The Water Report

Water Rights, Water Quality & Water Solutions in the West

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MUNICIPAL WATER USE IN NEW MEXICO

CONSERVATION, INFRASTRUCTURE, AND PLANNING FOR DROUGHT

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Introduction

This article provides an overview of New Mexico's approach to municipal water supply and demand, long-range planning, drought planning, infrastructure projects, and conservation. More specifically, it addresses the intersection of drought planning, infrastructure projects, and conservation from a municipal perspective. The overview is followed by a specific example of how these areas have been addressed by the Albuquerque Bernalillo County Water Utility Authority, which is the largest municipal water provider in New Mexico.

Overview

FORTY-YEAR WATER DEVELOPMENT PLANS

Under New Mexico law, the base planning document for each municipality in the state is a 40-year water development plan. By statute, municipalities can acquire and hold water rights unused to meet their "reasonably projected additional needs within forty years" (NMSA 1978 § 72-1-9(B) (1985)). The law contemplates the preparation of a 40-year water development plan when an application is filed for a new source of water with the New Mexico Office of the State Engineer (NMOSE). This includes an application for a new appropriation of groundwater or surface water or the transfer of an existing water right, *i.e.*, a change in place of use, purpose of use, or point of diversion. *Id.* A major purpose of the statute is to allow for long-range municipal planning because of the time and money involved in major infrastructure projects and water rights acquisitions.

The basic elements of a 40-year water development plan include providing information on existing water rights and reasonably projected 40-year demand. The NMOSE has expanded these requirements beyond what is required in statute to capture information on existing and future conservation efforts including: the use of the NMOSE **g**allons **p**er **c**apita **d**ay (gpcd) calculator, and the results of an America Water Works Association (AWWA) water audit. As a result, the NMOSE has mandated gpcd levels for some municipalities in New Mexico. However, it can be argued that the better approach is to allow a municipality's elected governing body to make that determination — because it effects the standard of living and business opportunities in that community — as long as the city's own gpcd objective is reasonable, prudent, and does not result in the wasting of water.

Water planning is complex and must consider such variables as: climate change projections; drought; protracted NMOSE water rights permitting; years-long federal permitting (e.g., NEPA); and the lengthy planning, design, and construction time associated with public water projects. Some municipalities, such as Albuquerque and Santa Fe, consider 40 years a mid-range planning horizon, and 80 to 100 years to be long-range planning.

The Water Report
(ISSN 1946-116X)
is published monthly by
Sky Island Insights LLC

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Website
www.TheWaterReport.com

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Municipal Water

Conservation Programs

Diminishing Returns

Conjunctive Management

Drought Planning

Planning for drought is much different when approached from a municipal perspective as opposed to before irrigated agriculture. Public water supply is less than 10% of the total water withdrawals in New Mexico, while irrigated agriculture is 76% (the remaining 14% falls into various other categories — *see New Mexico Water Use of Categories 2015,* NMOSE Technical Report 55). Because of this, water reductions by irrigated agriculture during drought have a much more significant impact than reductions by municipal water use.

Next, while it is possible to implement permanent fallowing for most agricultural crops and single-year or multi-year forbearance of water use for annual crops, municipalities cannot induce an immediate reduction in water use on a short-term basis to respond to drought without potentially significant socio-economic consequences. A fallowed field for an annual crop can be returned to the planting rotation with small to moderate costs to return the field to production. In contrast, immediate reductions in municipal water use results in large costs to repair or replace affected infrastructure, as well as significant time. For example, a community park space that is not watered for a summer season due to immediate water use restrictions would require expensive landscaping to restore the resource for community use. Consequently, meaningful reductions in water use requires advanced drought planning in order to make the necessary infrastructure adjustments to achieve real, long-lasting reductions in water use. Schools and hospitals cannot have water use curtailed, even on a short-term basis, even in the most severe drought.

Two major tools for municipal drought planning are: 1) reducing demand through conservation programs; and 2) diversification of a water supply portfolio and construction of the related infrastructure to increase water management options.

Municipal Water Conservation Plans

In addition to a 40-year water development plan, the NMOSE also requires that municipalities prepare and file a separate water conservation plan. Existing and planned municipal water conservation programs are described in more detail in a water conservation plan as compared to a 40-year water development plan. The types of water conservation programs adopted and promoted by municipalities include the following:

- Public awareness and education
- Increasing block rates which discourage large water use
- Lawn and turf replacement programs
- Outdoor irrigation efficiency education and rebates including: increasing moisture content with organic ground cover, smart irrigation controllers, sensors, and drip emitters
- Rebates for xeriscaping
- Non-potable gray water systems for irrigation
- Rebates to install low water use toilets, showerheads, washing machines, swamp cooler thermostats, and hot water recirculation units
- Leak detection and pipeline replacement
- Installation of water efficient technologies by institutional, commercial, and industrial users, including rebates for specified reductions in water use
- Ordinances to eliminate wasting of water

Some municipal conservation programs might produce immediate water savings in a severe one-year drought, such as mandatory outdoor irrigation schedules. However, the most positive effects of successful water conservation programs — reductions in municipal demand — are not experienced immediately, but over a longer continuum. Several New Mexico municipalities have been able to reduce their gpcd by up to fifty percent in the last 20-30 years. That said, the largest water use reduction percentages typically occur in the initial years after initiation of municipal conservation programs — these percentages diminish over time.

Municipal Water Supply Diversification and Infrastructure Projects

An equally important approach to drought planning for municipalities is the diversification and construction of water supply related infrastructure projects. This includes replacement of aging infrastructure in order to increase conveyance efficiency and reduce system water losses.

When possible, it is preferable for a municipality to have water available from both surface and groundwater sources. Managing both type of supplies together can be described as conjunctive use or conjunctive management. This strategy encourages management options such as using renewable surface water to the greatest extent possible in order to save groundwater as a drought reserve for when surface water supplies are low or unavailable.

Municipal Water

Diverse Portfolio

Other examples of water supply diversification that increase water management flexibility in drought include: importation of surface water from other basins; importation of groundwater from a distant aquifer; aquifer storage and recovery of surface water; accessing groundwater from unrelated aquifers at different depths; and extracting deep brackish groundwater that can be treated through desalination. Accessing, transporting, and treating water from any of these sources requires planning, permitting, and construction of infrastructure.

Diversification of a water supply portfolio creates resiliency — *e.g.,* redundancy — in a municipal water supply. Below are examples of municipalities in New Mexico that have diverse water supply portfolios that increase management options, particularly in times of drought. Each municipality has its own unique circumstances that create or limit their options.

Water Sources

Albuquerque Bernalillo County Water Utility Authority

In general, the Albuquerque Bernalillo County Water Utility Authority (Water Authority) can conjunctively manage its municipal water supply using five different sources of water: 1) San Juan-Chama Project water, which is surface water imported from the Colorado River Basin; 2) groundwater from the Albuquerque Basin; 3) native Rio Grande surface water rights (not imported), some of which are used to offset the impacts to the Rio Grande that result from groundwater diversions; 4) treated wastewater effluent; and 5) aquifer storage and recovery of stored surface water supply. The Water Authority's objective is to utilize renewable imported surface water to the greatest extent possible, reserving the groundwater as a drought reserve. The use of treated wastewater effluent is increasing over time (applications include non-potable irrigation and commercial use). Together, these diverse sources allow the Water Authority to effectively manage its municipal water supply during times of drought.

Figure 1: Albuquerque Bernalillo County Water Utility Authority

Municipal Water

San Juan-Chama Project

The Drinking Water Project, which allows the Water Authority to divert and fully consume its imported San Juan-Chama Project surface water, was a $500,000,000 investment in new infrastructure. Components of this project include: a bladder dam to accomplish the surface water diversion; a fish passage structure for the endangered Silvery Minnow; conveyance pipelines; and a surface water treatment facility. The infrastructure associated with the aquifer storage and recovery varies; one project is passive recharge and another involves an injection and recovery well.

Water Portfolio

City of Santa Fe

The City of Santa Fe has four sources of water: 1) imported San Juan-Chama Project water from the Colorado River Basin; 2) native surface water from the Santa Fe River — a tributary of the Rio Grande; 3) groundwater from the Santa Fe and Buckman Well Fields; and 4) treated wastewater effluent. Like the Water Authority, Santa Fe aims to maximize imported surface water and native surface water use to conserve groundwater to the greatest extent possible. To reduce the need to divert additional water supplies — like groundwater and surface water native to the Rio Grande Basin — Santa Fe also developed a plan to maximize the use of treated wastewater effluent for non-potable irrigation and return flow credits to fully consume its imported water. With this diverse portfolio, Santa Fe is well situated during times of drought.

Return Flow Credits

Santa Fe is presently pursuing the permitting and construction of a return flow pipeline that will return treated effluent to the Rio Grande for a return flow credit that will allow it to divert a like amount, thereby accomplishing the full consumption of its imported water supply.

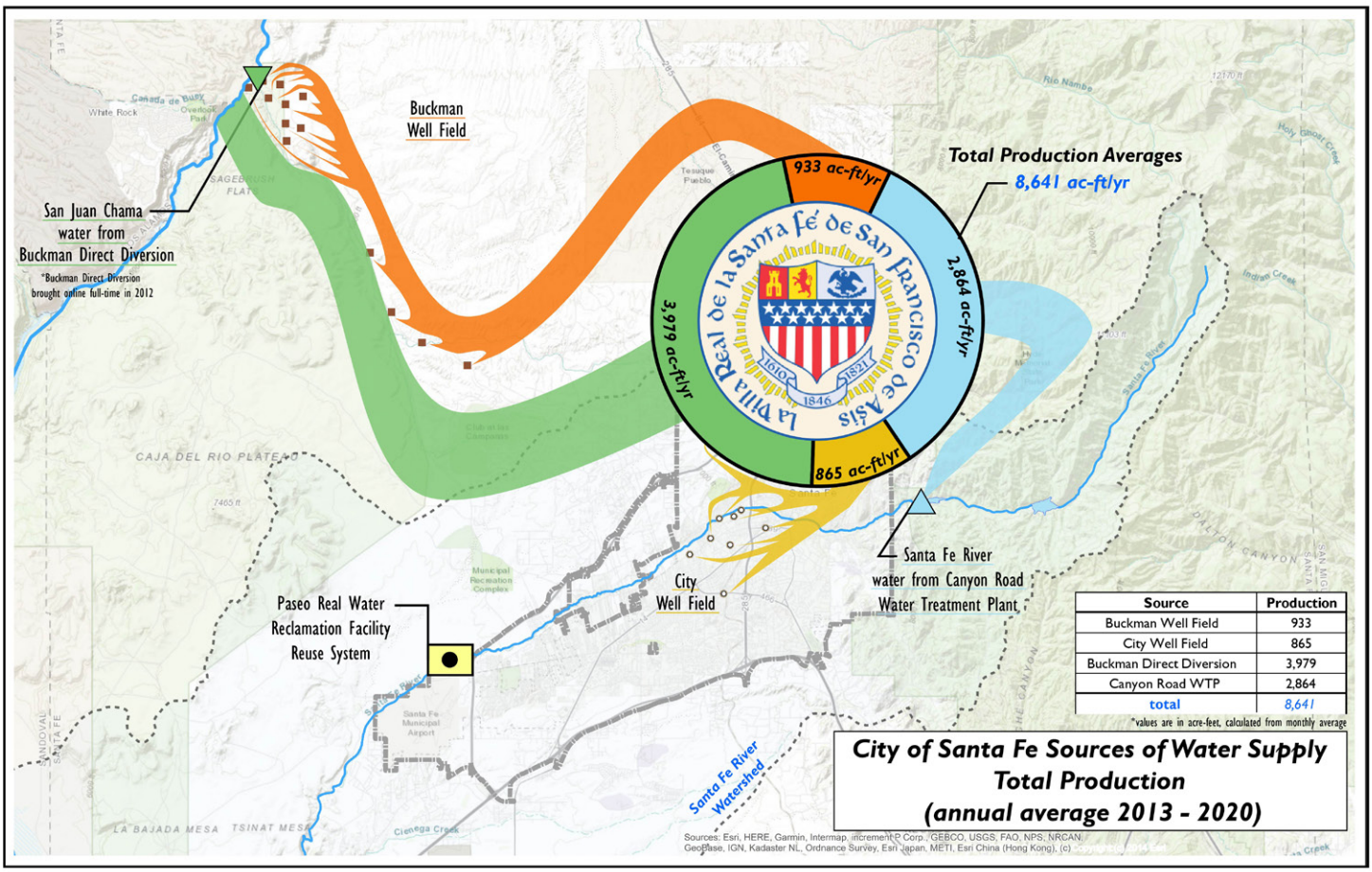

Figure 2: City of Santa Fe

Municipal Water

Hydrological Connections

City of Las Cruces

Las Cruces utilizes three well fields, two on the West Mesa and one on the East Mesa. The West Mesa wells are hydrologically connected to the Rio Grande and — when necessary under New Mexico law — require surface water rights and return flows to offset the effects of groundwater pumping. The City's East Mesa Well Field is not hydrologically connected to the Rio Grande and effectively imports water to the river in the form of unconsumed treated wastewater effluent.

