam. RAI Amsterdam. For info: www.aquatechtrade.com/amsterdam/

November 6-8 TX
NWRA 88th Annual Conference, Houston. The Westin Galleria. Presented by National Water Resources Assoc. For info: www.nwra.org/upcoming-conferences-workshops.html

November 7 CA
Water & Environmental Law Program Speaker Series: Wade Crowfoot, California Secretary for Natural Resources, Sacramento. McGeorge School of Law. Presented by Water & Environmental Program in collaboration with McGeorge's Capital Center for Law & Policy. For info: Jennifer Harder at jharder@pacific.edu

November 12 WY
"Water as a Commodity at Pathfinder Ranches: From Schoonmaker's Ditch to Cattle Kate's Grave", Cheyenne. Water Development Office, 6920 Yellowtail Road, 10 am - Noon. Presented by Wyoming State Engineer's Office. For info: Jeff Cowley, WSEO, 307/ 777-7641, jeff.cowley@wyo.gov or https://sites.google.com/a/wyo.gov/seo/interstate-streams/water-forum

November 12-14 IL
Storm Water Solutions Conference & Exhibition, Tinley Park. Tinley Park Convention Center. For info: www.swsconferenceexpo.com

November 12-14 TX
American Water Summit: "Leadership for a Sustainable America", Houston. OMNI Houston Hotel. For info: www.americanwatersummit.com

November 13 WA
Streamflow Restoration Competitive Grants Applicant Workshop, Bellevue. Northwest Regional Office, 3190 - 160th Avenue SE. Presented by Department of Ecology. For info: https://ecology.wa.gov/Events/WR/WRSRP2020/NWRO

November 13-15 CA
Resilience, Adaptation & Innovation: Leading in a Changing Climate - 2019 AWWEE Conference, Napa. Silverado Resort & Spa. Presented by the Assoc. of Women in Water, Energy & Environment. For info: https://awwee.org/events/2019-conference/

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Water Rights, Water Quality & Water Solutions in the West
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CALENDAR

(continued from previous page)

November 14-15 OR
Oregon Water Law Conference - 28th Annual, Portland. World Trade Center, 121 SW Salmon Street, Auditorium Room. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

November 15 OK
Tribal Water Law Conference, Oklahoma City. Skirvin Hilton. For info: CLE Int'l, 800/ 873-7130, live@cle.com or www.cle.com

November 16 OR
17th Annual Celebration of Oregon Rivers, Portland. Leftbank Annex, 101 N. Weidler Street. Presented by WaterWatch of Oregon. For info: waterwatch.ejoinme.org/auction2019

November 20-21 WA
12th Annual Washington Water Code: Past, Present & Future Seminar, Seattle. Hilton Seattle, 1301 6th Avenue. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

November 20-21 CO
Colorado Groundwater Issues Conference, Denver. DoubleTree by Hilton Denver, 3203 Quebec Street. Presented by American Ground Water Trust. For info: https://agwt.org/civicrm/event/info%3Fid%3D302%26reset%3D1

November 21-22 WA & WEB
The Lucrative Business of Marijuana in Washington State Seminar, Seattle. Washington Athletic Club, 1325 6th Avenue. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

November 26-27 Netherlands
Smart Water Utilities 2019: Reducing Leekage Across the Network - 2nd Annual Conference, Amsterdam. For info: http://www.smart-water-utilities.com/

November 19-20 WA
Lake Roosevelt Forum, Spokane. The Davenport Hotel. For info: www.lrf.org/conference

December 3-4 DC
P3 Government Conference (Public Private Partnership), Washington. Marriott Marquis. For info: www.p3gov.com

December 6 WA & WEB
Permitting Strategies Seminar, Seattle. Grand Hyatt Seattle, 721 Pine Street. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

December 9-10 TX
Hydraulic Fracturing Production Chemicals 2019 Exhibition & Conference, Houston. TBD. For info: www.hydraulic-fracturing-chemicals.com

December 9-10 CA
PFAS Litigation Conference, San Diego. Hilton San Diego Gaslamp Quarter. For info: Law Seminars International, 206/ 567-4490 or www.lawseminars.com/

December 10 WY
Wyoming Cloud Seeding Activities and Update - Water Forum, Cheyenne. Water Development Office, 6920 Yellowtail Road, 10 am - Noon. Presented by Wyoming State Engineer's Office. For info: Jeff Cowley, WSEO, 307/ 777-7641, jeff.cowley@wyo.gov or https://sites.google.com/a/wyo.gov/seo/interstate-streams/water-forum

December 12-13 CA
CEQA Conference, San Francisco. Hilton Union Square. For info: CLE Int'l, 800/ 873-7130, live@cle.com or www.cle.com

December 16 WA
Fifth Annual Tribal Natural Resource Damage Assessments Seminar, Seattle. Crowne Plaza Hotel - Seattle Downtown. For info: Law Seminars International, 206/ 567-4490 or www.lawseminars.com/