

# Beneath the Surface

Key Issues Underlying Groundwater Management in Texas

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Finding the ways that work

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# Executive Summary

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In a state where water is a limited and vital resource, it is imperative to wade into the difficult issues associated with groundwater management in Texas. More specifically, this report, with the input of a diverse group of experienced professionals, provides an overview of the groundwater landscape in Texas, describing some of its key features, and then identifying five of the most important challenges to holistic, proactive groundwater management for Texas.

To set the stage for the groundwater scenario, we list and briefly discuss some key features of Texas groundwater: 1) it is private property; 2) it is primarily managed by groundwater conservation districts; 3) its levels are declining; 4) its legal regime is not the same as the laws governing surface water; 5) it is viewed as an extractable and transferable resource; and 6) its current management framework is challenged. These aspects of Texas groundwater raise interesting and often difficult questions at many levels, in a wide range of settings, from a wide range of perspectives. Landowners; companies in search of a water supply for various purposes; water utilities; private well owners; groundwater conservation districts; river authorities; regional water planning groups; agricultural irrigators; conservation interests; municipal and industrial water suppliers and users; state agencies; government officials; policy makers; legislators; and many others are looking for answers to the questions that persist for Texas groundwater – the source of about 60% of the state’s annual water use.

This document presents five of the major challenges to groundwater management in Texas that have been identified for further consideration and review, then briefly describes each of the five issues presented. Along with background information, the document sets out various perspectives on the issue, provides information on recent or pending litigation, and presents information on the handling of the issue in past sessions of the Texas Legislature.

The first issue presented discusses the challenges related to **regulating privately owned, yet shared, groundwater**. In the 2012 case *Edwards Aquifer Authority v. Day* (“Day”), the Texas Supreme Court held that landowners own their groundwater in place.<sup>1</sup> The Supreme Court described how one purpose of groundwater regulation, similar to oil and gas, is to afford a landowner his fair share of the groundwater beneath his property. But the court also stated that landowners are subject to reasonable regulation by Groundwater Conservation Districts (GCDs). The legal uncertainty over what “fair share” and “reasonable regulation” mean is upending current groundwater regulation as the districts struggle to allocate groundwater resources under this relatively new holding.

Next, the document discusses the challenges related to **groundwater management at the GCD level**. GCD critics argue that it is difficult for GCDs to effectively manage groundwater in a fragmented regulatory structure. Proponents of local management of groundwater, however, argue that local control ensures representation of community values and concerns and recognition of hydrogeologic conditions specific to a district’s jurisdiction. The reality is that it can be challenging for GCDs to manage groundwater with actual and threatened litigation

increasing and without sufficient funding and science to support their responsibilities under the Water Code.

Third, the challenges associated with **groundwater and surface water interactions** are presented. Despite the hydrogeological relationship between groundwater and surface water in some areas of the state, Texas water law and policy are often implemented in a fashion that fails to adequately recognize this connection. The absence of a framework for conjunctively managing groundwater and surface water may adversely affect both groundwater and surface water resources.

Fourth, the document describes the challenges related to **sustainable management of groundwater**. Texas groundwater statutes set the guiding terms for how local GCDs and groundwater management areas (GMAs) set management goals. Recent changes to those laws, and ongoing disputes about how much groundwater can or should be removed from an aquifer, have arguably moved the law away from sustainable management goals and toward maximizing groundwater withdrawals.

Next, there is a discussion of the challenges associated with the **marketing and exporting of groundwater**. With growing populations, some utilities and cities in search of additional water supplies are turning to importing groundwater from rural areas of Texas. The existing and proposed large-scale marketing and export of groundwater is generating a variety of conflicts, pitting rural interests against urban, potentially threatening the economies, property rights, and ecology of rural areas from where groundwater is exported, and creating regulatory and political challenges for local GCDs.

Finally, there is a brief discussion of a number of additional issues related to groundwater management in Texas, such as aquifer storage and recovery, brackish groundwater desalination, abandoned wells, and transboundary aquifers.

EDF greatly appreciates the time and effort of all who are contributing to this document as it evolves into a report that we hope will form the basis for a meaningful and successful advancement of groundwater management in Texas.

# Introduction and Purpose

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Recent years have seen a rising intensity of debate and concern around the current condition and future of groundwater resources in Texas. The issues arising in discussions of groundwater span a wide range of topics, including the benefits and costs of marketing groundwater, the risks that groundwater pumping poses to surface water rights and river health, and the impact of current management on the long-term viability of groundwater supplies themselves. Environmental Defense Fund (EDF) works across the western U.S. to improve water management so that the water supplies for farms, communities, the environment, and our economy are resilient in the face of droughts, floods, and changing needs. The growing groundwater debate in Texas signals a need for thoughtful, collaborative action to advance proactive groundwater management that appropriately recognizes private property rights, water supply needs, and the environment.

The purpose of this report is to provide an overview of the state of groundwater management in Texas by clarifying the key issues underlying groundwater management challenges and identifying opportunities to move toward more sustainable management of this vital resource. The report highlights a handful of issue areas that have arisen as priorities in our discussions with groundwater experts, providing background and a brief review of various stakeholder perspectives on each of those areas.

The report is intended to promote a constructive dialogue with stakeholders and decision-makers interested in advancing healthy groundwater management.

## Overview: Some Basic Tenets

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Texas has nine major aquifers and 21 minor aquifers. These aquifers are a vital water supply source, providing approximately 60 percent of the 16.1 million acre-feet of water used in the state annually.<sup>2</sup> Not only is the groundwater itself an important water supply, but discharges (through springs, seeps or otherwise) from these aquifers help sustain streams and rivers, providing an estimated 30 percent of the flow in rivers across the state,<sup>3</sup> including most of the natural base (low) flows of these streams.

The condition of groundwater reserves, the intensity of groundwater use, and the nature of groundwater/surface water interconnection varies significantly across Texas. Thus, a uniform “one-size fits all” approach to sustainable management of groundwater is not likely to meet the diverse local conditions and needs. Historically, while governed by an overarching common law and statutory and case law framework, groundwater management decisions have been made at a local or regional level.

Some key features of the current Texas groundwater situation are described below.

## Groundwater is private property.

Texas groundwater management takes place within the context of groundwater as a private property right. In Texas, the Legislature and the courts have determined that groundwater is owned in place by the overlying landowner.<sup>4</sup> Over a century of case law has shaped the law around groundwater ownership, which, similar to oil and gas, is rooted in the English common law concept of absolute ownership — the notion that a landowner owns everything above and beneath his land, “up to the sky and down to the depths.”<sup>5</sup> Texas courts have relied on the absolute ownership doctrine to adopt and uphold the rule of capture, a legal doctrine which, with a few exceptions, does not impose liability on a landowner who adversely affects his neighbor’s groundwater by pumping groundwater from beneath his own land for a beneficial purpose. Texas is the only state where the rule of capture is still law.<sup>6</sup> As discussed in more detail below, recent judicial rulings and subsequent statutory amendments have solidified the “ownership in place” doctrine, and, with that, significantly affected the context for groundwater management.

## Groundwater is primarily managed by GCDs.

Recognizing the need for some level of coordinated management and reflecting the importance of local uses and priorities, groundwater conservation districts (GCDs) are the state’s designated method of managing groundwater. GCDs, which are often organized along administrative, not aquifer, boundaries and governed by locally elected boards, are authorized to regulate and manage the production of groundwater. The districts must balance this responsibility with the protection of property rights as required by case law and Chapter 36 of the Water Code.<sup>7</sup> Article 16, section 59 of the Texas Constitution is the legal foundation upon which the Legislature conceived GCDs in 1949. It places a constitutional duty on GCDs to preserve and conserve groundwater resources and to balance the conservation and production of groundwater.<sup>8</sup> In areas of the state managed by a GCD, therefore, a landowner’s right to pump groundwater is tempered by the Water Code’s goals of protecting property rights in groundwater and protecting the groundwater resource itself. It is important to note that the existence of a groundwater conservation district does not eliminate the rule of capture in regulated areas of the state. Rather, regulation overlays the rule and ideally prevents one landowner from pumping to such an extent that nearby wells are impacted.

As the GCD map (Figure 1) shows, not every acre of land in Texas is within the boundaries of a GCD. In some areas of the state, therefore, there is virtually no oversight of groundwater extraction beyond the limited exceptions to the rule of capture.<sup>9</sup>

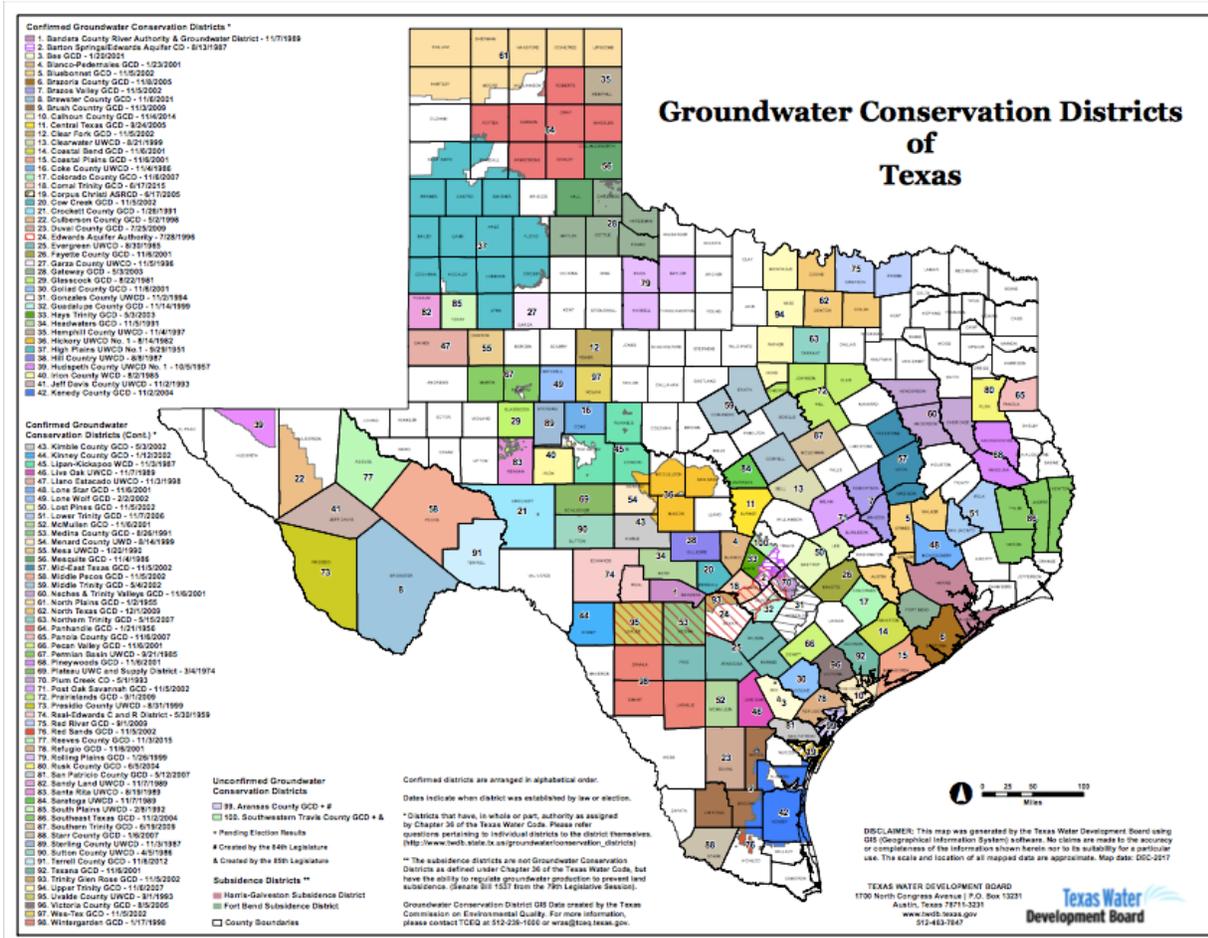


Figure 1: Groundwater Conservation Districts in Texas, Texas Water Development Board. ([http://www.twdb.texas.gov/mapping/doc/maps/GCDs\\_8x11.pdf](http://www.twdb.texas.gov/mapping/doc/maps/GCDs_8x11.pdf))

## Groundwater levels in Texas are declining.

Despite Texas having a regulatory structure to manage groundwater, groundwater levels are declining in many aquifers across the state. Groundwater supplies are projected to decrease 24%, from 7.2 million acre-feet per year in 2020 to 5.4 million acre-feet in 2070.<sup>10</sup> This decrease is primarily a result of declines in the Ogallala and Gulf Coast aquifers.<sup>11</sup> According to a recent study conducted by the Texas Water Development Board, “[t]otal water-level declines in the state’s aquifers since 1900 range from less than 50 feet to more than 1,000 feet. The greatest water-level declines are in the Trinity Aquifer, focused in the Dallas–Fort Worth and Waco areas. ... All of these water-level declines have been caused by groundwater pumping, primarily since the 1950s.”<sup>12</sup> A key point from the report is that “groundwater levels in all major and minor aquifers have declined.”<sup>13</sup>

Groundwater-level declines in Texas aquifers can have notable impacts beyond the degradation of the groundwater resource itself. When groundwater pumping diminishes levels in aquifers connected to surface water, it can have an adverse effect on surface water supplies and river

flows. Groundwater pumping, therefore, not only affects other groundwater users who share in the common pool; it can affect surface water users as well. Declines in groundwater levels can also cause land surface subsidence, as has occurred with significant consequences in areas of Texas overlying the Gulf Coast Aquifer.