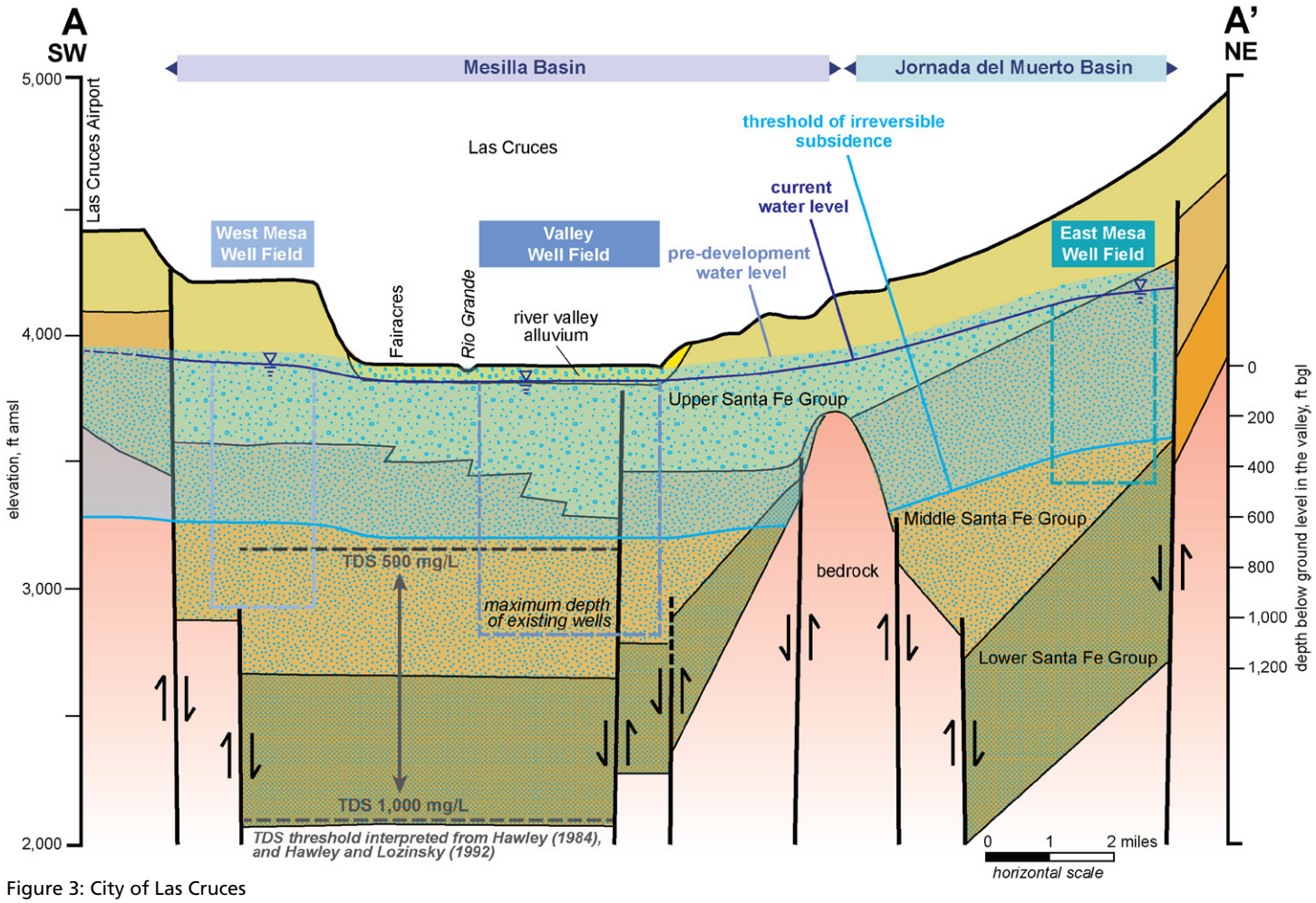

Figure 3: City of Las Cruces

Confined Aquifers

Las Cruces also owns surface water rights within Elephant Butte Irrigation District, which is a US Bureau of Reclamation irrigation project in southern New Mexico that extends into west Texas. Importation of groundwater from other distant aquifers is also being considered. Because of the difference in hydrologic connection to the Rio Grande among its well fields, Las Cruces can manage groundwater pumping effectively during drought.

City of Gallup

The City of Gallup in western New Mexico is unique because it obtains its municipal groundwater supply from confined aquifers, i.e. the Gallup Sandstone, Dakota-Westwater, and Shinarump-San Andreas-Glorieta aquifers. These are extremely deep municipal wells between 2,000 and 3,800 feet below ground surface, costing approximately $6 million each, drilled with oil & gas rigs, with recent wells completed using directional drilling techniques primarily utilized in the oil fields. Diversions from each confined aquifer are carefully managed and this provides some degree of operational flexibility.

Tribal Partnership

More significant in terms of diversification and drought planning, the City of Gallup is a partner in the Navajo-Gallup Water Supply Project (NGWSP). The NGWSP, a $2 billion project which is still under construction, will import water from the San Juan River Basin for use on the Navajo Reservation and in the Gallup regional area. Gallup's imported surface water will be water leased from the Jicarilla Apache Tribe. Once available, the City will fully utilize the imported surface water, saving groundwater as a drought reserve.

Municipal Water

Drought Strategy

Regional System

Natural Disasters

Little Bear Fire

Supply Gap

Hermit Peak-Calf Canyon Fire

Long-Term Solution

City of Alamogordo

The City of Alamogordo has four major sources of municipal water supply: 1) surface water from the nearby Sacramento Mountains east of town; 2) imported water from Bonito Lake, a transmountain diversion; 3) limited fresh groundwater; and 4) a municipal desalination facility that treats brackish groundwater. Like other municipal management strategies, Alamogordo seeks to use its renewable surface water sources first. After that, it turns to its limited fresh groundwater next, using only to the extent necessary the more expensive potable water treated in the desalination facility. Preserving the groundwater resource is part of the City of Alamogordo's drought management strategy.

Town of Silver City

The Town of Silver City has two distinct and hydrologically unconnected well fields. It is engaged in a planning process to create a regional water system, covering a large geographic area, to fully utilize unconsumed treated wastewater effluent. Full consumptive use of the presently unused treated wastewater effluent will reduce the demand on the groundwater supply and allow it to be saved as a drought reserve.

The Need for Municipal Drought Planning and Supply Resiliency

Municipal water conservation (i.e., reducing demand) and diversification of municipal water supplies (increasing management options) are important not just for drought planning, but also to adapt to situations that may be caused by drought or natural disasters that compromise or eliminate a source of municipal supply on a short-term or long-term basis. Two recent examples in New Mexico — the City of Alamogordo and the City of Las Vegas — illustrate such adaptation.

City of Alamogordo

The City of Alamogordo relied on Bonito Lake as an imported surface water supply since the 1950s. Bonito Lake is a mountain lake surrounded by forest. The NMOSE considered Bonito Lake to be a reliable source when it reviewed the City of Alamogordo's 40-Year Water Development Plan. It turned out to be less reliable than expected.

In the summer of 2012, the Little Bear fire broke out and — until it was finally contained some two months later — burned the surrounding forest and local watershed. Nearly 45,000 acres were burned and the surrounding watershed around Bonito Lake — which was used by the City of Alamogordo as a drinking water supply — was damaged beyond use. Monsoon rains flooded the lake with logs, mud, and debris. It took ten years to dredge and rehabilitate Bonito Lake in order to make it useable again as a municipal drinking water supply. During the same time, the City of Alamogordo was experiencing lower than normal precipitation which reduced its other surface water supplies.

In this situation, the City of Alamogordo would have struggled to deliver municipal water supplies to 35,000 people without its diverse municipal water supply portfolio and the related infrastructure to deliver municipal water from other sources. In this instance, planning for drought had the added benefit of bridging the municipal water supply gap during a natural disaster.

City of Las Vegas

A second recent example of the need for drought and natural disaster planning comes from the City of Las Vegas, New Mexico. The spring of 2022 was one the New Mexico's top ten warmest ever, and its sixth driest. That summer, the Hermit Peak-Calf Canyon fire broke out in the mountains of northern New Mexico, burning nearly 350,000 acres of forest, including the Gallinas watershed which supplies water to the City of Las Vegas. Ash and debris that entered the watercourse made the water untreatable given the existing capability of the water treatment plant. At one point the City of Las Vegas was left with less than 20 days' supply of water, even with extreme water use limitations. Because the City of Las Vegas' other municipal water supply options are limited, the long-term solution appears to be an entirely new filtration system constructed at a drinking water treatment plant at a cost of $100 million. The City is also pursuing direct potable reuse regulations and project approval from the New Mexico Environment Department.

Municipal Water

Albuquerque Bernalillo County Water Utility Authority

"Water 2120" — a 100-year water resources management plan

Management Plan

The Albuquerque Bernalillo County Water Utility Authority (Water Authority) has developed a 100-year water resources management plan titled Water 2120. Water 2120 uses conjunctive management to achieve full utilization of the Water Authority's water rights portfolio. The plan projects supply and demand scenarios anticipating a range of possibilities for population growth and hydrologic changes due to climate change impacts. The Water Authority's water rights portfolio includes: pre-1907 and vested water rights for Rio Grande native water; imported San Juan Chama surface water from the Colorado River; and two groundwater permits.

Drought Resiliency Through Conjunctive Use

ASR Projects

Drought resiliency is achieved through conjunctive use of surface water, groundwater, reuse, and aquifer storage and recovery (ASR). The Water Authority diverts San Juan-Chama water through a surface diversion that is treated for use as drinking water, and via a subsurface diversion that serves non-potable customers in northeast Albuquerque. The Water Authority operates a reuse system at the Southside Water Reclamation Plant capable of distributing reuse water to customers in southeast Albuquerque. The Water Authority also has two operating ASR projects: 1) Bear Canyon infiltration gallery; and 2) a direct-inject well plus a vadose zone infiltration well at the San Juan-Chama surface water treatment plant. The Water Authority has over 90 wells, of which approximately 60 wells are in operation. Many of the wells require treatment for arsenic, which is naturally occurring in the area, and a number of the high arsenic wells have been out of service since the Arsenic Rule took effect in 2006 (40 CFR 141 National Primary Drinking Water Regulations). Planning projects to bring those wells back online with arsenic treatment plants is an important drought resiliency measure.

Planning for Future Infrastructure

Non-Potable Reuse

Water 2120 incorporates future projects and water management policies approved by the Water Authority's governing board. The Water Authority is currently working on three new reuse projects which will extend non-potable reuse water throughout its service area: Bosque Water Reclamation Facility for reuse in Albuquerque's westside; and a South-to-North Reuse Pipeline to connect eastside reuse systems and expand service to potential reuse customers throughout the eastside of Albuquerque. The Water Authority is also working on additional ASR projects to store surface water underground, extending groundwater resource use during drought.

Funding and Resources

It takes many years (sometimes decades) for a municipality to ramp up alternative supplies — such as arsenic treatment or water reuse projects — to reduce dependency on surface water supplies. The Water Authority is in the process of constructing several arsenic treatment plants to improve supply resiliency when the utility is forced to operate 100 percent on groundwater during periods of limited surface water availabity. Funding, designing, and constructing these projects is a multi-year process even when timelines are expedited. The current influx of funding from the Federal government could serve to fund many water/wastewater projects. However, the current construction environment is increasing timelines due to staffing shortages and supply-chain issues — so implementation of relief funds will take multiple years to result in tangible projects.

Reservoir Storage

Reservoir storage is a critical piece of Water 2120. The Water Authority is working with Federal agencies to implement the Water Resources Development Act of 2020 (WRDA 2020). This includes the US Army Corps of Engineers, which authorized additional storage in Abiquiu Reservoir for concurrent storage of San Juan Chama water and native Rio Grande water (see usace.army.mil).

Conservation Actions and Outcomes

Consistent Effort

Effective conservation actions can be taken to maintain a beautiful community and resilient economy, but those changes don't happen overnight. Effective municipal conservation requires long-term consistent efforts that take years to implement to ultimately achieve conservation goals. The Water Authority has been aggressively working to conserve water for decades and conservation continues to be a key water management tool in Water 2120.

Over the last 30 years the Albuquerque water system has cut per capita water usage in half, going from approximately 250 gpcd in the late 1990s to 125 gpcd today. This conservation has been achieved

Municipal Water

Outdoor Conservation

GPCD Goals

primarily by: converting turf-based landscapes to xeriscape (low-water use landscaping); improving irrigation efficiencies; and reducing water use indoors by installing low water use appliances. The Water Authority maintains an irrigation specialist and arborist on staff, with conservation specialists focused on helping customers reduce water waste. The Water Authority has found supporting customers to help reduce water waste to be very effective and rarely resorts to punitive corrective measures, such as water waste fees.

Water 2120 sets a policy of continued conservation, with a goal of reductions to 110 gpcd by 2037. The Water Authority recently signed a memorandum of understanding (MOU) with other Colorado River municipalities to cut non-functional turf by 30 percent, which further supports conservation efforts already underway. As a result of conservation and water reuse efforts — despite significant growth — water demand in the Water Authority service area is lower now than it was in the late 1990s (illustrated in the graph below). This graph also illustrates the shift from groundwater to conjunctive use with surface water and reuse that has occurred over the last two decades.

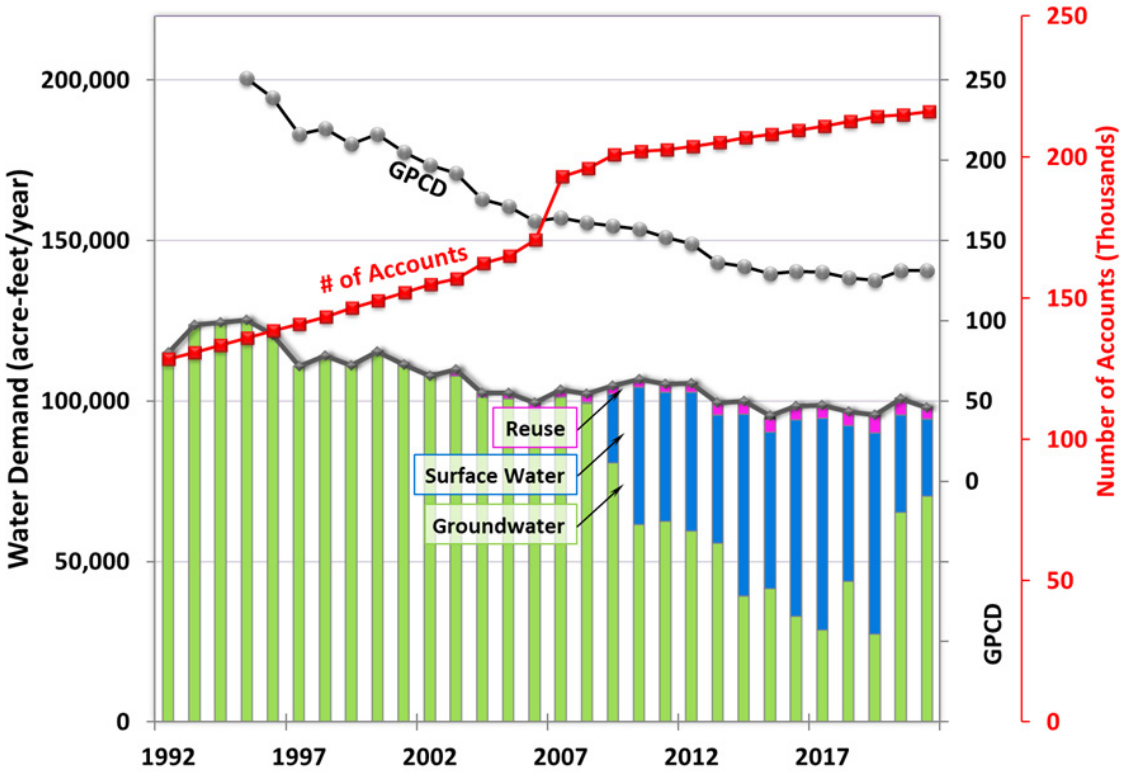

Figure 4: Albuquerque Bernalillo County Water Utility Authority GPCD

Additional Programs

Additional conservation measures taken during drought include:

- Doubled xeriscape conversion rebate
- Doubled water waste fees
- Doubled seasonal staff for water waste compliance
- 3 Steps to Landscape Success drought classes for $20 rebate for participants
- Increased public education
- Low Income Conservation Support Program
- Home Owners Association Landscape Irrigation Transformation (LIT) Program
- Outreach to Top Five Percent Users

Municipal Water

Figure 5: Conservation Ad

Protecting Trees While Conserving Water

Treebate Program

Green infrastructure — such as community trees — has been established with a long-term investment in water and this investment could be quickly lost via short-term, aggressive drought response measures. Water Authority customers have provided clear feedback that drought response measures should not result in loss of the community's trees. In response, the Water Authority created a "Treebate" Program that provides a rebate for low water use tree purchases and tree maintenance. The Water Authority also created a website (505Outside.com) to inspire beautiful xeriscapes and low water use irrigation practices, and published an *"Irrigation Efficiency Guide: Beautiful Landscapes with Less Water"* to support customer efforts to create beautiful xeric landscapes. Customers can request free consultation from the on-staff irrigation specialist, water conservation specialists, and arborist to support effective irrigation practices and tree maintenance.