## **Groundwater and surface water are treated under separate legal regimes.**

Unlike groundwater, surface water in Texas is held by the state, in trust for the public.<sup>14</sup> Permits are issued by the state for various uses, generally according to the prior appropriation system. All basins have been adjudicated and most are fully appropriated on paper (even though in many basins permitted paper rights far exceed actual use). River authorities, governmental entities with appointed boards and substantial resources, hold large percentages of water rights in many basins. Despite this well-defined system for surface water, there is little to no connection to the regime for groundwater. Generally, the two resources are treated separately under the law, despite their physical interdependence in many locations, though there are some provisions in law and policy that, if more fully implemented, could assist with conjunctive management of groundwater and surface water.<sup>15</sup>

## **Groundwater is viewed as an extractable and transferable resource.**

Historically, most groundwater wells were primarily used by the overlying landowner for personal-residential and irrigated-agricultural use. With Texas's exponential and spatially variable population growth, however, municipal use of groundwater is increasing, and water planners estimate that municipal use of groundwater will surpass agricultural use in 50 years. Private interests seeking to develop and market groundwater (referred to as "groundwater marketers" or "groundwater developers") and some urban water utilities argue that groundwater management should facilitate the development and transport of groundwater to where it may be used to meet growing demand. A concern, expressed by many landowners and conservation interests, however, is that extensive marketing and export of groundwater outside of the aquifer boundaries could exacerbate aquifer depletion, harming local groundwater and surface water resources and property rights, and impacting the long-term viability of local economies. Additionally, critics of large groundwater export projects express concern that well-heeled marketers and end-users will price groundwater out of the reach of those Texans who depend on that water for their lives and livelihood.

## **The current groundwater management framework is challenged.**

Although Texas has a long-standing framework in place to manage groundwater, declining aquifer levels, ongoing conflicts and litigation, and sporadic, often controversial efforts at legislative reform indicate that the current system of groundwater management has not been

wholly successful in sustainably managing aquifers, as evidenced by groundwater level declines across the state, or meeting the needs of various stakeholders. The reasons for, or factors contributing to, the ineffectiveness of the current groundwater management framework are highly varied, reflecting the physical and institutional heterogeneity of the state and the varied historical narrative of different localities.

However, in the discourse around groundwater concerns, a handful of issues seem to emerge as major themes. The remainder of this paper examines five major issues that appear to be at the top of most experts' lists of the most important challenges to holistic proactive groundwater management in Texas. Although this is certainly not an exhaustive list, it is intended to capture a significant slice of the most notable challenges to proactive groundwater management that appropriately recognizes private property rights, water supply needs, and the environment.

- 1) Challenges related to how GCDs regulate a privately owned, yet shared resource.
- 2) Challenges related to managing groundwater resources.
- 3) Challenges related to groundwater and surface water connection.
- 4) Challenges related to sustainable management of groundwater.
- 5) Challenges related to marketing and exporting groundwater.

The discussion provides a snapshot of each issue followed by more detailed background. Perspectives of different stakeholder interests on the issue are also included, along with an explanation of relevant litigation and key policy aspects.

## **Issue 1: Challenges Related to Regulating Privately Owned, Yet Shared Groundwater**

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### **Snapshot**

In the 2012 case *Edwards Aquifer Authority v. Day* (“*Day*”), the Texas Supreme Court held that landowners own their groundwater in place.<sup>16</sup> The court described how one purpose of groundwater regulation, similar to oil and gas, is to afford a landowner his fair share of the groundwater beneath his property. But the court also stated that landowners are subject to reasonable regulation by GCDs. The legal uncertainty over what “fair share” and “reasonable regulation” mean is upending current groundwater regulation as the districts struggle to allocate groundwater resources under this relatively new holding, portions of which were codified in Chapter 36 of the Texas Water Code (“Chapter 36”). In some areas of the state, proposals to market and export large amounts of groundwater have brought litigation over how to apply *Day*. These controversies have led some to argue that groundwater should be regulated in a way similar to oil and gas, where management occurs on a reservoir basis and the resource is

allocated on a correlative rights basis, thereby ensuring that all landowners are entitled to a fair share of the value of the resource produced. Conservation organizations, GCDs, and many landowners are concerned that treating groundwater strictly like oil and gas will erode the ability of local GCDs to protect the unique resources within their jurisdictions and lead to widespread aquifer depletion. On the other hand, many landowners who want to protect and conserve their groundwater are arguing that GCDs must also protect their “fair share” or right to conserve groundwater in place.

## Background

Over the past several years, courts have increasingly relied on oil and gas jurisprudence to decide groundwater disputes. *Day* has been the most significant case with respect to groundwater management. In *Day*, the Texas Supreme Court held that landowners own the groundwater beneath their land in place and that it cannot be taken for public use without adequate compensation.<sup>17</sup> In the decision, the court pointed out that in oil and gas regulation, each landowner is afforded “the opportunity to produce his fair share of the recoverable oil and gas beneath his land,” and that “one purpose of groundwater regulation is to afford each owner of water in a common, subsurface reservoir a fair share.”<sup>18</sup>

*Day* raises many questions: What does “fair share” of groundwater mean? What is the long-term implication of applying oil and gas regulation principles to groundwater, which in most settings is naturally replenished at some rate and can be augmented with managed aquifer recharge (MAR)? How does *Day* align with GCDs’ authorities? These and other questions have become central to how GCDs administer their duties in balancing groundwater conservation and production.

## Differing Perspectives

### **GCDs should regulate groundwater like oil and gas.**

Groundwater developers and marketers and some private property interests argue that “fair share” means GCDs should allocate groundwater under a statewide correlative rights approach similar to oil and gas. They take issue with GCDs that they believe protect historical uses and discriminate among categories of uses within a GCD. They argue that rules that allocate groundwater based on use categories — especially historic use — unfairly value existing uses over future uses, depriving other landowners of the opportunity to produce their fair share of groundwater in the future. These stakeholders advocate for correlative rights or surface acreage-based rules, which they maintain create regulatory certainty, a simplified permitting process, uniformity in the treatment of all landowners, and consistency in GCD rules.<sup>19</sup> Some commentators have further argued that permit exemptions in Chapter 36 related to domestic wells and oil and gas exploration inequitably favor certain uses over others.<sup>20</sup> They assert that if a landowner is deprived of his fair share of groundwater, then he can sue a GCD for taking private property without compensation.

An important case that speaks to the issue of how GCDs may treat categories of uses is *Guitar Holding Co. v. Hudspeth County Underground Water Conservation District No. 1*, decided in

2008 by the Texas Supreme Court.<sup>21</sup> In this case, the demand for water from El Paso created tensions between groundwater user interests. Under the GCD's rules, transfer permits were available to either historic users or new users, but "the historic users were guaranteed a more secure supply through the application of the logic of prior appropriation."<sup>22</sup> New users with large land holdings who desired to market their groundwater to El Paso argued that the Water Code only authorized a district to preserve historic or existing use of the same type or purpose and that the district's rule put historic users at an unfair advantage. Hudspeth County Underground Water District argued, on the other hand, that the provision granting it authority to preserve historic or existing use made sense only if "use" referred to an amount of groundwater, not its purpose. The Texas Supreme Court agreed with the new users, holding, "the District's transfer rules, in essence, grant franchises to some landowners to export water while denying that right to others."<sup>23</sup> One takeaway from the decision is that "[w]here the previous rules privileged use, the new regime suggests rights to groundwater based on surface land ownership."<sup>24</sup>

The Texas attorney general issued an opinion interpreting the holding in *Guitar*, which some had argued was limited to changes in use outside of a GCD's boundaries as opposed to changes in use within a GCD's boundaries. The attorney general disagreed, opining that a change in the purpose of the proposed use of water to be produced under a historic or existing use permit is a new use, even if the new use would occur within the district.<sup>25</sup> The attorney general explained that it is up to individual GCDs to determine whether a change in use for a historic or existing use permit should be treated as an application for a new use or as an amendment. Thus, historic users may only pump groundwater under their historic use status if it is for the original, historic use, which more often than not, is for agricultural purposes. Arguably, this levels the playing field when historic users with large volume permits seek to market their groundwater, as a GCD must treat them the same as new users.

### **Groundwater is different than oil and gas, and use is an important consideration.**

The majority of GCDs in Texas, however, regulate groundwater production by considering various uses and impacts and many employ a hybrid approach to permitting, combining acreage-based rules with beneficial and historic use rules. These approaches are allowed under current statute. These "use-based" rules consider factors other than surface acreage ownership, such as "protection of historic and/or existing use to allow recovery of reasonable investment-backed expectations; intended use; reasonable, non-speculative demand; site-specific hydrogeological conditions; pumping impacts to existing wells, surface water resources that are hydrologically connected to groundwater, the aquifer and the achievement of desired future conditions, and other aquifers that are hydrologically connected to the primary pool; or land subsidence."<sup>26</sup> GCDs that rely on use-based rules argue that use-based rules provide districts with flexibility to address local hydrogeologic conditions as well as production in urban and rural areas and that they provide a balance between the rule of capture and correlative rights to allow for maximum beneficial use of the resource.<sup>27</sup>

Although groundwater marketers argue that fair share of groundwater equates to surface acreage-based allocation, GCDs point out that "there is no statement from the court [in *Day*] that requires or implies that groundwater regulation should limit production based solely on surface acreage over an aquifer," and in fact, oil and gas regulation does not apply surface

acreage-based rules.<sup>28</sup> Indeed, while the Texas Supreme Court stated that *one* purpose of groundwater regulation is to afford each landowner his fair share, the court recognized that groundwater regulation is fundamentally different than oil and gas regulation and that groundwater regulation “must take into account not only historical usage but future needs, including the relative importance of various uses, as well as concerns unrelated to use, such as environmental impacts and subsidence.”<sup>29</sup> Groundwater, unlike oil and gas, has intrinsic value that is connected to and vital to the value of the land above and, in some cases, to springs and rivers.

Moreover, they point out that “[t]o date, no other case law exists in which courts have defined a property owner’s ‘right to a fair share.’”<sup>30</sup> *Edwards Aquifer Authority (EAA) v. Bragg* is the only decision in Texas where a court has determined that a regulatory agency charged with managing groundwater — the Edwards Aquifer Authority — committed a regulatory taking by limiting the amount of groundwater a landowner could pump.<sup>31</sup> The court’s holding that the EAA’s decision resulted in a taking of private property, however, was based on the fact that the landowners had been historically using more groundwater than the EAA was willing to permit, and consequently, the EAA’s decision to limit their permit interfered with their investment-backed expectations. To date, no court in Texas has held that a groundwater district’s decision to reduce or deny a *new* permit has risen to a taking of private property.

### **GCDs should protect landowners’ rights to conserve their groundwater in place.**

As a result of the Texas Supreme Court’s decision in *Day* that groundwater is owned in place, a growing number of landowners are arguing that GCDs should protect their private property rights and interests in conserving the groundwater they own in place. These landowners, along with some conservation interests, would like to see GCDs sustainably manage groundwater to protect all property rights, including the right to conserve groundwater in place.

## **Recent and Current Litigation**

In 2013, a year after the *Day* decision, a group of landowners in Bastrop County filed a contested case hearing request in opposition to a permit application submitted by End Op, L.P. to the Lost Pines Groundwater Conservation District. The landowners did not have wells on their property. They argued that the End Op permit would draw down the groundwater underneath their properties, diminishing the value of the land and making it economically impossible to drill a well in the future. The administrative law judge (ALJ) denied the landowners standing and the Lone Pines GCD Board of Directors agreed, arguing that to have standing, a landowner must demonstrate a particularized and concrete injury that is not common to the general public. The ALJ wrote, “It is not enough that they possess an ownership interest in groundwater, that right must be potentially impaired for them to possess standing.”<sup>32</sup> The landowners appealed the decision to Bastrop District Court. The court overruled the board’s decision to deny standing to the landowners, but the ruling did not provide a basis for the decision. End Op and the Lost Pines District appealed the court’s decision, and this past August, the Third Court of Appeals ruled that the landowners had not timely filed their petition for review with the district court and consequently dismissed the case on jurisdictional grounds. The groundwater community

was anticipating clarification from the court on the legal boundaries of standing post *Day*, but the decision did not reach this issue.

### ***Fazzino v. Brazos Valley Groundwater Conservation District***

In a 2018 case filed in federal district court in Waco, *Fazzino v. Brazos Valley Groundwater Conservation District*, a landowner, Anthony Fazzino, attempted to extend oil-and-gas “correlative rights” allocation law within the groundwater context. Fazzino argued that Brazos Valley GCD’s rules permit the city of Bryan, a historic user, to produce disproportionate amounts of groundwater from a small tract of land, draining the groundwater beneath his property and depriving him of his opportunity to produce a fair share of groundwater.<sup>33</sup> Notably, Fazzino relied on an old oil and gas case decided by the Texas Supreme Court, which held that, “[o]wners of groundwater rights in the same aquifer must be treated equally under Texas law.”<sup>34</sup>

Brazos Valley GCD issued the city of Bryan a permit to produce 3,000 gallons per minute from a 2.7-acre tract of land adjacent to Fazzino’s property. According to Fazzino, if the city of Bryan’s well had been a new well rather than a historic well, then under Brazos Valley GCD’s rules, the city would have been permitted to only produce 192 gallons per minute. When Fazzino applied to the Brazos Valley GCD for his own groundwater production permit for 3,000 gallons per minute from his 2.65-acre tract, Brazos Valley denied the permit because Fazzino could not demonstrate that he owned enough acreage under the district’s rules applicable to new wells. Fazzino filed suit in federal district court arguing that Brazos Valley GCD deprived him of his right to equal protection under the 14th Amendment to the U.S. Constitution by allowing the city of Bryan to produce large amounts of groundwater while refusing Fazzino a similar opportunity to produce his own fair share and that this constituted a taking of his private property without compensation.

The Federal District Court in Waco issued orders dismissing Fazzino’s equal protection and takings arguments on the basis that (1) the Brazos Valley GCD directors were immune from suit, both under qualified immunity and 11th Amendment immunity, that (2) under *Williamson Cty. Reg’l Planning Comm’n v. Hamilton Bank of Johnson City*, Fazzino’s taking claim was not ripe because Fazzino had neither received a final decision regarding the application of the challenged regulations nor sought compensation for the alleged taking in state court, and (3) that the takings claim was subject to Burford abstention because Texas law is unsettled with respect to what protectible rights a landowner has in groundwater that is subject to regulation by a groundwater conservation district.

The court’s decision to extend 11th Amendment immunity to GCDs was significant. The court determined that groundwater conservation districts should be treated as “arms of the state” since they were created under Article XVI, Section 59 of the Texas Constitution, they receive some state funding in the form of grants from the TWDB, both the TWDB and TCEQ have some oversight authority over GCDs, and groundwater management is a statewide problem.

On May 29, 2020, the Fifth Circuit overturned the district court’s decision in the case, potentially resulting in major implications for groundwater litigation and management in Texas. First, the Fifth Circuit concluded that groundwater conservation districts are not arms of the

state and do not enjoy 11<sup>th</sup> Amendment immunity. According to the Fifth Circuit, “[t]he purpose of the Eleventh Amendment is to recognize state sovereignty by shielding states, absent their consent or an explicit act of Congress, from money judgments assessed in federal court. The Eleventh Amendment does not bar suit, though, “if the political entity possesses an identity sufficiently distinct from that of the State.”<sup>35</sup> Like the district court, the Fifth Circuit evaluated the factors established in case law that a court must weigh in determining whether 11<sup>th</sup> Amendment immunity exists but it reached a different conclusion than the district court. The Fifth Circuit found that groundwater conservation districts do not possess identities sufficiently distinct from the state for the following reasons: GCDs are more akin to political subdivisions, similar to counties, which do not enjoy 11<sup>th</sup> Amendment immunity; GCDs are not state funded; there is limited state control over GCDs; and their jurisdictions are geographically local.

Secondly, as a result of the Supreme Court’s decision in *Knick v. Twp. Of Scott*, which overturned *Williamson Cty. Reg’l Planning Comm’n v. Hamilton Bank of Johnson City*, the Fifth Circuit determined that Fazzino’s takings claim was ripe because Fazzino had fully pursued the administrative remedies available to him. In *Knick*, the Supreme Court held that “the property owner has suffered a violation of his Fifth Amendment rights when the government takes his property without just compensation, and therefore may bring his claim in federal court under § 1983 *at that time*.”<sup>36</sup>

Finally, the Fifth Circuit held that the district court abused its discretion when it held that the Burford abstention doctrine applied to Fazzino’s takings claim on the basis that Texas law related to groundwater ownership is unsettled. The Fifth Circuit disagreed, holding that Texas law is clear: “the Texas Supreme Court reaffirmed in *Day* that groundwater is owned in place by the surface landowner, and the EAA’s (and by necessary implication, GCDs’) regulatory provision affording landowners a “fair share” of groundwater confers property rights that may be enforced in takings law and under doctrines of equal protection.”<sup>37</sup> Consequently, the Fifth Circuit reversed the district court’s ruling dismissing Fazzino’s equal protection and takings claims and remanded the case for the district court to decide on the merits “whether the groundwater scheme effectuated by BVGCD’s Rules promulgated in December 2004 has resulted in a taking of Fazzino’s interest.”

### ***Neches and Trinity Valleys Groundwater Conservation District v. Mountain Pure TX, LLC***

This case is an interlocutory appeal brought by the Neches and Trinity Valleys GCD to the 12<sup>th</sup> Court of Appeals in Tyler as a result of the district court’s denial of its plea to the jurisdiction alleging governmental immunity. The groundwater district filed suit against a bottled water company, Mountain Pure TX, seeking to require Mountain Pure to comply with the Texas Water Code and GCD rules, which require an entity to obtain a permit to operate a well. According to the groundwater district, Mountain Pure was pumping groundwater from an unpermitted well for its spring water bottling plant and refused to obtain a permit. Mountain Pure filed a series of counter claims, maintaining that the water it bottled and sold did not come from a well, but from an “underground formation from which water flows naturally to the surface of the earth,” and arguing that the District’s enforcement action against it constituted a regulatory takings.<sup>38</sup>

At issue on appeal was whether the district court erred when it denied the GCD's plea to the jurisdiction alleging governmental immunity. The Texas Constitution waives governmental immunity with respect to inverse condemnation (regulatory takings) claims, but absent a properly pleaded takings claim, the government retains immunity, and a court must sustain a properly raised plea to the jurisdiction.<sup>39</sup> The 12<sup>th</sup> Court of Appeals reversed the district court's denial of the GCD's plea to the jurisdiction, holding that an enforcement action cannot give rise to a regulatory taking claim and that Mountain Pure had not asserted a valid takings claim. Consequently, the Court of Appeals overruled the district court's denial of the Neches and Trinity Valley GCD plea to the jurisdiction.

The Court of Appeals decision is noteworthy because it clarified that when a GCD's rules have not yet applied restrictions to a landowner's property, "a civil enforcement action alone cannot serve as the basis of a regulatory takings claim."<sup>40</sup>

## Legislative Action or Interest

### Permitting and Management

The Texas Legislature continues to wrestle with the conundrum over how GCDs manage shared groundwater resources while ensuring that landowners' property rights are protected. During the 85<sup>th</sup> legislative session (2017), Sen. Charles Perry, chair of the Senate Agriculture, Water, and Rural Affairs Committee, introduced Senate Bill 1392, which would have made comprehensive changes to Chapter 36 of the Water Code and groundwater management in Texas. The bill reinforced the requirement that GCDs consider the impact their permitting decisions have on property rights, required districts to issue permits based on the surface acreage of overlying land, and required districts to designate common reservoirs of groundwater, similar to oil and gas reservoirs. Property rights interests and groundwater marketing and development interests supported the bill, but the majority of GCDs and conservation interests opposed the bill. The bill passed the Senate Agriculture, Water, and Rural Affairs Committee, but did not get a vote on the Senate floor.

### Fair Share

Rep. DeWayne Burns carried legislation in the 2017 session (HB 3028) that would have required GCDs to further recognize private property rights in groundwater by applying oil and gas law concepts, such as "fair share" and "uncompensated drainage," to groundwater regulation. The proposed legislation would have added a definition for "fair share" to Section 36.001 of the Water Code. Under the proposed language, "fair share" was essentially defined as a landowner's right to an amount of groundwater for the purposes of production — the amount of groundwater beneath a landowner's land that may be produced under applicable desired future conditions (DFCs) and hydrogeological realities — without causing uncompensated drainage of the fair share of groundwater in place under other tracts of land. The Texas Farm Bureau and other property rights interests supported the bill, which was left pending in a House Natural Resources subcommittee.<sup>41</sup>

## **Retail Water Utilities**

Additionally, the Legislature is grappling with how municipal production of groundwater impacts property rights. Many GCDs permit municipal utilities to pump large amounts of groundwater from extremely small tracts of land (see *Fazzino v Brazos Valley GCD* litigation described above). These utilities have substantial investments in infrastructure and an expectation that the groundwater supplies served by that infrastructure will not be abated. Under Section 36.116(c) of the Water Code, GCDs may consider the service needs or service area of a retail public utility when regulating groundwater production by tract size or acreage.

During the 2019 session, two bills were filed which sought to modify Section 36.116(c). House Bill 2122, by Rep. Cody Harris, and its companion, SB 800, would have prohibited a GCD from considering the service needs or service area of a retail public utility unless the retail public utility had obtained permission from the landowner or purchased or leased the groundwater from the landowner. Neither of these bills passed. Property rights advocates like the Texas Farm Bureau supported HB 2122 and SB 800. The Farm Bureau argues that laws that permit a groundwater district to consider a utility's service area when determining production volume in a surface acreage-based district, "convey the private property rights of landowners in the groundwater under their land to the utility," "permit private property to be taken for a public use without compensation," and "unconstitutionally discriminate to the benefit of the utility by allowing the utility to produce large volumes of groundwater from small tracts of land when all the other groundwater users in the district are being allocated production based on the number of acres they own."<sup>42</sup>

Conversely, HB 2249 by Rep. Eddie Lucio III would have *required* a GCD to use a retail public water utility's service area or the utility's aggregate acreage when calculating the allowable production volume under surface acreage-based rules. The bill did not pass. The Texas Rural Water Association supported HB 2249, explaining that it addressed a growing trend of GCDs restricting the amount of water a utility can pump based on surface acreage owned.<sup>43</sup> Since many utilities historically pump large amounts of groundwater from small tracts of land, according to the Texas Rural Water Association, surface acreage-based production rules threaten the water supply of rural areas.<sup>44</sup>

GCDs maintain that they need flexibility in determining how to allocate groundwater to water utilities. According to GCDs, "if the current law is changed to mandate, rather than allow a GCD to consider the service needs or area of a retail public utility, it may impact and confuse issues of groundwater rights and ownership," disrupt existing regulatory systems, and increase litigation against GCDs.<sup>45</sup>

## **Standing**

The Legislature has not addressed the standing issues raised in the Lost Pines litigation. Attorneys for groundwater developers argued at a House Natural Resources Committee hearing in June 2018 that the Legislature should define who has standing under Chapter 36 of the Water Code to protest a groundwater permit, arguing that only those who have a particularized and concrete interest that is not common to the public should have standing. In other words, they argue that only landowners who are using wells should be granted standing to protest a

permit.<sup>46</sup> It is not clear how the private property rights of those landowners who are choosing to preserve their fair share by not pumping would have standing.