Drought Impacts

Colorado River Shortages

The western United States has been experiencing a drought over the last 20 years, which has drained reservoirs despite conservation efforts. Colorado River water is delivered via the San Juan-Chama Project and New Mexico contractors receiving water from this project have not received a full allocation in seven of the last nine years. Since 2014 San Juan-Chama Project Contractors have only received, on average, 80 percent of full project allocation.

Dry Rio Grande

In the summer of 2022, the Rio Grande went dry through the Albuquerque stretch for the first time since the 1980s. Upstream water diversions also create water management challenges, impacting river operations in the middle Rio Grande during drought conditions. For example, the Water Authority was not able to operate its San Juan-Chama Drinking Water Plant from June 2022 through October 2022, because river flows were low and surface water availability was unpredictable. The Water Authority's surface water diversion permits have restrictions that do not allow surface water diversion when river flows are below a set level, preventing the Water Authority from impacting river ecosystems supporting the federally endangered Rio Grande Silvery Minnow. Low river flows meant water customers were served entirely from groundwater and reuse water during the months of highest demand.

Public Outreach

Bosque System

The Water Authority has a nationally recognized education program that focuses on: increasing understanding and participation in water conservation; water resource protection; and increasing local ecological knowledge of the "bosque system" (i.e., the riparian area surrounding the Rio Grande). The education program employs a full-time educator with five contract staff positions to: take every Albuquerque Public School 4th-grade student on a day trip to the river; a tour of the wastewater treatment plant; and provide puppet shows for kindergarten through 2nd-graders. A partnership with the local children's science museum, Explora, is resulting in construction of a Science, Technology, Engineering,

Art and Mathematics ("STEAM") center that encourages middle and high school students to pursue careers in the water industry and educates customers on water reuse, conservation, and source water protection. Additionally, the Water Authority provides adult education opportunities including a virtual Water Smart class — "3 Steps to Landscape Success" — which focuses on irrigation systems, irrigation schedules, and vegetation selection.

Success of the Water Authority's education program includes informed customers who participate in ensuring a resilient and sustainable water supply, adopting water conservation practices across generations.

Conclusion

The most effective protections for a municipal water supply — against drought, possible supply reductions, or changes in timing of surface water supplies caused by climate change — are diversification of supplies and reduction in demand. Management strategies such as aquifer storage and recovery, increased surface water storage, water importation projects, and desalination will become increasingly important for municipal water supplies. The technology exists for each. Easing the state and federal permitting burdens and fast-tracking projects would reduce time and costs to create better diversity and resiliency in municipal water supplies.

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Conjunctive Management

CONJUNCTIVE MANAGEMENT / EDWARDS AQUIFER

CONJUNCTIVE WATER MANAGEMENT PRACTICES FOR THE EDWARDS AQUIFER, TEXAS

by Olivia Coutre, Colorado College, Southwest Studies and Environmental Studies (Colorado Springs, CO)

Introduction

They say everything is bigger in Texas, and that is not far off when describing the state's water management issues. Unfortunately, pressing environmental issues — including increasing temperatures, climate variability, intensifying droughts, and a booming population — are all putting the future of Texas's water at risk.

Texas water resources have historically been managed with a laissez-faire attitude. However, given climate change and increasing population demands, it is clear there needs to be some alterations to the law, governing structures, and management techniques.

Ground/Surface Water Management

Conjunctive management is the technique of integrating the use and management of both groundwater and surface water. This approach holds a promising role in adapting to the challenges being faced.

This article analyzes the past, present, and future of conjunctive management in Texas and examines how it has been used to secure water for increasing municipal demand and to ensure adequate water for environmental support. It specifically focuses on the Edwards Aquifer, a unique karst aquifer in south central Texas that is home to several endangered species and two million residents — both of which have extensive water demands that are in jeopardy.

Conjunctive Management in the West

The timing of demand for water in the West has an inverse relationship to supply — i.e, demand is highest in the summer months while supply is highest in the winter months. Additionally, 20th century water infrastructure — such as dams and overly constructed surface water diversions — are becoming an outdated and less viable way to meet demands (Blomquist et al., 2018). Historically, surface water has been the primary source for municipal, agricultural, and industrial uses. However, temperatures are increasing and surface water is especially prone to evaporation — causing precious and expensive water to disappear into thin air.

Seasonal Flows

Since the advent of pumping technologies, groundwater has commonly become the primary or only water source for many towns and cities across the West. Groundwater is a finite resource and many streams rely at least partially on groundwater for their flow. A major issue arises when policy attempts to combat surface water depletion without recognizing or addressing its interconnectedness to groundwater. An increase in groundwater usage can deplete aquifers at a rate that can not be recharged naturally, ultimately lowering the water table or decreasing artesian pressure (Ekhardt, 2022). Consequently, when the water table drops lower than a stream's groundwater input, or there is not enough artesian pressure to allow discharge at artesian wells, instream flows can decrease or completely halt (Alley et al., 1999). This shift from perennial to ephemeral flow produces negative effects for: local water supply; local recreation; indigenous cultural practices; and ability to meet federal demands for endangered species management. Even with the best policies, it can be challenging, if not impossible, to fix depletion issues if water supply is less than water demand.

Interconnectedness

Supply and Demand

Conjunctive management (CM) is a way of managing water that recognizes the interconnectivity between the phases of water, usually ground and surface water. It also recognizes that actions affecting one phase of the water cycle will affect other phases (Templer, 1980). Many see CM as an ideal management technique since its direct purpose is to coordinate water use in order to: reduce drought exposure; maximize supply; protect water quality; protect environmental and ecological needs; and sustain aesthetic and recreational water use. CM can also: improve the security of water supply; reduce costly technological interventions; and protect aquatic life and habitat (Blomquist et al., 2018, p. 654). CM also "means optimizing the use of multiple water sources over time in response to changing conditions" (Welles, 2013, p. 502). Often the primary advantage of CM is that both environmental and human needs are being attended to simultaneously. CM has even been shown to be more cost-effective at securing water for peak or emergency demands than relying on dams and reservoirs alone (Fisher et al., 1995).

Management Technique

Conjunctive Management

Edwards Aquifer

Texas has fallen behind on implementing CM compared to other states in the West (Sugg et al., 2016). To understand the specifics of Texas water law in relation with CM, this article will closely examine the Edwards Aquifer system. This examination will demonstrate the effects of: the state's bifurcated water laws; fragmented jurisdictions; federal versus state law; and the role of the federal Endangered Species Act. It will also explore the implementation of new technological approaches to CM.

While the findings from examining Texas water management and the Edwards Aquifer are uniquely impacted by Texas state laws and aquifer geology, the concepts and adaptive measures addressed below can be viewed as universal techniques that can apply to most arid regions.

Texas Water Management

Bifurcated System

Texas operates in a bifurcated system wherein surface water and groundwater are governed separately under different legal doctrines. The reason for this bifurcation lies in the fact surface water was the initial primary water supply and was influenced by Spanish law. This lead to surface water being governed under the doctrine of prior appropriation, where water access is prioritized to the benefit of earlier water users (Mace, 2022). Eventually, cultural preference trended towards groundwater use because surface water was perceived as polluted and dirty (Eckhardt, 2021). Since Texas lacked legislation for groundwater, the Supreme Court deferred to English Common Law and thereby started governing interconnected water resources (i.e., groundwater and surface water) under two separate codes (Mace, 2022).

Surface Water Management

In Texas, surface water is state property and is highly regulated with all management and permitting done by the Texas Commission on Environmental Quality (TCEQ). Surface water is ruled by both the riparian doctrine and the prior appropriation doctrine. The riparian doctrine designates private water rights to the owners of property bordering a natural river or stream. The Texas Water Rights Adjudication Act of 1967 merged the riparian system into the prior appropriation system. This act created a unified water permitting scheme which requires all surface water users be granted a water right from the TCEQ based on a "first-in-line / first-in-right" system (Kaiser, 2002.).

Groundwater Management

Texas' groundwater, on the other hand, has traditionally been governed by the Rule of Capture. *See* Frownfelter & Trejo, *TWR* #1. Under this legal doctrine, a landowner may pump an immense amount of water, even at the cost of drying up their neighbors' wells, and still have claim to said water — which is why this doctrine is dubbed "the law of the biggest pump" (Kaiser, 2002). Historically, groundwater was completely unregulated unless: it was being used wastefully; an owner used a slant well onto another property; the drawing of water caused land subsidence; or there was malicious harm to a neighbor.

Conservation Districts

In 1949, with a better understanding of hydrology and the apparent effects of the depletion of groundwater across the state, Texas passed a law to create Groundwater Conservation Districts (GCDs) to manage groundwater locally. Since then, 98 GCDs have been created to cover nearly 70% of the state (TWBD, n.d.-a). GCDs "work to prevent waste, educate the public about groundwater and conservation, and prevent irreparable harm to the aquifer" (Kaiser, 2006, p. 7). While the Rule of Capture remains in place and is uncontested by the courts, Texas legislation such as the introduction of GCDs can override this outdated system (Potter, n.d).

Management Areas

Groundwater Management Areas (GMAs) were created in 1995 as geographic regions that unified GCDs to promote joint planning. There are 16 GMAs and every GCD is a part of at least one GMA, while there is only one GMA with no GCDs (TWDB, n.d.-d). The Texas Water Development Board (TWDB) is a state level agency that provides the necessary resources and modeling for GCDs and GMAs (TWDB, n.d.-a). GCDs must create a set of Desired Future Conditions (DFCs) which the TWDB then uses to estimate Modeled Available Groundwater (MAG) (TWDB, n.d.-b,e). The DFCs and MAGs are then used to create a groundwater management plan (TWDB, n.d.-c). All groundwater management plans are submitted to the TWDB, which approves them to be administratively complete. The TWDB is not in charge of commenting on or altering the management strategies proposed in these groundwater management plans as the GCDs can propose anything so long as their stakeholders agree and it correlates to their DFCs. This spatially uneven web of districts and areas are intended to execute all resource management while the state provides technical support and long-term planning.

State Water Plan

The other job of the TWDB is to create a State Water Plan every five years. Since the principal purpose of the TWDB is to be an unbiased and trusted source, it rarely pushes for particular management ideas or outcomes (Dupnik, 2021). To create the State Water Plan, the TWDB created 16 Regional Water Planning Areas. Each area has around 20 members in their Regional Water Planning Group with diverse backgrounds and a multitude of responsibilities. The Regional Water Planning Groups are essentially separate from the GCDs and GMAs despite also working with the TWDB (TWDB, n.d.-f). Figure 1 (below) maps the different districts and areas.

Conjunctive Management

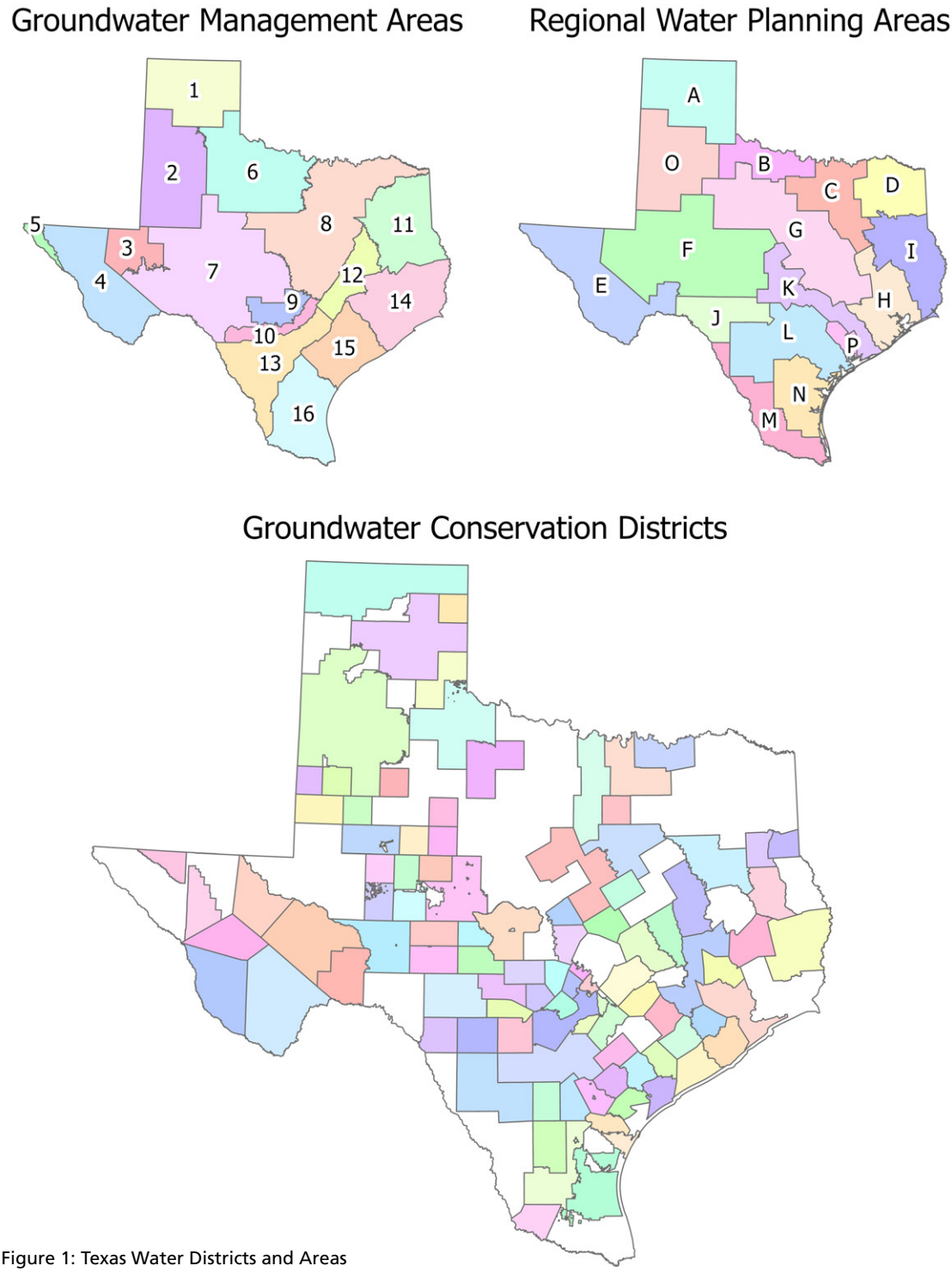

Figure 1: Texas Water Districts and Areas

Confined Aquifer

The Edwards Aquifer

The Edwards Aquifer is a highly-faulted karst aquifer made of a honeycomb-like limestone which makes it very permeable and allows for water to be transported quickly (Eckhardt, n.d.). The aquifer is a single water bearing system, so any act taken — be that pumping, spring discharge, or recharge — affects the water levels across the entire system (Kaiser, 2006). It is also, in part, a confined aquifer which allows for hydrologic pressure to feed its artesian springs, which have been an important part of the area's culture throughout history. Stretching across central Texas, the aquifer holds around 45 million acre-feet (acre-ft) of water (acre-foot = water of one foot depth covering one acre). The aquifer supplies almost two million people, including most of the City of San Antonio. The only treatment necessary for Edwards Aquifer water is some chlorine and added fluoride before distribution (Eckhardt, n.d.).

Conjunctive Management

Endangered Species

Edwards Aquifer Authority

Throughout the aquifers' caverns, springs, streambeds, pools, and rivers live seven endangered species including: blind salamanders, fish, beetles, and wild rice. These species rely on the steady flow of the aquifers' spring and streams as well as its well-regulated temperatures to survive (Eckhardt, n.d.). The federal government can intervene in any state's water management system if there is a threat to an endangered species, but to the average Texan, federal intervention is not considered an ideal outcome. In the 1990s, the Sierra Club sued regarding the presence of endangered species in these springs. They won several court cases, which prompted the state legislature to pass the Edwards Aquifer Authority Act in 1993 to limit groundwater withdrawal (Thompson, 2011, p. 19).

The creation of the Edwards Aquifer Authority (EAA or Authority) allowed state autonomy from federal intervention. The EAA regulates pumping based on permits and drought management to ensure a suitable environment for the endangered species. This permitting setup has resulted in a water marketing program within the aquifer as well as a pumping fee system that provides the Authority's revenue (Kaiser, 2006, p. 12). Since its creation, the pumping cap has fluctuated between 450,000 and 572,000 acre-ft per year, and is now fixed at the later.

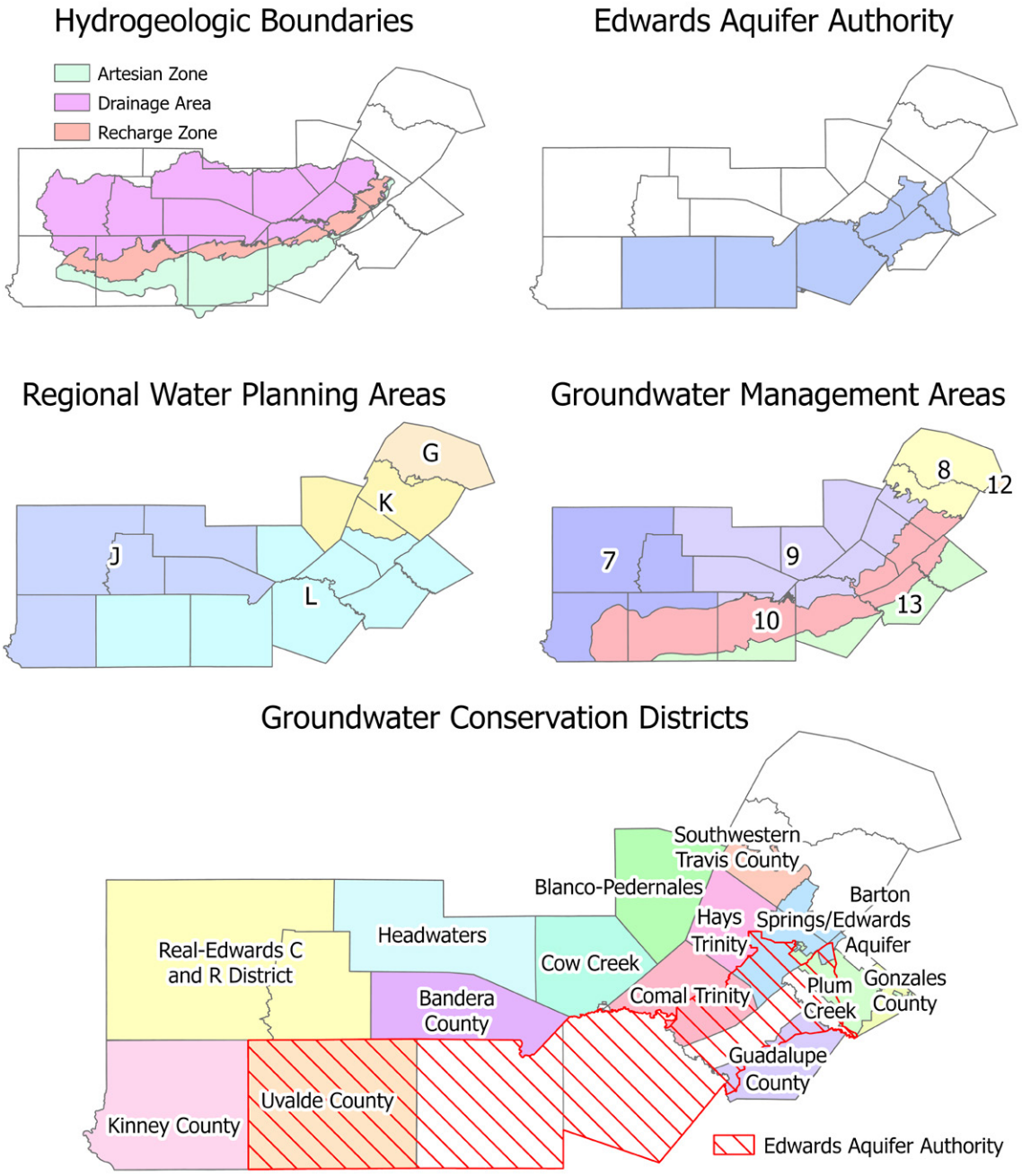

Figure 2. Boundaries, jurisdictions, areas, and districts of the Edwards Aquifer (Eckhardt, n.d.).

Conjunctive Management

Pumping Cap Strategies

The Authority enforces its pumping cap by:
- purchasing excess rights
- reducing water proportionally
- assigning junior rights to the permits over the cap
- implementing conjunctive strategies that are discussed below (Kaiser, 2006, p.13).

The EAA is the only agency of its kind in Texas and is unique with its explicit powers to ensure particular aquifer levels. The EAA is considered an active adaptive management model and many wish its framework could expand to other aquifers in the state and region. Figure 2 (left) shows the many jurisdictions, areas, and districts that make up the Edwards Aquifer.

The Edwards Aquifer is part of Regional Water Planning Areas J, L, and K, Groundwater Management Areas 7, 9, and 10. It is also a part of multiple Groundwater Conservation Districts and is covered by jurisdiction from both the Edwards Aquifer Authority and the TCEQ.

Current Conjunctive Management in the Edwards Aquifer

Conjunctive Management (CM) in the Edwards Aquifer provides for growing municipal demands and directly helps instream flows, which benefit groundwater dependent ecosystems by keeping water levels from falling below a damaging threshold (Thompson, 2011). The EAA participates in CM through its large Aquifer Storage and Recovery (ASR) facility — a complex system of recharge dams — using transportation rules such as bed and banks permits, and engaging in conservation efforts throughout the aquifer (discussed below). *See* Friberg, *TWR* #226.

Management Impacts

The TWBD outlined water supply strategies in their 2022 State Water Plan. CM accounts for 0.3% (5,061 acre-ft per year) of the supply, and 1.1% (18,868 acre-ft per year) is from ASRs. While these direct CM strategies do not equate to the 50.9% that water conservation and demand reduction provide, they will play an important role in supplying water for areas that cannot lower their use or reuse their water (TWBD, 2021). Implementing CM requires a multitude of factors, including: adequate infrastructure; geological conditions; hydrological conditions; institutions; laws; funding; and more (Sugg et al., 2016). Additionally, CM helps to address the expense of a high peak water demand as it can provide backup sources and emergency reserves.

Aquifer Storage and Recovery

Subsystems

ASR has been defined as "the storage of water in a suitable aquifer through a well during times when water is available, and recovery of the water from the same well during times when it is needed" (Sheng, 2005, p. 369). That definition remains accurate, but modern ASR can also include recharge through spreading basins, infiltration galleries, and recharge wells, as well as withdrawal from neighboring production wells or increasing the base flow in streams as needed (Sheng, 2005, p. 369). There are four main subsystems within ASR: 1) the source water to be stored; 2) a storage space-aquifer; 3) recharge facilities accompanied by necessary delivery pipelines and/or channels; and 4) recovery facilities with an adequate distribution network (Sheng, 2005, p. 375). It is required that the water pumped into an aquifer is chemically compatible with the water already in the aquifer; to abide by Texas law, this water must be up to drinking water standards (Texas Living Waters Project, 2017). Additionally, to ensure the people who are using and paying for the process are the ones benefiting from it, it is ideal if the hydrology of the aquifer prevents injected water from traveling or connecting to other aquifers (Eckhardt, 2022). ASR is an extremely flexible technological approach to CM as it can turn the variability of precipitation and surface water into a reliable source by using groundwater aquifers for storage (Thompson, 2011, p. 28).

ASR Advantages

ASR has a number of advantages over surface water reservoirs, including:
- ASR has a drastically smaller footprint than reservoirs
- ASR does not face long-term issues of sediment accumulation that limits storage capacity
- ASR does not lose water to evaporation
- ASR is much harder to contaminate
- ASR rarely poses any environmental concerns.

ASR is often less costly than building dams and reservoirs, especially since reservoirs require an extensive amount of land that becomes unusable for other uses after construction (Thompson, 2011). In comparison, the ASR facility in San Antonio operates on land that is leased out to cattle farmers (Eckhardt, 2021).

H2Oaks Facility

One of three ASR projects in Texas is within the Edwards Aquifer in San Antonio and is called H2Oaks (formerly Twin Oaks). It is managed by San Antonio Water Services (SAWS) and is currently storing around 175,000 acre-ft out of its approximate storage capacity of 200,000 acre-ft (Eckhardt, n.d.). The H2Oaks facility takes excess water from the Edwards Aquifer and stores it in the Carrizo-Wilcox Aquifer. The use of a second aquifer for storage is needed because the conduit system in the Edwards Aquifer promotes

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Habitat Conservation Plan

Mimicking Nature

Recharge Concerns

Instream Flow Permits

Critical Period Management

VISPO Program

fast moving water so injected water would migrate and no longer be retrievable from the aquifer. The EAA granted SAWS a permit for about 284,000 acre-ft per year, which is around half of all water the EAA permits (SAWS, n.d). In the years SAWS does not use and distribute all its permitted water for their municipality customers, they can store the excess in the Carrizo-Wilcox Aquifer for later use. During times of drought, they can use the same wells they used for injection to recover their stored water and supply it to their customers or use it to maintain springflow. The EAA also pays SAWS to store water through the H2Oaks facility for its federal Endangered Species Act-associated Habitat Conservation Plan (SAWS, n.d.). This water can then be used during droughts to maintain spring flows in areas such as New Braunfels and San Marcos for endangered species. At the end of 2020, around 122,904 acre-ft or 69% of all the water in storage at the H2Oaks facility was dedicated solely to the Habitat Conservation Plan for spring flows, thus freeing up Edwards Aquifer water for other uses (Mace, 2021).

Recharge of the Aquifer

Another CM strategy is to mimic or support natural aquifer recharge by either constructing artificial recharge zones and dams or by enhancing and/or protecting naturally occurring recharge. Dams usually slow down the water by holding it back above a naturally occurring recharge zone, so the water has more time to percolate into the ground (Eckhardt, n.d). There are also initiatives that divert water into large sinkholes and pit caves which quickly transport water into the aquifer (Doty, 2021). Texas is prone to inconsistent precipitation patterns and when there is an excess of precipitation or a flood event, not all of that water recharges naturally back into the underlying aquifer. The EAA is tasked with recharge efforts in the aquifer. Current EAA dams recharge around 3,300 acre-ft per year during average weather conditions and an estimated 200 acre-ft per year during drought conditions (Hamilton & Boenig, 2017, p.6). This is the only way the EAA is involved in the management of surface water and the agency is facing legal issues since these recharge enhancement structures are technically surface water withdrawals that do not have official permits from the TCEQ (Doty, 2021).

The major concern of artificial recharge is that it keeps water from flowing downstream and prevents runoff from collecting elsewhere. This threatens the supply of downstream surface water users, could limit environmental and instream flows, and could even decrease the recharge of other aquifers such as the Carrizo-Wilcox (Eckhardt, n.d.).