## **Issue 2: Challenges Related to Groundwater Management at the GCD Level**

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### **Snapshot**

The “patchwork” framework that has resulted from the state’s preference for local control and a lack of robust funding complicate groundwater management. Critics argue that small, county-based GCDs are ineffective because they manage groundwater based on a local political context rather than a hydrogeological one, often resulting in permitting decisions that impede export of groundwater and that favor historic users over, and at the expense of, future users and their property rights. It is also argued that local GCDs are not incentivized or equipped to address unmet regional and state-level demands for water supplies. Proponents of local management of groundwater, on the other hand, argue that local control ensures community representation of community values and concerns and recognition of hydrogeologic conditions specific to a district’s jurisdiction. These differing views aside, most interest groups agree that GCDs face numerous challenges related to managing groundwater resources within their jurisdictions.

### **Background**

The state of Texas has declared that GCDs are the state’s preferred method of managing groundwater. In 1949, state water regulators and utilities, who were advocating for state control of groundwater, and large landowners from the Panhandle, who wanted no regulation at all, compromised on local management of groundwater. As one high plainsman remarked, “I favor no control, but if we must have it, let it be local.”<sup>47</sup>

Currently, there are 98 confirmed GCDs and two GCDs awaiting confirmation covering all or part of 176 of the state’s 254 counties and the majority of the major and minor aquifers in Texas (Figure 1).

In some areas of the state, numerous GCDs with different rules and management plans regulate various portions of a shared aquifer. Aquifers are not confined by GCD boundaries and GCDs managing the same aquifer can have different management goals; unique rules, permitting and spacing requirements; and often entirely distinct concerns. As a result, “[m]anaging for sustainability or even some level of allowable depletion breaks down with small-scale county-based GCDs that do not have the power to regulate wells that are outside their district, even though such wells may draw from and deplete groundwater resources common to multiple districts.”<sup>48</sup>

In 2005, to address this fragmented regulatory structure and “to help generate groundwater policies that considered the shared groundwater resources among the GCDs,” the Legislature passed HB 1763, which required GCDs over the same aquifer to participate in joint planning within their groundwater management area (GMA).<sup>49</sup> The Texas Water Development Board (TWDB) determines the boundaries of GMAs, which generally follow the hydrogeological boundaries of aquifers across Texas. Together, GCDs within a GMA determine the desired future conditions for aquifers within their jurisdiction that are relevant to joint planning. In its most basic form, a desired future condition (DFC) is a long-term management goal for an aquifer “that captures the philosophy and policies addressing how an aquifer will be managed.”<sup>50</sup> GCDs use groundwater availability models to help them evaluate optional DFC expressions, and then select the DFC(s) that a supermajority of the GCDs approves. The TWDB then takes the DFC and uses it to develop the modeled available groundwater (MAG) for each relevant aquifer — the amount of groundwater that is available for permitting and planning purposes and, after deducting the amount that is exempt from permitting, for permitting by the GCDs.

In addition, many GCDs, especially smaller ones, have limited funding. Unfortunately, “GCDs in Texas face significant funding challenges, as they have statutorily restricted water use fee rates and low ad valorem taxation rates” and “[b]oth of these revenue-generating mechanisms are affected by the areal extent of the jurisdiction of a GCD.”<sup>51</sup> Chapter 36 provides GCDs with the authority to levy taxes and require permittees to pay user fees and production fees, but enabling legislation for many GCDs across the state limits this revenue authority. Many GCDs do not have the authority to levy taxes, and others are not permitted to set production fees or production fees are set at a very low rate. This can “hinder operational efficiency and limit the availability of resources and human capital needed to effectively manage the resource.”<sup>52</sup> Without sufficient funding, some GCDs are limited in their ability to study aquifer dynamics, develop modeling, monitor drawdown, and study the connection between groundwater and surface water as well as fully evaluate individual permit applications.

Moreover, many GCDs do not have the financial ability to defend permitting decisions or management goals if they are sued by disgruntled applicants or adjacent landowners. The concern is that looming threats of takings litigation are causing GCDs to grant production permits when they otherwise may have reduced or denied them.

## Differing Perspectives

### Desired Future Conditions

Although the Legislature created the joint planning process to facilitate a more consistent approach to groundwater management and planning, groundwater marketers and some urban water utilities argue that local management of groundwater is ineffective and thwarts their ability to market and export groundwater to areas of the state seeking to augment their water supply. They advocate for groundwater management based on aquifer boundaries, “not political subdivisions or arbitrarily gerrymandered management zones.”<sup>53</sup> On the other end of the spectrum, many landowners and conservation interests express frustration with local management goals that they believe are unsustainable and will further deplete aquifer levels.<sup>54</sup>

For example, in 2011, the Wimberley Valley Watershed Association (“WVWA”) unsuccessfully challenged the desired future condition for GMA 9 as it applied to the Trinity Aquifer within the boundaries of the Hays Trinity Groundwater Conservation District. WVWA argued that the DFC that Hays Trinity GCD adopted, which permitted a 30-foot average drawdown, was unreasonable because it would impact private wells and reduce springflow and baseflow to surface waterways.<sup>55</sup> The TWDB determined that the DFC was reasonable.

Groundwater marketers and some urban water utilities, on the other hand, argue that the desired future conditions process, described above, is plagued by local politics and local motivations to prohibit export of groundwater and artificially limit the amount of groundwater that is available to be pumped under the DFC.<sup>56</sup> Groundwater marketers claim that GCDs “reverse engineer” the desired future conditions, essentially setting a predetermined amount of pumping based on local concerns rather than sound science, and that consequently, there is a “regulatory induced shortage” of groundwater in Texas.<sup>57</sup> They believe there is far more groundwater available in aquifers than local GCDs are allowing to be produced.

In 2016, the city of Conroe, along with other cities in Montgomery County, filed a petition appealing the Lone Star Groundwater Conservation District’s desired future conditions in GMA 14, arguing that the Lone Star GCD reverse engineered the DFCs, artificially restricting groundwater production and infringing on property rights.<sup>58</sup> Lone Star questioned the need for the DFC petition because the district was in the middle of a three-year technical study to develop science to support changes to the DFCs to allow additional groundwater pumping.<sup>59</sup> In 2017 and after receiving the results from the three-year study and adoption of a new policy by the Lone Star Board, the parties determined the challenged DFCs were no longer reasonable. The board decided that in light of the results from the study, the policy should follow a model run scenario known as Run D that would allow additional groundwater pumping. Chapter 36 provides a process for the GMA district members to follow to revise a DFC after a successful DFC petition. Lone Star took Run D to the district members in GMA 14 and requested that the GMA districts revise Lone Star’s DFCs in accordance with Run D. Because the GMA had already started the process to adopt DFCs by the 2021 deadline, the members took no action on revising Lone Star’s DFCs for the second round of joint planning but voted unanimously to consider Run D in the next round of joint planning.

Because the five-year review of Lone Star’s management plan was not synced with the five-year DFC planning cycles, Lone Star had to submit its management plan for approval before GMA 14 adopted new DFCs. When Lone Star submitted its management plan to the TWDB for approval, the TWDB determined the plan was not administratively complete because Lone Star failed to include the 2016 DFCs. Lone Star argued that the 2016 DFC’s had been successfully petitioned and were found to be no longer reasonable, so the district did not have an effective DFC. TWDB maintained that Lone Star needed to include the 2010 DFCs in its management plan as those were the last DFCs that had been approved by GMA 14 and had not been challenged. Chapter 36 is silent on which DFCs should apply in a management plan when the DFCs are successfully challenged, and the GMA districts have not yet revised the DFCs. Lone Star filed suit to appeal the TWDB’s decision and the parties used mediation to settle the dispute. Lone Star adopted an amended management plan that included the 2019 DFCs and on June 9, 2020, the TWDB

approved Lone Star GCD's amended management plan. Additionally, the management plan acknowledges that Lone Star is working with other members of GMA 14 to propose appropriate DFCs by May 1, 2021, and adopt final DFCs by Jan. 5, 2022.

GCDs emphasize that the majority of districts across the state are managing groundwater efficiently and effectively, using sound science to support their decisions, and that they collaborate through the joint planning process. As a whole, most GCDs seem to believe that concerns such as those articulated above arise not from a systemic failure of the state's approach to groundwater management and planning, but that they derive from individual specific outcomes that are unfavorable to certain commercial and corporate interests, or are possible actions of simply imagined "rogue" districts, and/or are previous, rare situations that should not be used to indict the local management of groundwater. Interests opposed to the current approach also apparently find daunting the prospect of having to constructively work with and influence a dozen or more local GCD boards rather than a single governing body at the regional or state level, so their preference is to attempt to denigrate the local management approach in favor of something that they can more easily influence if not dictate.

### **GCD Rules**

Groundwater marketers and large groundwater users often express frustration with the array of permitting rules and management plans that result from the state having numerous county-based GCDs managing groundwater. They complain that rules placing moratoriums on production, allowing special conditions on permits, discriminating against different users, or allowing GCDs to collect fees on the export of groundwater hinder a strong groundwater market in Texas and interfere with property rights.

Collectively, GCDs maintain that local management of Texas's diverse groundwater resources provides GCDs with flexibility to address unique hydrogeological conditions and local needs and to fulfill their statutory mandate to balance the conservation and development of groundwater resources. According to districts, GCD rules across the state are different because they reflect differing local conditions and were adopted pursuant to enabling legislation specific to each district, which provides every GCD with a different level of funding and authority. Provisions in GCD rules that allow a district to issue a moratorium on issuing permits or to place special conditions on permits are essential to managing unique hydrogeological elements, addressing specific uncertainties that are being investigated, and assessing and protecting against impacts from production.<sup>60</sup> Finally, GCDs explain that in many cases, districts rely on fees as their sole source of revenue, and export fees "fund GCD operations necessary to monitor the impact of the withdrawal and manage the resource, or to mitigate impacts to local landowners."<sup>61</sup>

## **Recent and Current Litigation**

Over the years, applicants have filed a number of lawsuits and administrative appeals challenging the ability of GCDs to limit groundwater production.<sup>62</sup> As just one example, in 2015, the City of Conroe and other large volume pumpers filed a lawsuit in Montgomery County District Court challenging Lone Star GCD's groundwater reduction plan, which the district adopted to convert large volume groundwater pumpers to surface water in an effort to avoid

subsidence in the district. The plaintiffs petitioned the court to invalidate the district's desired future conditions, its large volume user rule, and its regulatory plan, arguing that they artificially restricted the amount of groundwater available for production in the county, lacked any legitimate and scientific basis, and destroyed the property rights of landowners by limiting the amount of groundwater available for them to pump. In September 2018, the Montgomery County District Court issued an interlocutory order declaring Lone Star GCD's large volume user rule invalid based on arguments that the rule exceeds the district's statutory authority granted by the Legislature. Lone Star appealed the decision, and in January 2019, newly elected members of the Lone Star GCD Board voted to settle the case with the city of Conroe and other utilities. The settlement agreement resulted in a final judgment in May 2019 declaring the district's rule void and unenforceable.

## Legislative Action or Interest

In an attempt to provide regulatory certainty to the groundwater permitting process and to move toward aquifer-wide management of groundwater, during the 85<sup>th</sup> legislative session, Perry, chairman of the Senate Agriculture, Water and Rural Affairs Committee, introduced Senate Bill 1392, which would have made comprehensive changes to Chapter 36 of the Water Code and groundwater management in Texas. Specifically, the bill as introduced removed the ability of GCDs to consider the public interest when adopting rules, prohibited districts from issuing permits with special conditions unless approved by the applicant, required GCDs to enact similar rules over common reservoirs of groundwater, prohibited districts from issuing historical based permits, and required districts to issue surface acreage-based permits. The bill passed the Senate Agriculture, Water and Rural Affairs committee, but did not get a vote on the Senate floor. Groundwater district and conservation interests opposed the bill.