Bed and Banks Permitting

A new management strategy uses "bed and banks" permits issued by the TCEQ as a way to supplement instream flows. These permits allow users to transport groundwater through a river or stream and remain privately owned despite the bed and banks of the river being state-owned (Eckhardt, 2021). The state is unlikely to issue a bed and banks permit unless: the owner has control over the water; knows how much water is being released into the watercourse; withdraws approximately the same amount of water; or knows how much water was lost in transit so they only withdraw the remaining amount (Shelley, 2010, p. 5). These permits are usually requested when water users want to move their water downstream to another area via a surface watercourse, as the permit prevents their water from becoming state owned when it transfers from being groundwater to surface water.

In 2013, SAWS applied for a bed and banks permit to transport a dedicated 50,000 acre-ft per year to flow down the San Antonio River for instream flow purposes. While it is still awaiting approval, the idea is for the water to be transported nearly all the way down the river, thus making it the first time bed and bank permits would be used to augment water for instream flows (Eckhardt, 2021).

Conservation

Conservation is a way of implementing CM since it keeps demand lower, thereby taking the pressure off groundwater and surface water supplies. The EAA's Critical Period Management and the Voluntary Irrigation Suspension Program Option (VISPO) are two ways water use is lowered during droughts. *See* Friberg, *TWR* #226.

The EAA implements water pumping caps by using the Critical Period Management system, which has five stages of drought, each correlating to a percentage of water withdrawal reduction. These withdrawal limitations apply to all users who pump over three acre-ft per year, including municipalities which then distribute water to their customers. Since the EAA only enforces the direct withdrawal limitations, the agency is not in charge of activity regulation, such as lawn watering, which becomes the duty of the municipalities or users (EAA, 2021-a).

The VISPO program — an initiative of the Habitat Conservation Plan — "is an irrigation suspension program and compensates enrolled irrigation permit holders for being enrolled in the program but it

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also pays an additional suspension rate in years where irrigation suspension is required" (EAA, 2021-b). The suspension is determined based on the levels of an index well in Bexar County and is administered yearly. If the levels do not trigger a suspension program, the permit holder is in control of all their water, allowing those who lease their permits to the program to continue the full use of their water for irrigation. The enrollment goal is 41,795 acre-ft of irrigation water, and users are compensated between $54-$214 per acre-ft per year depending on if the suspension is triggered (EAA, 2021-b).

Outcomes of Conjunctive Management in the Edwards Aquifer

Modeling

While it is hard to track which water successes have occured because of CM, simple modeling can predict what water levels will be like with and without CM projects. Modeling examples such as Figure 3 (below) show how each of the CM and conservation initiatives currently implemented in the Edwards Aquifer would have affected the water supply of the past. The dotted line is 45 cubic feet per second (cfs), which is the minimum spring flow needed for Comal Springs. The graph suggests that with the use of VISPO, conservation, SAWS ASR, and a Stage V drought response from the Critical Period Management system, the spring flow at Comal Springs would have been maintained even during the drought of record in the 1950's (Votteler, 2021). While there are many altered factors today, such as population and per capita use, this chart indicates how these tools are stunningly helpful during times of drought.

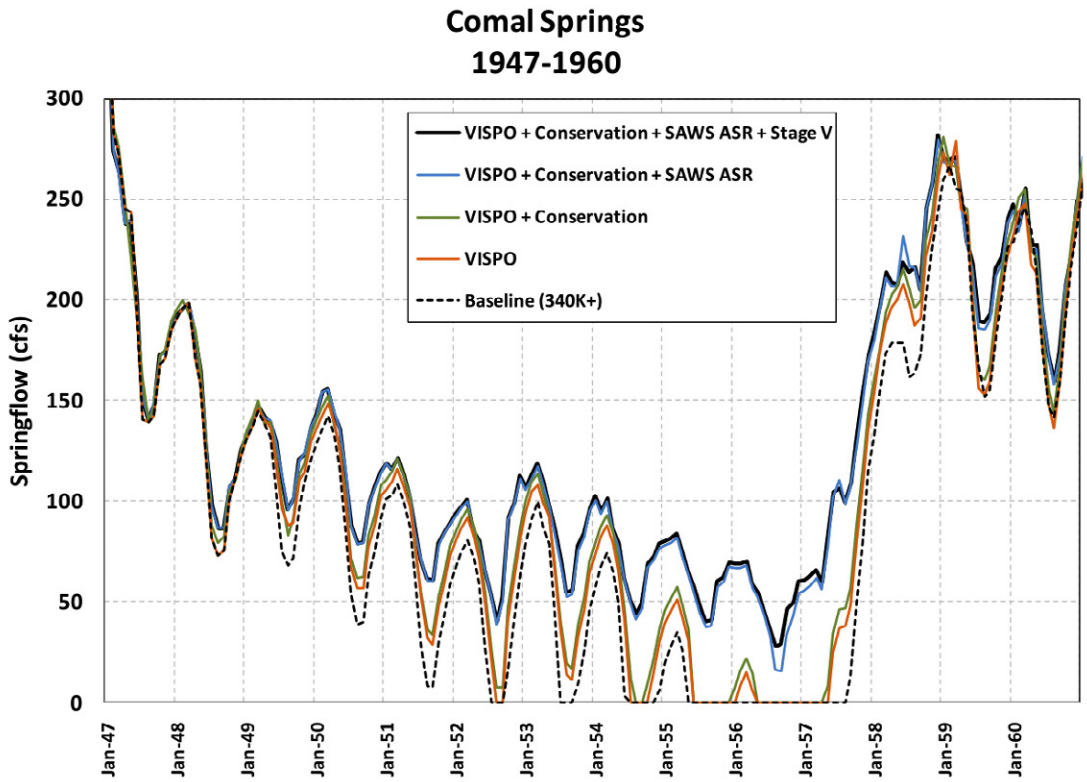

Figure 3. Effects of Conjunctive use Modeled on Past Conditions (Votteler, 2021)

Cultural Acceptance

The actions and perceptions of stakeholders — including: water municipalities; protection agencies; permit holders; crop irrigators; and others — can reflect how well CM is doing from a cultural sense. Every single interviewee I spoke to for this project agreed that CM was in fact a positive strategy that would help maintain the state's water supply. Having a management strategy that is widely agreed upon is rare, especially for such a large state with a variety of interests. Many resource managers agree that a large portion of adapting any sort of management regime relies on public support — which CM has fortunately garnered.

Limiting Factors to Conjunctive Management

Texas could achieve much more by more actively pursuing strategies such as conjunctive use, ASR, bed and banks initiatives, and conservation — but why aren't they? Limiting factors to CM range from financial to social, and while it is improbable Texas will take part in widespread water management reform, identifying these limitations can move the state farther on its way to implementing more progressive management strategies.

Conjunctive Management

Legal Constraints

Water Law

Most Texas water experts would agree that the bifurcated system of managing surface water and groundwater is the greatest limitation to implementing CM. A more pragmatic way of managing water would allow water to move above and below the ground without changing the law it is subject to, its legal jurisdictions, and its permitting regimes. That said, unifying the two systems to be under the jurisdiction of a single authority is not currently feasible. In Texas, it would involve taking away a landowner's constitutionally-protected ownership of groundwater which would require compensation, and therefore cost a lot of money. It has been estimated that at a price around $2,500 per acre-foot (an amount established in *EAA v. Day*), it would cost around $25 billion to settle the state's allocated and permitted groundwater, a cost Texas would not remotely consider (Shelley, 2010, p. 12).

Besides the system being bifurcated, CM faces issues with common law and the side effects of the Rule of Capture and the Prior Appropriation Doctrine. These practices are not well suited for CM as "common law also fails to provide adequate guidance for merging the divergent legal regimes governing groundwater and surface water, leading to uncertainty that undermines conjunctive management efforts" (Welles, 2013, p. 505). Additionally, the system under the Rule of Capture — where users can legally pump any amount of water so long as it is for "beneficial use" — does not promote a conservation-focused culture. Even though the EAA and GCDs can override the Rule of Capture, the written law makes litigating pumping issues in court much harder. Prior appropriation also means surface water rights often come out ahead of groundwater rights — due to their senior priority status based on first historical use. Under prior appropriation, the users who are claiming the most water are not necessarily the ones who are using it for the highest value, economic or otherwise (Thompson, 2011, p. 26).

Pros and Cons

Decentralization

The second most noted limiting factor is the state's decentralized management system. The TWDB does not adopt or promote particular management regimes, but rather fulfills administrative duties and provides scientific modeling and financial resources. This leaves most of the planning and management to the state's decentralized GCDs and RWPGs. Most experts note there are pros and cons to decentralization, with the efficacy of the model dependent upon funding, staffing, scientific knowledge, and a good balance between stakeholder input and expert knowledge (Sugg, 2021).

Benefits of a decentralized management model include the ability for the rules and regulations to reflect that specific area's hydrology, geology, institutions, and stakeholders' interests. Decentralized governance also allows for a variety of contributing perspectives, which may create a more holistic look at an issue and thereby satisfy the needs of more users and industries. Additionally, decentralization aligns well with the cultural and political values common in Texas as it allows users to go downtown, walk into an office, and talk to someone about their issue or suggestion instead of having to deal with the state or a distant agency (Sugg, 2021).

Consistency and Efficiency

Downsides to a decentralized model include GCDs not always being equipped with ample resources or water specialists. Decentralized management also lacks consistency and efficiency since various individual districts can have contradicting goals and management plans. Groundwater Management Areas (GMAs) were intended to coordinate GCDs' Desired Future Conditions (DFCs) and groundwater plans, but that is not always the reality. DFCs involve a relatively new objective and GCDs have very few restrictions as to what their DFCs must entail. Decentralization can also cause many gaps in who handles what.

Centralization can provide what decentralization cannot — such as creating unified systems, developing an all-inclusive view, promoting efficiency, and being able to address externalities — but does not have the same customization, ability to include stakeholder input, and creative freedom that decentralization provides.

Spatial Boundaries

Fragmentation

Jurisdictional fragmentation is an inevitable part of creating multi-level resource management governance, especially when there are a variety of districts, authorities, and boundaries at play. Jurisdictional fragmentation can be defined as when "responsibility is divided or allocated among multiple actors and/or agencies; fragmentation may manifest as duplication, overlap, or gaps in authority" (Bakker et al., 2011, p. 193). This concept is best highlighted in Texas's bifurcated system, but it can also relate to the way GCDs and GMAs overlap authority and are not connected to the regional planning groups.

In addition, the management of natural resources usually faces spatial fragmentation in which hydrological and geological boundaries seldom correlate to jurisdictional boundaries. For example, with the Edwards Aquifer, it would be more effective to have a regional planning group or even a GMA that encompasses the entire aquifer along its hydrological boundaries to ensure consistent, comprehensive

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management. Luckily, there is the EAA to do this job for a sizable part of the aquifer, but that is not the case for the other aquifers in the state. Centralization is a way of minimizing jurisdictional fragmentation since it includes all areas of the state. It can also prevent spatial fragmentation, since it often creates boundaries that correlate to natural features.

Legal and Judicial Obstacles

The way in which water cases are brought through the Texas judicial system has hindered many progressive strategies, including CM. In the current framework, one of the few pathways to change any part of the water code is to take a case to the Texas Supreme Court.

EAA v. Day

The famous *EAA v. Day* case was one such example as its decision: further defined specifics of groundwater rights; reinforced the state's code stating that groundwater and surface water are interconnected; and started the trend of ruling on groundwater similarly to oil and gas. *See* McCarthy, *TWR* #99. In 1994, two farmers, R. Burrell Day and Joel McDaniel, bought a farm with an Edwards Aquifer artesian well that free-flowed into a small lake on their property. They used this lake for recreation and to irrigate their crops. After it was created, the EAA required all non-exempt water users in the region to request a groundwater pumping permit before the end of 1996. Day and McDaniel sought a 700 acre-ft per year permit to irrigate their 300 acres as well as 100 acre-ft of water per year for the recreational use of their pond. The EAA initially granted a 600 acre-ft permit for irrigation (their enabling Act required the EAA to grant permits of 2 acre-ft per year per acre for historically irrigated land). Then, at the invitation of Day and McDaniel, the EAA visited the farm regarding the other 100 acre-ft per year the farmers sought for recreational use.

Change in Property

Once on-site, EAA staff realized that the water from the well was actually being discharged into a small channel and then into the farmers' pond, which was part of a state watercourse (Mace, 2016). This slight difference meant that the produced groundwater had become state property, ultimately leading the EAA to leave Day and McDaniel with a permit for only 14 acre-ft per year to attend to the 7 acres of crops that were being directly irrigated from the well. In response, Day and McDaniel sued the agency claiming they had taken their property (via state curtailment) without compensation, which violated the Texas Constitution (*EAA v. Day*, 2008). After a number of appeals, the case made it to the Texas Supreme Court (Court) in 2012. The court agreed with the 14 acre-ft per year allowance, suggested by the EAA, as the agency was within their governing statute to decide on this permit and had appropriately distinguished when water is considered state property *(EAA v. Day*, 2012).

However, for the first time, the Court found that landowners have a property right in groundwater, and therefore could also experience a taking of their groundwater. That said, the courts made it clear that this situation was local in scope and that future cases would need their own litigation for individual outcomes (*EAA v. Day*, 2012). Additionally, the Court confirmed that the water in the lake was surface water and was owned by the state. Because the Court strictly followed the state's water code, their decision ironically did not legally recognize groundwater and surface water as interconnected. Some believe this was a missed opportunity to change how the code is interpreted for future cases and to apply the most current scientific hydrologic understanding in policy (Welles, 2013).

Lastly, the case started the trend of ruling on groundwater pumping in the same manner as ruling on oil and gas, with the law of ownership in place and fair share (Mace, 2022). Some groundwater experts suggest that is an inappropriate way of regulating a completely different natural resource, (Votteler, 2021) while others suggest its potential viability as ownership in place is similar to the Rule of Capture, while fair share could be an improvement to groundwater regulation (Mace, 2022).

Case-by-Case Basis

While experts disagree as to what this case means for the future of Texas water law, it is important to note that *EAA v. Day* did not set a significant precedent for CM as it determined these types of disputes are inherently single-case instances, highly contextual, and must be litigated on a case-by-case basis. Additionally, because it is the role of the courts to abide by the state's water code — which explicitly disconnects groundwater and surface water — it will be up to water authorities and the state legislature to work with the courts in the future to establish policy that formally recognizes a new role for CM.

Unfortunately, current legal limitations restrict CM and the judicial system simply moves too slowly in altering outdated water codes that the legislature controls. Getting more cases to the Texas Supreme Court could allow for clarification and alteration of ineffective parts of Texas's current water code (Doty, 2013), yet it may not alter what is fundamentally needed in the state's water code — legislation for CM.

Natural Limitations

Natural limitations to CM exist and it is important to understand these obstacles to avoid wasted water, expensive fixes, or even full-blown safety crises. Geographic, geologic, and hydrologic limitations can

Conjunctive Management

Geology

Politics

Funding

Incentives

sometimes be solved with technology, but it may be a matter of balancing the benefits with the cost of new infrastructure and systems. For example, the Edwards Aquifer is considered a very poor aquifer to use for ASR since it cannot hold water in the same place for long periods of time. A few of the proposed ASR projects in the Edwards Aquifer looked at injecting into the more stationary saline zone of the aquifer which would create a freshwater bubble, but there is risk of contamination and it is possible the freshwater would be transported elsewhere (Mace, 2021). Additionally, it is critical that water chemistry is carefully considered when using ASR, especially if there is an inter-basin transfer involved.

Cultural Hurdles

The other limitations to CM in Texas include cultural ideals and partisan views, as well as poor funding and understaffing. While the role of partisan issues is a subjective topic, many experts note that water issues are not inherently partisan, but the structure of resource management politics can often be polarizing since ideals in regulation and government involvement vary. Some say partisan views are less of an issue amongst water experts since all management issues are seen as scientific and procedural, not political. That said, policy heavily depends on elected officials, many of whom were elected for their political agendas which have nothing to do with resource management (Norman, 2021). This allows people who are not well versed in the complexity of water management, resource planning, or hydrology to be in charge of the funding and management schemes for the entire state.

These political and legislative motives are often what determine the funding for state water management, which correlates to employment and resources. For example, more money would allow the TWDB to increase their grants, loans, and funding initiatives to allow GCDs to develop into the stronger decentralized systems that were originally envisioned. Additional funding would also allow the most accurate modeling by improving data collection, data quality, improved analysis, and staffing.

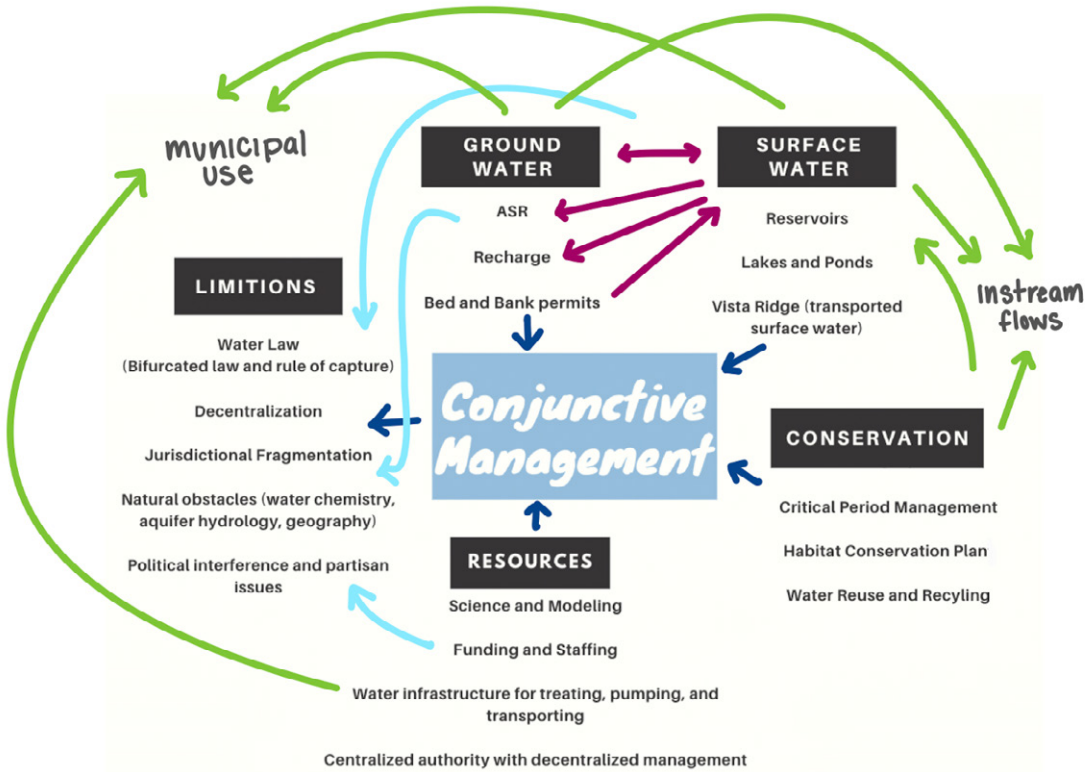

Figure 4: Conjunctive Management in the Edwards Aquifer Flow Chart. Figure by Coutre (author)

Into the Future

Looking forward, many agree that the first step to implementing more CM in Texas is to incentivize it. This could mean changing restrictive laws that limit ASR or conjunctive use or could include tax subsidies, payback systems, or other encouragement for municipalities and users to adopt CM techniques. Other smaller tweaks to the system include *requiring* state water planning and regional water planning to consider conjunctive strategies. Changing the word of the law to require CM, instead of just suggesting it, could lead to more innovation and could also prevent many messy legal disputes such as the *EAA v. Day* case (Shelley, 2010).

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The TWDB lists 77 proposed ASR initiatives totaling over $3.7 billion in their 2022 State Water Plan. Another 115 projects costing over $8.7 billion are proposed for implementing conjunctive use (TWDB, 2021). If the funding, science, and policy allows, these ASR and conjunctive use projects will continue to progress, making CM more of a norm across the state.

Unifying Law Systems

To make restructuring more productive, it would be beneficial if groundwater permits were subject to a single authority, like the TCEQ, since it could ensure surface water rights do not compete with any groundwater permits and vice versa (Shelley, 2010). If the state unified their water law systems like other Western states, Texas could move away from the bifurcated system and decrease jurisdictional and spatial fragmentation (Shelley, 2010). Additionally, the Rule of Capture would ideally be eliminated since it is an out-of-date system given the knowledge that aquifers are finite and water is a limited resource. By altering the bifurcated system and the Rule of Capture, Texas would be able to effectively implement CM without fighting so many legal, technical, and financial battles.

Market Approach

Thompson suggests a few ways of restructuring the management system to promote CM, including a flexible water "market" approach and integrated regional water management. Market systems would allow economic efficiency even when demands, sources, and conditions change over time (Thompson, 2011). Thompson argues that, in theory, markets could be successful — even if surface and groundwater rights were not integrated — so long as water rights are well defined, rights can be retired, and groundwater overdrafting is prohibited (Thompson, 2011p.32). An integrated regional water management system would look similar to the intended set up of GMAs and RWPGs overseen by TWDB resources. In reality, the approach Texas has taken is not there yet and would need to improve its coordination and adaptability (Thompson, 2011).

Climate Change

All of this considered, the largest issue Texas water will ever face is the "impending doom" of climate change. Droughts will become longer, precipitation events will become more drastic, temperatures will rise, and the need for water will only increase. While the outlook does not seem ideal, these stressors will in fact spark innovation and alternate solutions to the water quantity and quality crisis.

Conclusion

Conjunctive practices connect science with environmental management, a phenomenon we often take for granted. When water is managed conjunctively, it can be used based on demand, spatial extent of the system, value to users , and economics (Doty, 2021). Striving towards CM as an integrative approach is necessary to fulfill the needs of people across the West.

The implementation of CM in Texas can be seen in two ways. As a cautionary tale, the lack of CM can show the effects of a limiting and outdated legal and political approach to water management. It can also be seen as the success story of a state who jumped through its own hoops to implement what they knew was best for their people. Either way you look at it, there is plenty to learn from the Lonestar State. It is hopefully just a matter of time before proposed projects can take root and major restructuring in the foundation of the state's water law are made. As states across the West utilize CM, it is important for them to understand and learn from the approaches and practices of other states to streamline their own adaptive and integrative management processes.

EAA Example

However, it may take prolonged droughts and unprecedented conditions to spark needed changes to any contradictory laws, policies, politics, public beliefs, management structures, and technological limitations. The Edwards Aquifer is living proof that CM strategies can provide water where it is truly needed. The conditions and systems in the future will not behave like they have in the past and an ever-growing population will be an additional challenge. Even in a state where it is difficult to do so, practicing conjunctive management can: instill an adaptive plan for the future; ease the transition from old to new water infrastructure; and ensure robust water longevity.

For Additional Information:

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Olivia Coutre is senior at Colorado College with a double major in Environmental Studies and Southwest Studies. This article is a version of her senior thesis and is based on research she conducted when living in Austin.

WOTUS Update

EPA ISSUES NEW WOTUS RULE

SCOTUS CASE STILL PENDING

by Olivier Jamin, Associate, Davis Wright Tremain LLP (Portland, OR)

Editors' Note: The following article updates an article by Olivier Jamin and Rick Glick in October of 2022. That article provided an overview of the history of "**w**aters **o**f **t**he **U**nited **S**tates" (WOTUS). The article concluded by examining the most recent Clean Water Act case in front of the Supreme Court, *Sackett v. EPA* (*Sackett*) — a case likely to narrow the scope of WOTUS — while predicting that the Biden Administration would try to issue its own new WOTUS rule ahead of that decision to limit its impact, or even make the case moot. *See* Jamin & Glick, *TWR #224.*

Sackett v. EPA

Introduction

"**W**aters **o**f **t**he **U**nited **S**tates" (WOTUS) is a key term of the 1972 federal Clean Water Act. Determining the extent of WOTUS jurisdiction has fueled much contention for courts, agencies, and environmental law practitioners over the last 50 years.

On the eve of 2023, the US Environmental Protection Agency (EPA) announced a final rule modifying the definition of WOTUS. In the published final rule, EPA appears to appeal to some skeptical Supreme Court Justices as they deliberate on the outcome of *Sackett*, a case that could quickly impact the new rule. This article analyzes how the new rule differs — or not — from previous attempts to redefine WOTUS by the Obama and Trump administrations, and discusses the potential impacts of *Sackett*.

Definition of WOTUS

While central to the enforcement of the Clean Water Act, the definition of "waters of the United States" has always suffered from a lack of clarity. The constant back-and-forth between administrations and confusing jurisprudence illustrate the need for a legislative fix, but the current political landscape makes such a fix highly unlikely. The current WOTUS confusion stems from the last major Supreme Court decision on WOTUS, *Rapanos v. United States*, 547 U.S. 715 (2006) (*Rapanos*). Since *Rapanos*, courts, agencies, and landowners have struggled to decide which test to apply to jurisdictional determinations. [For additional details concerning the *Rapanos* decision, *see* Bricker, *TWR* #29, Walston, *TWR* #30 and Glick & Gilardi, *TWR* #87.] Test options include Justice Kennedy's significant nexus test and Justice Scalia's surface connection test. More recently, the Obama administration tried to codify Justice Kennedy's approach, which was challenged in court and rescinded by the Trump administration. *See* Sensiba & Gerard, *TWR* #179. The Trump administration then issued its "permanent surface connection" rule following Justice Scalia's test, which was also challenged in court and rescinded by the Biden Administration. *See* Water Briefs, *TWR* #211. In the midst of all of this, the Supreme Court agreed to review *Sackett v. EPA* in a matter questioning whether certain wetlands qualify as "waters of the United States."

Significant Nexus Test

Surface Connection Test

New Rule Language

The new rule language returns to some pre-2015 concepts for jurisdictional wetlands: wetlands may be considered adjacent to jurisdictional waters — like navigable waters or other traditionally jurisdictional waters — and thus jurisdictional themselves if they are connected to those jurisdictional waters with "relatively permanent" surface water connections or if they have a "significant" hydrologic or ecological "nexus" to those waters. The heart of the new rule is its return to the "significant nexus" standard, defined as "waters that, either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters, the territorial seas, or interstate waters."

Jurisdictional Waters

The new rule is undoubtedly broader than the Trump-era rule, but does not necessarily bring the clarity for which some had hoped. Many had hoped, and had been pushing, for EPA to adopt a bright line approach to adjacency based on distance to traditionally jurisdictional waters or other firm criteria. Instead, courts, agencies, and perhaps most importantly landowners will likely have to return to a case-by-case analysis to determine whether certain wetlands and other adjacent waters are covered under the Clean Water Act. Perhaps this approach is inevitable, as wetlands' impacts on other WOTUS can vary by region, topography, and climate.

Bright Line v. Case-by-Case

The new rule does try to bring additional guidance to wetland jurisdictional determinations. For example, the new rule defines "significantly affect" — for purposes of the significant nexus analysis — to mean "a material influence on the chemical, physical, or biological integrity" of a traditional navigable water, territorial sea, or interstate water body.

Several factors can be considered when determining whether a "material influence" exists, including:

- the distance from a traditional navigable water, territorial sea, or interstate water body
- hydrologic factors such as the frequency, duration, magnitude, timing, and rate of hydrologic connections

Material Influence

- the size, density, or number of waters that are similarly situated
- landscape position and geomorphology
- climate variables such as temperature, rainfall, and snowpack

While the added guidance is helpful, it will take time, and likely litigation, to clarify what "material influence" really means.

Omission From the New Rule

Recycling and Reuse

Stormwater

One particular and noteworthy omission from the new rule is the absence of water recycling and reuse facilities and stormwater control features from the rule's exclusion. The new rule recognizes long-standing exclusions for waste treatment systems designed to meet the requirements of the Clean Water Act, prior converted cropland designated by the Secretary of Agriculture, and a handful of others. The Trump rule had incorporated an exclusion for water recycling and reuse facilities and certain basin infrastructure, as well as stormwater control features constructed to convey, treat, or store stormwater. Those exclusions did not make it to the new rule. The lack of exclusion for recycling and reuse facilities is particularly impactful for western states that have been moving fast on recycling and reuse programs as a result of extended drought conditions. Similarly, the absence of the stormwater control feature exclusion could be particularly impactful with the increased frequency of extreme flooding events that generate additional stormwater.

Legal Challenges - Conflicting Ruling?

Moot Case

"Chevron" deference

If history is any indicator of what is to come, the new rule is virtually certain to draw legal challenges from critics and industry groups. But the new rule could be substantially weakened before it even gets its own day in court depending on the outcome of *Sackett v. EPA*. The "significant nexus" test is central to the *Sackett* case, making the new rule vulnerable to an adverse Supreme Court decision. Many critics and Republicans in Congress have argued that EPA should have waited for the *Sackett* decision to be released to avoid a conflicting ruling. At this stage, the Supreme Court has a number of options in terms of their ruling that could produce significantly different outcomes for the new rule.