Rep. Lyle Larson, chairman of the House Natural Resources Committee, filed a similar, less controversial bill, HB 31, during the 85<sup>th</sup> legislative session, that addressed issues related to regulatory certainty, such as administrative completeness requirements for permit applications, export permits, and moratoriums. The Texas Association of Groundwater Districts supported the bill, and it passed the House, but it never made it out of the Senate.

During the 86<sup>th</sup> legislative session, Chairman Perry filed SB 1010, which generally sought to prohibit GCDs overlying a "common aquifer" and located within the same GMA from making or enforcing rules that are not similar to another GCD. Although SB 1010 passed the Senate, it was not voted out of the House Natural Resources Committee.

Chairman Larson filed HB 726 during the 86<sup>th</sup> legislative session that sought to (1) require GCDs to consider impacts to registered exempt wells when evaluating permits; (2) clarify that the rules in place at the time of a permit application govern consideration of the permit; (3) authorize GCDs to issue 90-day moratoriums under certain circumstances only after a notice and hearing process has occurred; and (4) prohibit a district from issuing a separate export permit from an operating permit. The bill passed the House but did not receive a hearing in the Senate.

## **Attorney Fees**

Groundwater marketers and property rights interests have expressed concern over language in Chapter 36 that requires a court to award attorney fees to a groundwater conservation district if the district requests them and prevails in a lawsuit. Groundwater marketers and property rights interests argue that this one-sided provision deprives landowners of their ability to protect their property rights because they fear they will have to pay a district's attorney fees if they do not win in court. Interests like the Texas Farm Bureau argue that the only legal recourse a landowner has to defend his constitutionally protected groundwater rights is to file a takings lawsuit against the district, and the current one-sided attorney fees provision intentionally dissuades landowners from suing districts.<sup>63</sup>

GCDs defend the current attorney fees provision, arguing that it was intentionally written to insulate districts from frivolous lawsuits and protect the taxpayers and ratepayers from the financial burdens of prolonged litigation. The decision to include the attorney fees provision was made after proposals requiring the Texas Attorney General's Office to represent GCDs led to a "fiscal note" that would have killed the entire bill.

Nevertheless, in response to the property rights concern, during the 85<sup>th</sup> legislative session, Perry filed Senate Bill 862, which would have allowed a court to award attorney fees to any prevailing party, not just GCDs. Proponents of the legislation argue that it is consistent with other statutes. GCDs, on the other hand, insist that no other state agency is subject to a similar requirement and all other agencies have state-supported representation through the attorney general's office.

The subject of attorney's fees awards to GCDs was front and center during the 86th legislative session. Two bills were filed that proposed to amend the provisions in Chapter 36 that require a court to award attorney's fees to a prevailing GCD. House Bill 2125, by Rep. Burns, would have removed the mandatory requirement that a court issue an attorney's fees award to a GCD, instead making it permissive, essentially giving the court discretion. This "one-way" award (still only to a GCD) received support from many GCDs, hoping to reach a compromise on the issue, as well as the Texas Association of Groundwater Owners and Producers and the Farm Bureau. Chairman Perry filed a more controversial bill, Senate Bill 851, which would have made the award of attorney's fees permissively available to any prevailing party in a lawsuit. In other words, a landowner bringing a lawsuit against a GCD could also recover attorney's fees against the GCD. While SB 851 was voted favorably by the Senate, neither bill made it past the House Natural Resources Committee, as the committee membership seemed to disfavor attempts to expose GCDs to additional litigation.

# Issue 3: Challenges Related to Groundwater and Surface Water Connection

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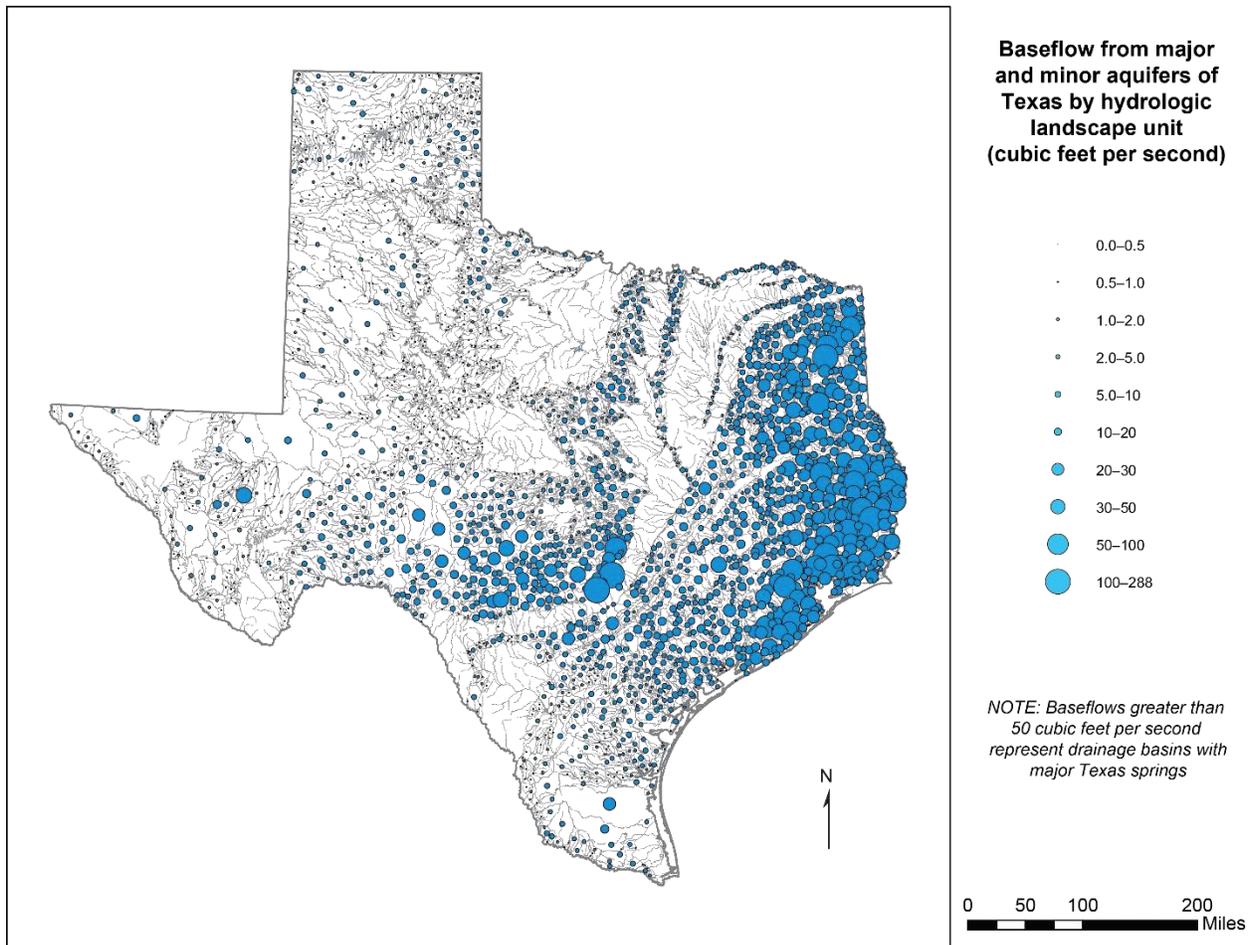
## Snapshot

Despite the hydrogeological relationship between groundwater and surface water in some areas of the state, Texas water law has few features that recognize or accommodate this connection. Surface water is owned by the state, and groundwater is privately owned by the overlying landowner. As a consequence, distinct water allocation and management systems govern groundwater and surface water in Texas. The absence of a more comprehensive framework for conjunctively managing groundwater and surface water may adversely affect both groundwater and surface water resources, as increased groundwater pumping can reduce springflow and baseflow in creeks and rivers and ultimately reduce the reliability of the surface water rights of downstream permit holders.

## Background

The state of Texas has historically treated groundwater and surface water as independent water bodies. This is contrary to the water cycle, where, as Professor Charles Porter explains, “surface water, diffused surface water, and groundwater are, have been, or will be ultimately in union with one another; water exists in a conjunctive relationship in all three geological containers all the time.”<sup>64</sup>

During the 84<sup>th</sup> legislative session in 2015, the Legislature passed HB 1232, which directed the TWDB to determine the contributions of groundwater from major and minor aquifers to surface water in the state of Texas. The TWDB estimates that, statewide, 30% of all surface-water flows in Texas originate from groundwater.<sup>65</sup> According to the TWDB, “eighteen major and minor aquifers contribute between 20 and 50 percent of the flow to streams flowing over their outcrop zones,” and “groundwater contributions to surface water are greatest in East Texas and around major springs in the Hill Country and west Texas (Figure 2).”<sup>66</sup> Groundwater is obviously an important source of flow, especially of ecologically critical baseflow, to surface waterways in many parts of Texas.



*Figure 2: Baseflows from aquifers by hydrologic landscape unit (in cubic feet per second), Texas Water Development Board, Texas Aquifer Study.*

Numerous additional studies support the connection between groundwater and surface water throughout Texas. The Texas Water Development Board has recently completed a study analyzing groundwater resources in Val Verde County. Key takeaways from the study include that groundwater pumping in the Edwards-Trinity Aquifer impacts surface water flow to the Devils River. Local residents and landowners are concerned that unregulated groundwater pumping in Val Verde County, which lacks a groundwater conservation district, will impact property rights and flow to the Devils River and San Felipe Springs, which are both important to the baseflows into and water rights derived from the Rio Grande, and which both provide habitat to endangered species such as the Texas Hornshell Mussel. Another recent study of the hydrogeology of the Devils River and Edwards-Trinity Aquifer also illustrates the linkage of groundwater flow with surface-water flow in the Edwards-Trinity Aquifer located within the Devils River watershed.<sup>67</sup>

The TWDB also completed a study in 2010 that examined groundwater contributions to the Brazos River, and concluded that “[w]ater levels and base flow analyses suggest that a substantial portion of the water in the Brazos River is derived from baseflow from the shallow alluvial aquifer.”<sup>68</sup> Additionally, dye trace studies conducted by hydrogeologists in the Trinity

and Edwards Aquifers have confirmed groundwater and surface water connections in both Onion Creek and the Blanco River.<sup>69</sup>

Despite these hydrogeological connections, two entirely separate bodies of law govern groundwater and surface water in Texas. Surface water is owned by the state and is held in trust for the public welfare.<sup>70</sup> This “State Water” includes all of the “water under ordinary flow, underflow and tides of every flowing river, natural stream, lake, bay, arm of the Gulf of Mexico, and storm water, floodwater or rain water of every river, natural stream, canyon, ravine, depression, and watershed in the state.”<sup>71</sup> Under Chapter 11 of the Water Code, the Texas Commission on Environmental Quality (“TCEQ”) issues permits to individuals or entities that give them the right to use the state’s water through a system called “prior appropriation,” or “first in time, first in right.”<sup>72</sup>

Groundwater, on the other hand, is privately owned in place by overlying landowners.<sup>73</sup> It is defined as “water percolating below the surface of the earth.”<sup>74</sup> Although the common law rule of capture prohibits landowners from seeking damages against a neighboring landowner who pumps and draws down aquifer levels, in many areas of the state, groundwater production is regulated by local GCDs under Chapter 36 of the Water Code.<sup>75</sup>

In the past, Texas courts have held that landowners may continue to pump their privately owned groundwater, even if doing so decreases springflow and surface water for downstream users.<sup>76</sup> In a 1954 case involving the infamous West Texas watering hole, Comanche Springs, which has now ceased flowing, the Texas Court of Civil Appeals relied on the rule of capture to hold that Clayton Williams could pump groundwater from beneath his property even though doing so dried up Comanche Springs, which downstream farmers relied on for irrigation.

Only one case in Texas has resulted in protections for springs — a lawsuit involving endangered species in Comal and San Marcos springs in the Edwards Aquifer, which the Sierra Club filed in the early 1990s against the U.S. Fish and Wildlife Service.<sup>77</sup> Decades of heavy groundwater pumping in the Edwards Aquifer resulted in diminished flows in both Comal and San Marcos springs.<sup>78</sup> As a result of the lawsuit, a federal judge ordered the service to determine minimum flow levels for the springs and threatened the state of Texas that the court would exert control over pumping in the Edwards Aquifer region if the Legislature failed to act. After the judgment, the Texas Legislature responded by creating the Edwards Aquifer Authority and establishing a cap on annual withdrawals from the aquifer. The Edwards Aquifer Authority developed a regulatory program designed to protect minimum flow levels necessary for the listed species to survive.<sup>79</sup> The Edwards Aquifer Authority, however, is a distinct governmental body from GCDs whose authority is articulated under Chapter 36 of the Water Code.

## Differing Perspectives

Diverse stakeholders in Texas agree that science supports the connection between groundwater and surface water and that groundwater management in Texas would benefit from the state developing policy that integrates groundwater and surface water management at least to some degree. It is also true that existing statutory and regulatory authorities may provide some

mechanisms by which the effects of such hydrologic connections could be better accommodated, for example, via relevant aquifer subdivisions and specification of springflows as DFCs, yet individual GCDs and groundwater management areas are not fully utilizing these authorities or tools.

### **Coordination of Regulatory Authority**

Some observers believe that the state cannot sufficiently protect water resources if groundwater and surface water are not managed as one connected system. Increased groundwater pumping impacts springflow and baseflow in creeks and rivers, and conversely, “in some instances, surface water serves as a source of flow that can change the chemistry and availability of groundwater.”<sup>80</sup>

Chapter 36 of the Water Code does not require GCDs to specifically protect springflow or surface water even though their permitting decisions have obvious impacts on these resources. Under Section 36.113(d)(2), GCDs are required to *consider* impacts to surface water resources before they grant a permit, but they are not required to ensure that springs continue to flow.<sup>81</sup>

Chapter 36 also requires GCDs to *consider* “impacts on springflow” when adopting desired future conditions, but does not require GCDs to adopt desired future conditions that ensure healthy flow rates for springs within their jurisdiction.<sup>82</sup> According to one scholar, the “consideration is weighed along with ‘socioeconomic impacts,’ ‘interests and rights in private property,’ and ‘any other information relevant’ to the specific DFC, effectively making it difficult for districts to prioritize such environmental impacts and embracing conjunctive management as a guiding principle for joint water planning.”<sup>83</sup>

It is important to note that under Chapter 36 of the Water Code, there are voluntary ways that GCDs can protect surface water resources — provided that they have the technical information to understand how to do so. For example, districts can adopt a desired future condition that specifically protects springflow by establishing a flow level for a spring or levels of drawdown designed to ensure artesian pressure in the aquifer is maintained. The district can then manage groundwater by, for example, curtailing permitted pumping to ensure that this desired future condition is being met. To protect the habitat of federally listed species under the Endangered Species Act, both the Barton Springs Edwards Aquifer Conservation District in Travis and Hays counties and the Clearwater Underground Water Conservation District in Bell County have adopted desired future conditions that establish levels of flow for springs within their jurisdiction. Additionally, under Chapter 36 of the Water Code, a groundwater district has the authority to adopt special rules or management zones to protect groundwater resources, such as a spring, within its jurisdiction.

Interestingly, Section 36.071 of the Water Code requires GCDs in coordination with surface water management entities to develop a management plan that “addresses conjunctive surface water management issues” and tasks GCDs with “estimating the annual volume of flow into and out of the district within each aquifer and between aquifers in the district, if a groundwater availability model is available.”<sup>84</sup> With regard to surface water permits, Texas Water Code §11.151 requires the TCEQ to “consider the effects, if any,” that a surface water permit will have

on groundwater or groundwater recharge, but the law does not require the agency to ensure that groundwater is not impacted by surface water diversions. State law in Chapters 36 and 11 of the Water Code recognizes the connection between groundwater and surface water, yet neither the TCEQ nor GCDs have the legal authority to regulate the interaction or the impacts of their permitting decisions on the hydrogeologically connected water body. This “inherent statutory conflict” leaves both groundwater and surface resources in Texas vulnerable.<sup>85</sup>

In some circumstances, wells located close to stream beds are actually pumping the underflow of a river as opposed to groundwater from an aquifer. Underflow is defined as surface water in Texas and a well owner is required to obtain a permit from the TCEQ to operate a well that pumps underflow. Historically, however, “the TCEQ and its predecessor agencies have been less diligent in taking aggressive action toward the diversion of state-owned water from underflow that has been prevalent for years (and continues today) in massive volumes for a variety of uses – either with no water right in place or at volumes greatly exceeding the amount authorized by an existing water right.”<sup>86</sup>

Downstream landowners along the San Saba River in Menard County claim that upstream farmers have drilled shallow alluvial wells that are pumping San Saba underflow or state-owned water, rather than groundwater, and are therefore depriving the river of flow. In 2015, after years of investigation, the TCEQ agreed, determining that some of the wells are pumping state-owned water and that the well owners needed to obtain a surface water permit from the TCEQ. The farmers dispute that conclusion and attribute reduced flows to severe drought and other causes. The issue has gained considerable attention and was a subject of testimony at a House Natural Resources Committee hearing in June 2017.<sup>87</sup>

### **Correlation of Availability Models**

In addition to Texas water law failing to recognize the interconnectivity of groundwater and surface water resources, surface water and groundwater availability models do not address the connection between groundwater and surface water. A surface water availability model (WAM) is “a computer-based simulation predicting the amount of water that would be in a river or stream under a specified set of conditions.”<sup>88</sup> The input files for a WAM include information about the river basin hydrology, historic gauged stream flows, and the details of water rights permits.<sup>89</sup> A groundwater availability model (GAM) is “a computer model that includes comprehensive information on each aquifer, such as recharge (amount of water entering the aquifer); geology and how that conveys into the framework of the model; rivers, lakes, and springs; water levels; aquifer properties; and pumping.”<sup>90</sup> However, “the WAMs do not account for stream-aquifer interactions over time or variable hydrologic conditions and predictive simulations using the GAMs do not account for streamflow changes associated with permitted surface-water withdrawals and/or return flows.”<sup>91</sup> In other words, in general the WAMS and the GAMS function in isolation from one another even though in reality, the availability of surface water and groundwater is influenced by each other. This lack of model connection can greatly impede any efforts to conjunctively manage groundwater and surface water.

### **Lack of Site-specific Information and Data**

Despite numerous studies related to groundwater and surface water interactions throughout much of Texas, GCDs need more complete information about local groundwater-surface water interactions “to properly address questions of how much groundwater pumping is affecting surface-water availability, flow, and quality.”<sup>92</sup> Many GCDs lack the data and science to properly consider whether a proposed permit will impact surface water resources, and similarly, the TCEQ lacks the data and monitoring needed to understand the impact that surface water permits have on groundwater resources. A more fundamental issue in this regard is that TCEQ has traditionally considered that, other than its own “Edwards Rules,” it has no jurisdiction or mission to consider effects of its other regulatory programs on groundwater quantity or quality.

According to experts, scientists and policy makers need more adequate field data to understand the complexities of groundwater surface water interactions. Too often, baseflow estimation techniques are unreliable because they do not provide consistent estimates or consider bank flow. Moreover, model simulations do not always adequately reflect the physical processes occurring in groundwater surface water interactions.<sup>93</sup>

### **Recent and Current Litigation**

Ironically, even though Texas does not provide a comprehensive framework for its agencies to conjunctively regulate the effect of groundwater pumping on surface flows, the state of Texas has sued the state of New Mexico based on this very argument. The suit claimed that farmers pumping groundwater from wells near the Rio Grande River in New Mexico are causing diminished flows in the Rio Grande and that consequently, New Mexico is failing to follow through with its obligation to deliver water from Elephant Butte Reservoir under the Rio Grande Compact.<sup>94</sup>

### **Legislative Action or Interest**

The House Natural Resources Committee recommended in its Interim Report to the 86<sup>th</sup> Legislature that the Legislature provide funding to the TWDB to study the influence of groundwater production on surface water resources in order to develop solutions to address their interaction.

During the 86<sup>th</sup> session, Chairman Larson filed House Bill 4570, which sought to create a nine-person advisory board charged with studying the extent of surface water and groundwater interaction in Texas, the challenges arising from these interactions, and potential approaches to mitigating those challenges. The bill did not receive a vote in the House, but the issue of groundwater and surface water interaction will likely be a topic during the 87<sup>th</sup> legislative session.

# Issue 4: Challenges Related to Sustainable Management of Groundwater

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## Snapshot

Texas groundwater statutes set the guiding terms for how local GCDs and GMAs set management goals. Recent changes to those laws, and on-going disputes about how much groundwater can or should be removed from an aquifer, have arguably moved the law away from sustainable management goals and toward maximizing groundwater withdrawals.

## Background

Chapter 36 provides GCDs with the authority to develop sustainable management goals under the desired future condition process. GCDs with jurisdiction over shared aquifers work together in a groundwater management area (GMA) to establish desired future conditions for these aquifers, which are defined as the “the desired, quantified conditions of groundwater resources (such as water levels, water quality, springflow, or saturated thickness) at a specified time or times in the future” — essentially a long-term objective for how much groundwater will remain in the aquifer in 50 years.<sup>95</sup>

Each GMA submits its DFCs to the Texas Water Development Board (TWDB), which uses them to determine the modeled available groundwater (MAG) for the aquifer. A MAG value is the amount of groundwater production, on an average annual basis, that will achieve a DFC according to the results of TWDB’s model run.<sup>96</sup> GCDs use the MAG as a factor in their permitting decisions, as Chapter 36 requires GCDs to manage groundwater in a way that achieves the adopted DFC.<sup>97</sup>

In 2011, the Legislature passed Senate Bill 660, which resulted in comprehensive changes to the desired future condition process. The bill added nine factors that a groundwater district must consider when adopting a DFC. Among these are environmental impacts, socio-economic impacts, property rights, and “hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator.” The TWDB defines total estimated recoverable storage (TERS) as “[t]he estimated amount of groundwater within an aquifer that accounts for recovery scenarios that range between 25% and 75% of the porosity-adjusted aquifer volume.”<sup>98</sup> In other words, TERS represents the maximum amount of groundwater that may be technologically feasible to recover from an aquifer without regard to other impacts.

Senate Bill 660 specified that the desired future conditions “must provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area.”

## Differing Perspectives

### **Role of Total Estimated Recoverable Storage in determining groundwater availability**

The result of SB 660 has been to ignite debate between groundwater developers and technical experts over this balancing test and what exactly “highest practicable level of groundwater production” means. Groundwater development interests argue that the “highest practicable level of groundwater production” equates to TERS. They argue that there is far more groundwater available for production within aquifers — that “[m]ajor aquifers located in the most populous parts of the state contain an unlimited supply of water at current consumption rates.”<sup>99</sup>

Technical experts disagree, arguing that by definition TERS does not include factors that would cause a GCD to limit production from an aquifer. Such factors include impacts to surface water, recharge, groundwater wells, water quality, subsidence, and whether it is practical or economically feasible to pump such a high volume of water from a particular aquifer.<sup>100</sup> According to the TWDB, although roughly 25% to 75% of the approximate 16.8 billion acre-feet of freshwater groundwater in Texas may be recoverable, “this range does not account for possible economic, environmental, or legal consequences of such pumping,” factors that do set realistic limits on what the highest practicable level of production might be in a certain aquifer.<sup>101</sup> Thus, many hydrogeologists agree that the MAG represents a volume that falls somewhere between what is sustainable and what the highest practicable level of groundwater production is in an aquifer. According to hydrogeologists, “with few exceptions, TERS is far greater than the highest practicable level of groundwater production and is not a useful tool for the planning and management of aquifers.”<sup>102</sup>

### **Managed depletion and the MAG**

Although GCDs have the legal responsibility to conserve groundwater, Chapter 36 authorizes GCDs to regulate the production of groundwater through “managed depletion.”<sup>103</sup> While GCDs can, in theory, adopt sustainable goals under the DFC process, “[a]most without exception, the GCDs that have been created to protect landowners from the imprudent actions of their neighbors are managing their aquifers to be drawn down over time.”<sup>104</sup> This future then is interpreted as the locally desired outcome for the aquifers, which may or may not be the actual intent of all users of the aquifer. For some aquifers, like the Ogallala, this may be the only method of managing groundwater, but for other aquifers throughout the state, a more sustainable approach is possible.