The Justices could decide that the new rule makes the case moot and issue no decision, or they could issue a very narrow ruling focused on the facts of the *Sackett* case: whether a wetland physically separated from a jurisdictional water by a berm is itself jurisdictional. These two options would have a similar outcome in that the US Army Corps of Engineers would continue to decide jurisdiction on a highly factual case-by-case analysis. Finally, conservative justices could firmly adopt Justice Scalia's test from *Rapanos* and hold that only wetlands with relatively permanent surface connections to downstream waters are jurisdictional and subject to the Clean Water Act — which would likely send EPA back to the drawing board. Also looming in the background is the recent decision from the Ohio Supreme Court to end the use of the "*Chevron*" deference, which gives credence to agency interpretations of ambiguous statutes. If the Supreme Court follows suit and eliminates the *Chevron*" deference, EPA may find it much tougher to defend its rule.

Conclusion

New Rule

The new rule was published in the Federal Register on January 18, 2023 and will become final 60 days later on March 20, 2023. The Supreme Court could issue a ruling before that, adding to the WOTUS drama. Even if the Supreme Court leaves the new rule mostly untouched, it will have to fend off the judicial challenges that are sure to come.

In the meantime, the most likely outcome is that landowners will continue to struggle with jurisdictional determinations, and Congress will undoubtedly avoid resolving the issue with a legislative fix — though I would be happy for Congress to prove me wrong!

For Additional Information:

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Olivier Jamin is an associate at Davis Wright Tremaine in Portland, Oregon where he practices environmental, land use, and energy law, with a focus on water quantity and quality issues. He is the co-chair of the Oregon Water Law Conference and sits on the Board of the National Water Law Forum.

WATER BRIEFS

NOOKSACK FILING WA
ADJUDICATION PLANS

Plans are underway at the Washington Department of Ecology (Ecology) for a water rights adjudication in WRIA 1 (Nooksack) with an anticipated filing date in late summer 2023. The exact date will be determined when Ecology has more information about funding and court readiness.

Ecology noted that its ability to develop solutions is limited by law — prior appropriation, permit requirements, and instream flow rules. The challenge of water use and instream needs cannot be resolved without consideration of the significant water claims by tribes and federal parties. Ecology passed through $250,000 in funding to Whatcom County for a "Solutions Table" process between 2021 and 2023. Ecology also coordinated a "Solutions Showcase" for stakeholders in the Nooksack Basin to highlight some of the solutions that have worked elsewhere in the state — work toward negotiated solutions is a parallel process that is best undertaken as a part of adjudication.

The adjudication will include all water use within the Nooksack Watershed. If water is used only as a customer of a city or group water system, you do not need to participate in the adjudication. Every other water user will be notified of the adjudication and provided with a claim form that can be completed online or on paper. All users must file a claim for the water use and explain the legal basis for its use.

Ecology is proposing a simplified process for small permit-exempt well use to apply to homes currently using 500 gallons per day or less. These users would claim the date of first use and certify that the use has been continuous at a quantity of 500 gpd or less. Ecology may investigate the accuracy of the claim, then ask the court to provide an adjudication certificate for up to 500 gallons per day per home. This will provide an accurate, enforceable inventory of existing homes.

Permit-exempt well users who take more than 500 gallons per day would need to submit a claim showing the history, purpose, and place of use of their water. They will be entitled to an adjudication certificate in the amount of legal water use up to 5,000 gallons per day (or more for qualifying stockwater use).

Some water users in the Nooksack Basin have water right applications that have been pending with Ecology for decades. In the adjudication, every water user will need to file a claim for the water they use and explain the legal basis for its use. Ecology has worked with permit applicants for many years to determine if water is legally available for pending applications and continues to work to approve applications where water is legally available.

Flood control and transboundary water management with British Columbia are complex legal and hydrologic issues. The water rights adjudication addresses the limited question of who has the right to use water in WRIA 1, and how much water is legally required to stay in-stream in the rivers and creeks. Adjudication will ensure that the State of Washington is responsibly managing its own use of water and protecting legally required streamflows when working on legal and infrastructure solutions with international and federal parties.

By contrast, flood management in the transboundary area focuses on building resiliency in the floodplain while protecting lives and critical infrastructure. Ecology is working with both local and international partners on plans that include measures such as acquisition of vulnerable properties, elevating buildings, and setting back levees.

Farms are a valued part of Whatcom County's history and Washington state's economy. Local farming groups have often been leaders in water conservation and protection. Ecology noted that it protects all water rights — including agricultural — the same way: in order of seniority. This has been the law in Washington for over 100 years, and the adjudication will not change that.

The adjudication will provide adjudicated water right certificates for all legal water right holders, including those with water rights for irrigation, commercial and industrial uses, and stock water purposes. Those without legal rights will need to buy or lease legal water. Adjudication does not affect zoning, comprehensive planning, or other land-use decisions. These are the responsibility of county governments.

Although anyone may hire a lawyer, Ecology is working with the courts to develop a filing process designed for unrepresented parties, planning to make the water rights adjudication as simple as possible. After adjudication is filed with the Whatcom County Superior Court, water-right holders will receive notification in the mail, with claim forms that can be completed by hand. Ecology will also place public notices in local newspapers and have information available online. Ecology's goal is to help water users find information about their water rights. Assistance will be available by phone and online.

FOR INFO Jimmy Norris, Ecology, 360/ 480-5722 or jimmy.norris@ecy.wa.govg

TEXAS V. NEW MEXICO SW
PROPOSED CONSENT DECREE

On Jan. 11, 2023, the Office of the Special Master unsealed a proposed settlement in the *Texas v. New Mexico and Colorado* interstate water case. Texas, New Mexico and Colorado filed a 76-page "Memorandum of Points and Authorities in Support of the Joint Motion of the State of Texas, State of New Mexico, and State of Colorado to Enter Consent Decree Supporting the Rio Grande Compact" (Memorandum) that was dated Nov. 14, 2022. The three states jointly moved the Special Master in the case to approve and recommend to the U.S. Supreme Court (Supreme Court) the Consent Decree, which "compromises and settles all claims among them arising from the Rio Grande Compact in this proceeding (Joint Motion)." *Memorandum* at 1. The United States, however, objected to the proposed Consent Decree and opposes the Joint Motion. The U.S. Supreme Court will decide whether to accept and approve the Consent Decree, as the case was brought under that court's original jurisdiction as an interstate dispute (*Texas v. New Mexico and Colorado*, No. 141, Original).

The Memorandum noted that "…litigation has persisted for nearly a decade, negotiations lasted over one year, and all interested parties participated in good faith, the Consent Decree is presumptively valid and the United States cannot meet its heavy burden in opposing the Decree. Therefore, this Court should approve the Consent Decree on the basis of its procedural fairness." *Memorandum* at 75. The United States intervened in the case as a party in 2018.

The dispute was focused on a stretch of the Rio Grande between Elephant Butte Dam and Hudspeth County, Texas. It was submitted to the Supreme Court when Texas filed a lawsuit in 2013, alleging that New Mexico groundwater users were unfairly syphoning water from the river after the water left Elephant Butte Dam and before it reached Texas. For more information about the case, see Bond, *TWR* #130 and Stein, *TWR* #151.

The Water Report is planning to publish a major article on the case following the decision by the Supreme Court.

FOR INFO *Memorandum* and other case filings available at Special Master's Docket Sheet at: http://www.ca8.uscourts.gov/texas-v-new-mexico-and-colorado-no-141-original

NEW TECHNOLOGIES CO
REUSE AND MICROPLASTICS

EPA is awarding two Colorado small businesses, Lafayette-based, Sporian Microsystems Inc., and Lakewood-based, J-Tech LLC, $100,000 each to develop promising environmental technologies related to microplastics identification and wastewater reuse. The Colorado businesses are among $2,497,134 EPA is awarding to 25 small businesses nationwide for projects advancing a wide range of technologies, including detecting methane emissions, prolonging the shelf life of foods, reducing food waste, improving recycling, and sampling methods for pollution.

Sporian Microsystems Inc., of Lafayette, CO will use $100,000 in EPA research funding to develop a high-speed, low-cost imaging system to identify microplastics in the environment. This system will rapidly and efficiently detect and quantify microplastics in waters and soils and improve monitoring and removal processes for these pollutants.

J-Tech LLC, of Lakewood, CO will use $100,000 in EPA research funding to develop a technology that enables low-cost, chemical-free,

and sustainable disinfection of wastewater in septic tanks for non-potable reuse, such as irrigation. The innovative technology uses microbes and electricity to disinfect septic tank wastewater on-site, eliminating the need for transport and treatment.

These awards are part of EPA's Small Business Innovation Research (SBIR) program, which conducts an annual, two-phase competition for funding. Twenty-five small businesses are receiving up to $100,000 in Phase I funding for six months for "proof of concept" of their proposed technology. Companies that complete Phase I can then apply to receive Phase II funding of up to $400,000 to further develop and commercialize their technology.

Additional SBIR Phase I winners and their proposed technologies can be found at the link below.

FOR INFO Richard Mylott, EPA, 720/ 237-8119 or mylott.richard@epa.gov; www.epa.gov/newsreleases/epa-provides-research-funds-colorado-small-businesses-develop-technologies-wastewater

GROUNDWATER AZ

HASSAYAMPA SUB-BASIN REPORT

Earlier this month, the Arizona Department of Water Resources (ADWR) released the Hassayampa Groundwater Model, a numerical basin-scale groundwater model that projects water usage by existing and planned development in an area west of the White Tank mountains and northwest of Phoenix.

The analysis finds a total unmet demand of 4.4 million acre-feet of groundwater over a 100-year period for the Hassayampa sub-basin. The projected unmet demand means ADWR cannot approve the development of subdivisions in the area that intend to rely on groundwater. Multiple large master-planned communities, all of them subject to the Assured Water Supply program, are being proposed in the region.

Arizona's Assured Water Supply program is a critical element of its landmark groundwater-management laws. An Assured Water Supply is one that meets certain prescribed criteria. The water supply must be physically, legally, and continuously available for 100 years; it must meet water quality standards; the water supplier must demonstrate financial capability to construct the delivery system and related features; and, the water supply must be consistent with both the Active Management Area's (AMA's) explicit management plan and goals.

In 2021, ADWR's groundwater modelers found similar results in the Pinal Active Management Area. On June 28, 2021, ADWR presented an update of its modeling of groundwater conditions in the Pinal AMA to a group of area stakeholders. The results of that analysis showed that over a period of 100 years — 2016-2115 — unmet demand for groundwater supplies in the region exceeded eight million acre-feet. At that time, ADWR Director Tom Buschatzke informed the region's stakeholders that in view of the modeling results, "the days of utilizing native groundwater for development in Pinal are over, it's done." He added that ADWR will not approve new assured water supply applications seeking to utilize groundwater within the existing Pinal model domain.

The Director's conclusions this month regarding the results of the Hassayampa modeling were reminiscent of those observations following release of the Pinal model. "ADWR previously worked with stakeholders in the West Valley that are subject to the Assured Water Supply program to seek solutions to the shortfall projected in the Hassayampa model," he said on Jan. 9. "As Governor Hobbs signaled in her (January 9) State of the State speech, it is time to include legislators, the business community and all constituencies to address the challenges attendant to the Assured Water Supply program in the Hassayampa Basin and for all the water management challenges facing Arizona."

In her January 9 State of the State address, Arizona Gov. Katie Hobbs announced the release of the Hassayampa model report and also launched the Governor's Water Policy Council, which is dedicated to modernizing and expanding Arizona's landmark 1980 Groundwater Management Act.

As in the Pinal AMA, identifying the challenges in the Hassayampa sub-basin — an area tabbed for considerable future development — is expected to enable important discussions about water supplies.

As the Director indicated on Jan. 9, those discussions may result in approvals of subdivisions subject to the Assured Water Supply program while maintaining the program's vital consumer protection objectives.

FOR INFO ADWR Assured and Adequate Water Supply webpage: https://new.azwater.gov/aaws

PFAS US

ANALYTIC TOOL

EPA has released a new interactive webpage, called the "PFAS Analytic Tools," which provides information about per- and polyfluoroalkyl substances (PFAS) across the country. This information will help the public, researchers, and other stakeholders better understand potential PFAS sources in their communities. The PFAS Analytic Tools bring together multiple sources of information in one spot with mapping, charting, and filtering functions, allowing the public to see where testing has been done and what level of detections were measured.

EPA's PFAS Analytic Tools draws from multiple national databases and reports to consolidate information in one webpage. The PFAS Analytic Tools includes information on Clean Water Act PFAS discharges from permitted sources, reported spills containing PFAS constituents, facilities historically manufacturing or importing PFAS, federally owned locations where PFAS is being investigated, transfers of PFAS-containing waste, PFAS detection in natural resources such as fish or surface water, and drinking water testing results. The tools cover a broad list of PFAS and represent EPA's ongoing efforts to provide the public with access to the growing amount of testing information that is available.

Because the regulatory framework for PFAS chemicals is emerging, data users should pay close attention to the caveats found within the site so that the completeness of the data sets is fully understood. Rather than wait for complete national data to be available, EPA is publishing what is currently available while information continues to fill in. Users should be aware that some of the datasets are complete at the national level whereas others are not. For example, EPA has included a national inventory for drinking water testing at larger public water utilities. That information was provided between 2013-2016. To include more recent data, EPA also compiled other drinking water datasets that are available online in select states. For the subset of states and tribes publishing PFAS testing results in drinking water, the percentage of public water supplies tested varied significantly from state to state. Because of the differences in testing and reporting across the country, the data should not be used for comparisons across cities, counties, or states.

To improve the availability of the data, EPA has published its fifth Safe Drinking Water Act Unregulated Contaminant Monitoring Rule to expand on the initial drinking water data reporting conducted in 2013-2016. Beginning in 2023, this expansion will bring the number of drinking water PFAS samples collected by regulatory agencies into the millions. EPA also significantly expanded the Toxics Release Inventory reporting requirements in recent years to over 175 PFAS substances — and more information should be received in 2023. Additionally, EPA's proposal to designate PFOA and PFOS as Hazardous Substances would also improve data on spill or release incidents reported to the Emergency Response Notification System. These reporting enhancements will be incorporated into future versions of the interactive webpage. EPA will continue working toward the expansion of data sets in the PFAS Analytic Tools as a way to improve collective knowledge about PFAS occurrence in the environment.