Initially, the MAG was defined as managed available groundwater, and Chapter 36 required districts to issue permits “to the extent possible ... up to the point that the total volume of groundwater permitted equals the managed available groundwater.” In 2011, the Legislature passed Senate Bill 737, which changed the term from managed to modeled available

groundwater to allow GCDs more flexibility in permitting. Instead of issuing permits “up to” the MAG, districts must now issue permits “up to the point that the total volume of exempt and permitted groundwater production will achieve an applicable desired future condition.” The MAG is now the amount that can be *produced* on an annual average, instead of amount that can be permitted and that is consistent with achieving the DFC, as opposed to a permitting ceiling per se.

To put it simply, the result is that GCDs can issue permits over the MAG, provided that at the end of the day, overall production (controlled by periodic review of production levels under the permits) within the district still achieves the DFC. This is the approach Post Oak Savannah GCD has taken, which has been sharply criticized by some in the environmental community, who argue that it undermines the ability of the district to achieve the DFC.<sup>105</sup> The goal of Post Oak’s rules, however, appears to be consistent with Chapter 36 — to achieve the DFCs through regulating the actual production of groundwater rather than limiting the number of permits that can be issued. Post Oak has consistently maintained that its rules allow the district to reduce the groundwater production authorized in previously issued permits and to lower the permitted production per acre for all permits issued in the future based on the aquifers reaching identified threshold levels.<sup>106</sup>

Many GCDs, however, continue to treat the MAG like a cap, limiting permits that exceed the MAG. This has led groundwater developers, who want to pump more groundwater to meet Texas’ water supply needs, to argue that policymakers should modify Chapter 36 during the upcoming legislative session to clarify that the MAG is not a cap.

### **The Rule of Capture Impedes Sustainable Management**

Approximately one-third of Texas is not regulated by a groundwater conservation district. In areas of the state without a groundwater conservation district, a landowner’s right to pump groundwater from beneath his property is governed solely by the rule of capture, and withdrawals are limited only by the exceptions to the rule of capture — i.e. causing waste, malicious drainage, or subsidence. Beyond these exceptions, in these unregulated areas, there are no mechanisms in place to ensure that long-term groundwater use is protected. When unregulated groundwater pumping threatens other pumpers, springflow or surface water flow, Texas law provides no mechanism for protection, even though the unrestricted pumping is in direct conflict with other legal and economic uses of water by other groundwater pumpers, surface water diverters downstream, and fish and wildlife habitat.

## **Legislative Action or Interest**

Chapter 36 provides no consistent guidance for GCDs on how to determine sustainable volumes of production for aquifers across the state, and sustainable production is not a factor that GCDs must explicitly consider when adopting desired future conditions. In an attempt to address this oversight, Rep. Lucio III introduced HB 3166 during the 2017 legislative session, which would have added “modeled sustainable groundwater pumping” to the list of factors GCDs must consider when adopting desired future conditions, or, in other words, “a bookend for TERS.” It

defined "modeled sustainable groundwater pumping" as the maximum amount of groundwater that the executive administrator determines may be produced in perpetuity from an aquifer on an annual basis using the best available science. The intent of the bill was to provide GCDs with information on the sustainable yield of aquifers so that they can better protect property rights and surface water emerging from springs.<sup>107</sup> The bill was a consensus piece of legislation that emerged from the Texas Water Conservation Association. It passed the House but died in the Senate Agriculture, Water and Rural Affairs Committee. It received support from interests including the Texas Landowners Council and the Texas Wildlife Association.

## Issue 5: Challenges Related to Marketing and Exporting Groundwater

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### Snapshot

Increased population growth in Texas, predominantly in urban centers of the state, is placing pressure on dwindling surface water supplies. Texas does not have widespread groundwater markets, but some utilities and cities in search of additional water supplies are turning to importing groundwater from rural areas of Texas. The existing and proposed large-scale marketing and export of groundwater is generating a variety of conflicts, pitting rural interests against urban, potentially threatening the economies, property rights, and ecology of rural areas from where groundwater is exported, and creating regulatory and political challenges for local GCDs. Many question if the sale and export of groundwater from rural areas is a good idea for Texas' water future. At the very least, in cases where an urban area may have no alternative supply, mechanisms for groundwater export should ensure protection of local interests and the environment over the long term are needed.

Despite these notable concerns surrounding the export marketing of groundwater, some types of voluntary transactions, such as water trades, water banks, dry year options and other forms of market-based approaches — with proper guidelines — could be quite useful in bringing aquifers into a sustainable balance and addressing shifting demand patterns within the aquifer.

### Background

The Texas groundwater market is considered to be a developing market.<sup>108</sup> Currently, with the exception of newly developing large export proposals (see below), groundwater transactions primarily take place in local markets dependent on local characteristics such as supply and demand, types of use, and the local regulatory environment.<sup>109</sup> In the past, there have been a few large groundwater transactions in Texas, most notably the \$110 million water sale between Mesa Water and the Canadian River Authority, but most groundwater transactions “are often kept private” and “[w]ater marketing in Texas is generally opaque.”<sup>110</sup>

The only aquifer in Texas with a formal, transparent market is the Edwards Aquifer. This is a result of the Legislature placing a statutory cap on groundwater production from the aquifer, which allowed the Edwards Aquifer Authority to fully allocate groundwater to users across the aquifer. With the resource fully allocated, new groundwater users in the Edwards Aquifer are forced to buy or lease water rights. The majority of groundwater transfers in the Edwards Aquifer are sales or leases of agricultural rights, although this could be changing. Additionally, the Edwards Aquifer Authority adopted trade rules designed to protect existing uses, such as agriculture, and developed permitting rules designed to ensure safe yield of the aquifer and protect springflow from Comal and San Marcos springs. Institutional oversight in the Edwards, which is lacking in other GCDs, has facilitated development of a groundwater market with strong regulatory oversight, although even this program is not without controversy.

However, with Texas' population boom comes increasing pressure on surface supplies to meet growing water supply demands. As a result, some urban areas are turning to purchasing and importing groundwater from rural areas, often at the urging of private water developers. Proponents of this approach argue that this is an efficient and effective means of reallocating a scarce natural resource.<sup>111</sup> In this vein, other touted benefits include stimulating water use efficiency by establishing a consistent monetary value for water, increasing water availability by moving it from areas where it is more abundant and underused to locations where it is needed, and providing mechanisms for returning water to the natural world. Often, however, there are negative impacts associated with out-of-aquifer groundwater transfers, specifically impacts to the environment and aquifer of origin communities. It is possible that some of these impacts may be mitigated, but strong planning, monitoring, and management programs are needed to ensure possible problems are identified and addressed.

Many groundwater export projects are met with local opposition. At the core of this opposition is resistance to the transfer of a water supply that may be needed for future local economic development, especially where the municipal area to which it might be exported has not shown that it does not have alternative supply or conservation options to meet its needs. Thus, the idea that one landowner can pump groundwater upon which most rural landowners depend for basic domestic needs or agricultural use and sell it to growing cities miles away is a major source of conflict in Texas today. There are numerous examples of this conflict, including the Vista Ridge pipeline project, which would pump groundwater from the Carrizo Aquifer in Burleson County to San Antonio; the Forestar Project in Lee County; and the Electro Purification project in Hays County. The fact that many GCDs do not have rules in place that protect local resources or manage based on sustainable yield only increases local resistance to export projects.

Moreover, because the controversy over these large export projects dominates the policy and political debate, the more local use of market tools to meet sustainable management goals within an aquifer or sub-aquifer is often overlooked.

## Differing Perspectives

There are conflicting perspectives around the appropriate amount of and type of regulatory oversight needed to facilitate the use of voluntary transactions that support flexibility in water use while contributing to groundwater sustainability. “The trick for policy makers is to find a balance that provides stability and limits unintended consequences while not creating delays, exorbitant transaction costs, and overly burdensome rules that would hinder market activity.”<sup>112</sup>

### **Production Caps**

As evidenced by the Edwards Aquifer Authority example, an active water market requires that policymakers set a cap on production from the aquifer and fully allocate available water to facilitate “reallocation via trade.” This is because “[t]here is little to no incentive to trade within an uncapped aquifer when more rights are obtainable by other means.”<sup>113</sup> However, state lawmakers and GCDs in other parts of Texas have not set production caps for any other aquifers. In fact, somewhat perversely, some interests supporting groundwater exporting are pushing for policy that would make more groundwater available for production without any real regulatory boundaries.

When the Legislature passed House Bill 1763 in 2005, the intent was for the desired future conditions process to result in aquifer-based pumping limits, referred to as the “managed available groundwater for an aquifer,” serving as a cap. It is possible that the framework could have “set the stage for development of water markets in aquifers with fully allocated water rights within the cap.”<sup>114</sup> In 2011, however, the Legislature changed “managed available groundwater” to “modeled available groundwater,” requiring GCDs to manage groundwater production on a long-term basis to achieve a desired future condition, and to simply consider the modeled available groundwater in this analysis. Because it can be challenging for GCDs to measure whether they are achieving the DFC, the lack of production limits or caps has created a nebulous allocation environment that is not conducive to groundwater trading.

### **Protections for Basins of Origin and the Environment**

Large-scale, out-of-aquifer groundwater export projects can potentially have adverse environmental impacts by causing groundwater declines, potentially impacting local wells and surface water. Additionally, because groundwater use for municipal needs or oil and gas production fetches a higher monetary value for groundwater than agricultural use, groundwater export projects can result in the decline of the agricultural economy, impacting the social and economic character of rural areas. A further concern is the permanent loss of a future water supply for local economic growth.

Again, considering the Edwards Aquifer example, groundwater management in that case considers and attempts to prevent impacts to basins of origin. The EAA’s enabling legislation, the Edwards Aquifer Act, has provisions to ensure that Comal and San Marcos springs continue to flow and that the EAA considers impacts to downstream interests. The EAA Act prohibits the export of groundwater outside the boundaries of the Edwards Aquifer, restricts the ability of irrigation water right holders from transferring more than 50% of their water rights by requiring half of the water rights to remain with irrigated land, and prohibits water right holders from

transferring groundwater from the rural Uvalde Pool to the more urban San Antonio Pool of the Edwards Aquifer.<sup>115</sup> It is notable that these are statutorily defined provisions, not discretionary regulatory provisions of a GCD.

Some argue that in limited situations where an urban utility has a demonstrated need and no reasonable alternatives, export projects might be done in a safe or “healthy” way, with clear accounting and oversight in place to protect basins of origin, the environment, and downstream users of surface flows that are affected by groundwater pumping.

### **Regulatory Inefficiency**

Groundwater marketing advocates argue that inefficiencies in groundwater management and regulation have slowed the development of a groundwater market in Texas. Specifically, they maintain that through the desired future condition process, GCDs are artificially restricting the amount of groundwater available for production. They claim that numerous small, county-based GCDs with inconsistent rules hinder development of a statewide or aquifer-based market. Additionally, export fees, short permit terms, protections for historic and existing users, as well as local politics opposed to groundwater export make developing groundwater projects in Texas and a corresponding market extremely difficult.<sup>116</sup> In actuality, there may be as many if not more examples where GCD groundwater management programs have fostered and facilitated development of groundwater by water marketers than those whose practices actually were responsible for hindering such development.

Some interests who desire to facilitate groundwater marketing suggest that state lawmakers should shift groundwater management to an aquifer-based framework, where jurisdictional boundaries are consistent with aquifer boundaries and groundwater district rules are uniform and predictable across a given aquifer. Furthermore, they recommend that GCDs allocate groundwater resources based on surface acreage. Indeed, Post Oak Savannah Groundwater Conservation District’s consistent surface acreage-based rules, designed to protect property rights in addition to the District’s long permit terms, enabled the San Antonio Water System to develop the Vista Ridge project, a 120-mile pipeline that will pump up to 50,000 acre-feet of water from Burleson County to San Antonio.