FOR INFO PFAS Analytic Tools at: https://echo.epa.gov/trends/pfas-tools

SETTLEMENT BILLS TRIBES

INDIAN WATER RIGHTS - ARIZONA

On Jan. 5, the Department of the Interior (Department) celebrated significant progress by the 117th Congress to advance settlements of Indian water rights claims and to protect Tribal sovereignty, key priorities for the federal government's efforts to uphold its trust and treaty responsibilities to Tribal communities.

Indian water rights settlements help ensure that Tribal Nations have safe, reliable water supplies; improve environmental and health concerns on reservations; and enable economic growth. These settlements have the potential to end decades of controversy and contention among Tribal Nations and neighboring communities and promote cooperation in the management of water resources. Indian water rights settlements also promote community and economic development for regions surrounding Tribal communities, as conflicts are resolved and vital infrastructure is developed. At the Department, the Secretary's Indian Water

Rights Office manages, negotiates, and oversees implementation of Indian water rights claims and is committed to continuing to work with Tribes across the West as they seek to realize their long-promised water rights.

As part of the 117th Congress' closing activity, one settlement was enacted, another settlement was amended, and another bill affecting Tribal water rights was enacted, including:

- S. 4104, the Hualapai Tribe Water Rights Settlement Act of 2022: The Hualapai Tribe Water Rights Settlement Act of 2022 settles the Tribe's water rights claims in Arizona and is the result of over a decade of dedicated, good-faith negotiations among the tribe, the federal government, the State of Arizona, and other parties. The bill approves a settlement agreement that will provide much needed water to the Tribe and establishes a trust fund of $312 million that the Tribe can use to develop water infrastructure on its Reservation. The Act's provisions will help provide certainty to the Tribe and to surrounding communities regarding access to water resources, enable Tribal economic growth, and promote Tribal sovereignty and self-sufficiency.
- S. 3168, an Act to amend the White Mountain Apache Tribe Water Rights Quantification Act of 2010 to modify the enforceability date for certain provisions, and for other purposes. This Act amends the White Mountain Apache Tribe's 2010 Settlement, which settled the Tribe's water rights claims in Arizona. That Act authorized the design and construction of a rural water system to address the dire need for a domestic water supply on the Tribe's Reservation. Working closely with experts at the Bureau of Reclamation, the Tribe identified critical changes to the infrastructure design along with the need for additional funding to complete the project. This amendment provides the additional $530 million needed to complete construction of the rural water system.
- S. 3308, the Colorado River Indian Tribes Water Resiliency Act of 2022: This Act authorizes the Colorado River Indian Tribes to lease, exchange, store, or conserve portions of their decreed water rights located in Arizona to off-Reservation users. This Act — the product of many years of diligent negotiations among the Tribe, the State, and non-Indian water users — reflects the federal government's commitment to Tribal self-determination and Tribal sovereignty.

These new laws supplement the significant resources provided in President Biden's Bipartisan Infrastructure Law, which provides more than $13 billion directly in Tribal communities across the country and makes Tribal communities eligible for billions more in much-needed investment. That includes $2.5 billion to implement the Indian Water Rights Settlement Completion Fund, which will help deliver long-promised water resources to Tribes, certainty to all their non-Indian neighbors, and a solid foundation for future economic development for entire communities dependent on common water resources. *See* Enacted Indian Water Rights Settlements at: www.doi.gov/siwro/enacted-indian-water-rights-settlements.

FOR INFO Secretary's Indian Water Rights Office at: http://www.doi.gov/siwro

UPPER COLORADO BASIN CO

RIVER DISTRICT CONSERVATION

On December 15, where the Upper Colorado River Commission (UCRC) meeting was held in concert with the Colorado River Water User's Association (CRWUA) Conference, UCRC formally released a Request for Proposal re-initiating a System Conservation Pilot Program (SCPP) beginning spring 2023. The Program aims to reduce consumptive use through temporary, voluntary, and compensated measures across the Upper Division States and allocates up to $125 million for the re-initiation with the potential to increase in scale. This action implements the first element of UCRC's 5-Point Plan released in July 2022.

Colorado River District General Manager Andy Mueller responded that a program of this scale and speed poses as much risk and opportunity as a Demand Management program, therefore it is critical how the program is implemented. "It is vital to the health of our communities and our agricultural industry that the River District have a decision-making role in this program, consistent with past implementation of a previously-authorized System Conservation Pilot Program, and we want to thank Commissioner Mitchell for her commitment to recognize the River District's role in that effort," Mueller said.

Commissioner Mitchell provided a written commitment stating that "...in the event the source of the water and the place of beneficial use of a prospective applicant's SCPP project is located within the boundaries of the District, enrollment in the SCPP will be subject to approval of the application by both the Colorado Water Conservation Board (CWCB) and the District." In Commissioner Mitchell's own press release, she stated, "We must continue to live within the means of what the river provides year to year and we ask others to do the same. This is the only way the system will continue as we know it into the future."

FOR INFO Upper Colorado River Commission at: http://www.ucrcommission.com/

VIOLATIONS WY

CHEMICAL EMERGENCY

EPA announced on January 18 an Emergency Planning and Community Right-to-Know Act (EPCRA) settlement with Dyno Nobel, Inc., resolving alleged violations at the company's ammonium nitrate production facility in Cheyenne, Wyoming. Under the terms of a Consent Agreement and Final Order filed in November, the company has paid a $20,352 penalty to address EPA's allegations that it failed to comply with requirements to notify the local emergency planning committee about past hazardous chemical releases at their facility at 8305 Otto Road.

"Facilities that store hazardous materials like anhydrous ammonia have an obligation to follow regulations designed to protect our communities and environment from potentially catastrophic consequences of accidents," said Suzanne Bohan, director of EPA Region 8's Enforcement and Compliance Assurance Division. "Failure to comply with the law puts first responders and members of the surrounding community in harm's way."

EPA conducted an inspection at the facility and found the company failed to submit required written notifications of anhydrous ammonia releases to the Laramie County Emergency Management Agency on two separate occasions, in violation of EPCRA requirements. Although Dyno Nobel, Inc. did provide immediate notification to the local agency about the occurrence of each of these events, as required by EPCRA, the company failed to provide the required written follow up notifications to specify any actions taken to address and contain a release and specifically identify any known or anticipated health risks associated with the release.

Dyno Nobel, Inc.'s Cheyenne facility is subject to EPCRA chemical emergency release notification regulations because it produces and stores anhydrous ammonia, which qualifies as an "extremely hazardous substance" under EPCRA. Facilities subject to EPCRA are required to report the details of releases to the environment that exceed specified reporting quantities to state and local emergency response agencies. For ammonia, the reportable quantity is 100 pounds.

The Emergency Planning and Community Right-to-Know Act establishes requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. Failure to comply with these requirements prevents emergency responders from preparing for, and safely responding to, emergencies at facilities where chemical hazards may exist. These and additional Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment.

This case is part of EPA's National Compliance Initiative to reduce risks from chemical accidents, and it addresses compliance within an industrial sector — chemical manufacturing — that can pose serious risks from such accidents.

FOR INFO David Piantanida, EPA, 720/ 661-7482, piantanida.david@epa.gov, or www.epa.gov/newsreleases/dyno-nobel-inc-resolves-chemical-emergency-release-notification-violations-cheyenne

CALENDAR

February 16 WEB

Tribal Natural Resource Damages Assessments - 8th Annual Comprehensive Seminar, Live Interactive Online Broadcast. For info: Law Seminars Int'l, 206/ 567-4490, registrar@lawseminars.com or www.lawseminars.com

February 16 UT & WEB

Measuring Water Use: The Good, The Bad, and The Ugly - Wallace Stegner Center Event, Salt Lake City. University of Utah College of Law. Hybrid Event: In-Person and Online; 12:15pm-1:15 pm MST. For info: https://sjquinney.utah.edu/events/

February 16-17 VA & WEB

Environmental Law 2023, Arlington. In-Person & Webcast Event. Environmental Law Institute Co-sponsored With ALI CLE. For info: https://www.ali-cle.org/course/ce008p; or www.eli.org

February 20-23 TN

2023 Membrane Technology Conference & Exposition, Knoxville. Knoxville Convention Center. Presented by American Membrane Technology Association & American Water Works Association. For info: www.awwa.org/Events-Education/Membrane-Technology

February 22-24 CA

Urban Water Institute - Spring Water Conference, Palm Springs. Hilton Palm Springs. Hosted by the Urban Water Institute, Inc. - Forum for Western Water Issues. For info: www.urbanwater.com/conferences/

February 23 CA

Water 101 Workshop: The Basics and Beyond, Sacramento. McGeorge School of Law. Optional Watershed Tour. For info: https://www.eventbrite.com/e/water-101-workshop-the-basics-beyond-tickets-480118797247

February 23-24 NV

Family Farm Alliance 2023 Annual Conference - A Wake Up Call for America: Why Farms, Water and Food Matter, Reno. Silver Legacy Resort. For info: www.familyfarmalliance.org/events

February 28-March 2 DC

ACWA DC 2023 Annual Washington, D.C. Conference, Washington. St. Regis Hotel. Presented by Association of California Water Agencies. For info: www.acwa.com/events/

March 1-2 DC

Environmental Summit of the Americas, Washington. Vinson & Elkins LLP. Presented by the ABA Section of Environment, Energy, and Resources and the International BAR Association Section on Energy, Environment, Natural Resources and Infrastructure Law. For info: environ@americanbar.org

March 1-3 NM & WEB

2023 Land and Water Summit: Field Trip & Conference - Communities, Collaboration & Climate Change, Albuquerque. TBA. Preconference Field Trip March 1; Conference March 2-3. For info: https://www.landandwatersummitnm.org

March 2 UT & WEB

Considering Wildlife in Water Management - Wallace Stegner Center Event, Salt Lake City. University of Utah College of Law. Hybrid Event: In-Person and Online; 12:15pm-1:15 pm MST. For info: https://sjquinney.utah.edu/events/

March 2-3 OR & WEB

The Mighty Columbia Conference, Portland. Royal Sonesta Portland Downtown. In-Person, Live Webcast or On Demand. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or theseminargroup.net

March 2-5 OR

"Reconnecting and Transitioning Together" - Public Interest Environmental Law Conference, Eugene. University of Oregon School of Law. 41st Annual Presented by Land Air Water Environmental Law Society. For info: www.pielc.org

March 5-8 GA

38th Annual WateReuse 2023 Symposium, Atlanta. Marriott Marquis Atlanta. For info: https://watereuse.org/news-events/conferences/

March 6-7 WA

Northwest Groundwater Conference, Pasco. Holiday Inn Express Hotel. Presented by American Ground Water Trust. For info: https://agwt.org >> Events

March 6-8 DC

Association of Metropolitan Water Agencies (AMWA) 2023 Water Policy Conference, Washington. Hilton Washington DC National Mall, The WHARF. RE: New Federal Drinking Water & Wastewater Infrastructure Opportunities; PFAS Cleanuup & Drinking Water Rules; Cybersecurity, Affordability, & Environmental Justice Activities. For info: www.amwa.net/ >> Events

March 6-8 TX

P3Conference 2023: Public-Private Partnership Conference & Expo, Dallas. Hyatt Regency. Gathering of Government & Development Professionals. For info: www.thep3conference.com

March 8 WEB

Benefits From the Application of Hydraulic Modeling for Small Water Systems - AWWA Webinar, 11:00am-12:30pm Mountain Time Zone. Presented by American Water Works Association. For info: www.awwa.org/Events-Education/Events-Calendar

March 9 WEB

Clean Water, Complicated Laws: Administrative Enforcement & Dispute Resolution - 2023 Water Quality Webinar Series, Free Webinar on Water Quality Issues, Laws & Regulations; 10:00-10:30am Pacific Time. Presented by Best, Best & Krieger. For info: https://bbklaw.com/news-events/webinars >> Clean Water

March 9-10 CA

Sustainable Water Investment Summit, Palos Verdes Peninsula. Terranea Resort. Water Finance From Risk Management to Water Transfer & Storage Strategies; Presented by Brownstein Firm & WestWater Research. For info: sustainablewaterinvestment.com

March 10 CA

Contaminated and Distressed Properties Seminar, Los Angeles. TBA. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or theseminargroup.net

March 14 NE

Nebraska Floodplain Management Workshop, Lexington. Dawson County Opportunity Center. For info: https://dnr.nebraska.gov/floodplain/training-and-workshops

March 14-16 CO & WEB

Contaminants of Concern - AWWA Conference, Denver. Online & TBA. Presented by American Water Works Association. For info: www.awwa.org/Events-Education/Events-Calendar

March 16-17 UT & WEB

Wallace Stegner Center 28th Annual Symposium: The Future of the Great Salt Lake, Salt Lake City. University of Utah College of Law. Hybrid Event: In-Person and Online. For info: https://sjquinney.utah.edu/events/

March 22-24 NY

UN 2023 Water Conference - Our Watershed Moment: Uniting the World for Water, New York City. UN Headquarters. For info: https://sdgs.un.org/conferences/water2023

March 28-31 CA

The Utility Management Conference, Sacramento. SAFE Credit Union Convention Center. Presented by American Water Works Association & Water Education Foundation. For info: www.awwa.org/Events-Education/Utility-Management

The Water Report
Water Rights, Water Quality & Water Solutions in the West
3615 W. Hills of Gold Dr. Tucson, AZ 85745

CALENDAR

April 3-4 **NM**

Law of the Rio Grande Conference: Opportunities for Collaboration of a Shared & Valuable Resource, Santa Fe. La Fonda on the Plaza. Perspectives from New Mexico, Texas, and Colorado by Leading Experts. For info: CLE International: 800/ 873-7130 or www.cle.com

April 4-5 **VA**

Interstate Council on Water Policy's Spring Washington D.C. Roundtable, Arlington. Doubletree Hotel Crystal City. April 5th Morning - Water Policy Summit with Partners of Water Organizations Across the US. For info: https://icwp.org/news/2023springroundtable/

April 6 **UT & WEB**

Bears Ears - Landscape of Refuge and Resistance: Wallace Stegner Center Event, Salt Lake City. University of Utah College of Law. Hybrid Event: In-Person and Online; 12:15pm-1:15 pm MST. For info: https://sjquinney.utah.edu/events/