James Griffin, an economist at the Bush School of Economics and Public Policy at Texas A&M University, advocates for GCDs establishing “groundwater bank accounts” for each landowner within a district. He explains that with advances in science, GCDs have a reasonably accurate picture of the thickness of an aquifer and its saturated content and can calculate water storage under individual tracts of land and allocate groundwater accordingly. Griffin explains, “when a landowner pumps water, he withdraws it from his account. Once the balance in the account is zero, he must stop pumping or purchase water from his neighbor.”<sup>117</sup> Griffin argues that a groundwater bank account creates a market for water rights within a groundwater district and promotes conservation as landowners could donate their groundwater rights to conservation organizations. Although some might find this general concept appealing, apportioning of the entire aquifer thickness disregards the potential impacts of dramatically lower groundwater levels, which may considerably affect the ability to pump, the cost of pumping, surface water flows, and water quality.

The Guadalupe County Groundwater Conservation District has taken a similar approach, developing a three-dimensional model that “visualizes the geological arrangements of groundwater in-place under a surface tract, quantifies its volume, and grants extraction rights accordingly, pro rata.”<sup>118</sup> A local groundwater market in Guadalupe County has developed as a result of this approach. “The greater ability of information, combined with the fact that each water rights owner now possesses a protected slice of the Carrizo-Wilcox Aquifer pie in the District, sets the stage for a functional commodity market in the District.”<sup>119</sup>

While three-dimensional modeling and “groundwater bank accounts” are intriguing and may work to some degree in a sand aquifer, like the Carrizo-Wilcox, these approaches would likely be problematic in karst aquifers where groundwater is not static or uniform. Further, any such management approach should consider potential impacts that lower water levels might have on local groundwater users and on other benefits the groundwater provides.

## Recent and Current Litigation

With development pressure looming, the Edwards Aquifer Authority amended their rules to accommodate land use changes, allowing water right holders to convert their restricted irrigation rights to other uses if the overlying land use has changed. The Uvalde County Underground Water Conservation District and Uvalde County filed suit against the Edwards Aquifer Authority arguing that the rule violated the Edwards Aquifer Authority Act, which required 50% of permitted irrigation rights to remain with the land and would result in groundwater permanently leaving Uvalde County. The lawsuit was resolved with passage of House Bill 3656, which established exemptions to the act’s requirement that 50% of permitted irrigation rights remain with the land, such as if the land can be developed and is no longer practicable to farm.

## Legislative Action or Interest

In an attempt to provide regulatory certainty to the groundwater permitting process and facilitate development of a groundwater market in Texas, during the 85<sup>th</sup> legislative session, Senator Perry, chairman of the Senate Agriculture, Water and Rural Affairs Committee introduced Senate Bill 1392, which would have made comprehensive changes to Chapter 36 of the Water Code and groundwater management in Texas. Specifically, the bill removed the ability of GCDs to consider the public interest when adopting rules, prohibited districts from issuing permits with special conditions unless approved by the applicant, required GCDs to enact similar rules over common reservoirs of groundwater, prohibited districts from issuing historical based permits, and required districts to issue surface acreage-based permits. Groundwater district and conservation interest interests opposed the bill. The bill did not pass.

Rep. Lyle Larson, chair of the House Natural Resources Committee, filed a similar, less controversial bill, House Bill 31, that addressed issues related to regulatory certainty, such as administrative completeness requirements for permit applications, export permits, and

moratoriums. The Texas Association of Groundwater Districts supported the bill, but it never made it out of the Senate.

During the 86<sup>th</sup> legislative session, House Bill 1066, a Texas Water Conservation Association consensus bill by Rep. Ashby related to export permits, passed. The bill amended Chapter 36 of the Water Code to align the timing of renewals of transfer permits and operating permit in districts where these permits are issued separately. Environmental interests argued that the legislation created almost automatic renewal of export permits and eliminated important public participation.

## **Additional Issues Related to Groundwater Management in Texas**

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### **Additional Water Supply Strategies: Aquifer Storage and Recovery (ASR) and Brackish Groundwater Desalination**

Texas is in search of additional sources of water to meet the state's growing water supply demands. Two technologies, aquifer storage and recovery (ASR) and brackish groundwater desalination, have the potential to address water supply shortages in some regions of the state, but have been slow to gain traction in Texas when compared with the rest of the United States. The hesitation among water providers to develop these alternative projects in Texas has had more to do with an ambiguous regulatory framework and with potential impacts to property rights than with practical or technological impediments. Recognizing the need for regulatory certainty, over the years the Legislature has taken steps to define a process for producing groundwater from both ASR well fields and brackish aquifers, and municipalities and utilities across the state are beginning to incorporate these types of projects as strategies in their long-term water supply planning.

#### **Aquifer Storage and Recovery**

Aquifer storage and recovery is most commonly defined as “[t]he 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 the water is needed.”<sup>120</sup> Water, either from a surface water source or sometimes groundwater from a different aquifer, is injected into an aquifer formation through a well and then pumped later when the water is needed. Because Texas's climate is defined by periods of intense drought, punctuated by heavy rainfall and flooding, ASR provides a mechanism for water providers to store water when it is not needed and to pump it when it is.<sup>121</sup>

ASR is a form of managed aquifer recharge, one of many methods to proactively introduce additional water into the subsurface of the earth. Other methods include enhanced surface

infiltration and vadose zone well infiltration. “Enhanced surface infiltration involves holding water above a pervious land surface for a longer period or greater surface area than would occur naturally and allowing water to percolate through the surface to an underlying aquifer. This is accomplished with engineered spreading basins or by damming natural water courses.” El Paso Water Utilities uses spreading basins to recharge the Hueco Bolson Aquifer with reclaimed water. Additionally, “[i]n vadose zone well infiltration, relatively shallow, large-diameter wells, completed above the water table, facilitate infiltration. Water is pumped into the wells and allowed to seep into the subsurface.”<sup>122</sup>

Compared with the more traditional strategy of storing water in surface water reservoirs, ASR has two significant benefits: the water is protected from evaporation since it is stored underground, and overlying land is not impacted. In 2015, the TWDB conducted a study of 114 reservoirs in the state and concluded that in 2011, a historically dry year, 8.3 million acre-feet of water was lost to evaporation.<sup>123</sup> Because water is stored underground in ASR projects, evaporation is not an issue. Additionally, “a modestly sized Texas reservoir (capacity of 36,500 acre-feet) has an inundated area of about 2,515 acres.”<sup>124</sup> Again, because water is stored underground in ASR projects, ASR eliminates the need to inundate large areas of land.

Despite these benefits, until recently, Texas has been reluctant to embrace ASR technology. Although there are 175 ASR facilities in the United States, there are only three in Texas – in El Paso, Kerrville, and San Antonio. In 2011, the TWDB released a study assessing the status of ASR across the state, examining the reasons why water providers were not using ASR more in Texas. The report highlighted several major concerns of utilities with respect to ASR: the ability to recover stored water once injected, water quality of the recovered water, cost effectiveness of ASR, and the potential for others to recover the stored water.<sup>125</sup> According to the report, “the lack, or perceived lack of ability to protect the stored water is one of the greatest identifiable impediments to ASR implementation.”<sup>126</sup>

To address these concerns and encourage development of ASR projects, the 84<sup>th</sup> Legislature passed two bills in 2015 that may impact the development of ASR projects. The Legislature appropriated \$1 million from general revenues to the TWDB to fund grants for demonstration projects for alternative water supplies such as ASR.<sup>127</sup> The cities of Victoria and Corpus Christi and New Braunfels Utilities were the recipients of these grants. In addition, House Bill 665, which amended Chapter 27 of the Water Code, streamlined permitting and operational requirements for ASR facilities, giving TCEQ exclusive jurisdiction over the regulation and permitting of ASR injection wells.<sup>128</sup> Before passage of House Bill 665, GCDs could regulate the injection and recovery of water in ASR projects, but with passage of HB 665, “the role and power of GCDs in regulation of ASR injection and recovery greatly diminished.”<sup>129</sup>

HB 665 attempted to address utilities’ concerns over their ability to protect the injected source water by requiring TCEQ to adopt technical standards to ensure that the volume of water that may be recovered by an ASR project does not exceed the amount of water injected under the project.<sup>130</sup> In determining whether to grant an ASR permit, the TCEQ must consider whether the cumulative volume of water injected can be successfully recovered from the geologic formation for beneficial use, the effect of the ASR project on existing water wells, and whether, generally

speaking, the introduction of water into the receiving geologic formation will alter the physical, chemical, or biological quality of the native groundwater.<sup>131</sup> Additionally, TCEQ regulates ASR injection wells as Class V injection wells, and the injected water must be treated to federal Safe Drinking Water Act standards prior to injection.

Although TCEQ regulates ASR wells, GCDs are not entirely removed from the ASR process. ASR injection and recovery wells that are located within a GCD's jurisdiction must be registered with the GCD, and the ASR project operator must send the GCD copies of the reports filed with the TCEQ regarding injection and recovery amounts.<sup>132</sup> However, a GCD is prohibited from regulating the spacing of and production from ASR recovery and injection wells unless amount recovered exceeds volume authorized by the TCEQ.<sup>133</sup>

As a result of the regulatory framework established by House Bill 665, more regional water planning groups are recommending ASR as water management strategies in their regional water plans. In the 2017 State Water Plan, seven regional water planning groups recommended ASR as a water management strategy with a total of 17 ASR projects.<sup>134</sup> This is an increase in the number of ASR projects that regional water planning groups recommended in the 2012 State Water Plan.

Furthermore, policymakers and water supply planners are considering whether ASR can be used to capture stormwater and flood water to serve both water supply and mitigation strategies. For example, "stormwater that has been temporarily captured in reservoirs and retention basins can be recharged underground through wells that are drilled into local aquifers, thereby providing a water supply benefit in addition to a stormwater management benefit."<sup>135</sup> The difficulty with injection of stormwater underground, however, is that the water quality of stormwater is often very poor, therefore the expense of treating it is significantly higher than treating surface water. This is because "[i]n general, water injected into aquifers has to meet very strict quality standards and stormwater frequently carries a dirty mix of clays and silts that could clog up water pumps designed to move it underground — not to mention other contaminants such as bacteria."<sup>136</sup> Additionally, "stormwater ASR often requires additional considerations, such as temporary storage due to the short-term duration and intermittent availability of stormwater."<sup>137</sup>

Similar challenges related to water quality exist with capturing and storing floodwater. Additionally, part of the challenge with storing floodwater through ASR is that "[f]or ASR to have any meaningful impact in an extreme flooding event, extensive off-channel storage would be required, because the rate at which water could be injected underground is so slow in comparison to the rate of flood flows." The reality is that "the off-channel storage is actually the mechanism for mitigating the flood in this case, not the ASR system." And in extreme flooding events, such as those caused by Hurricane Harvey, it would be impossible to capture enough water to mitigate flooding.

Currently, no ASR systems in Texas capture and store floodwater. During the 85<sup>th</sup> legislative session, Rep. Larson authored a bill that would have directed the TWDB to conduct a statewide assessment of potential sites for aquifer storage and recovery systems, especially in flood-prone

areas, but Gov. Greg Abbott vetoed the bill, claiming that TWDB already has the authority to conduct such assessments.<sup>138</sup>

Rep. Larson authored another bill during the 85<sup>th</sup> legislative session, House Bill 3991, which would have allowed the TCEQ to issue permits for “excess flows in a watercourse or stream that would otherwise flow into the Gulf of Mexico” so that this water could then be stored underground via ASR. Environmental groups such as the Sierra Club and the National Wildlife Federation opposed the bill because of the negative impact capturing “excess” flows could have on rivers, bays, and estuaries. According to these groups, the current amount of water budgeted for environmental flows does not actually account for all the water needed for river, bay and estuary ecosystems.<sup>139</sup> The legislation died in the Senate.

During the 86<sup>th</sup> legislative session, Chairman Larson finally saw passage of several of his ASR bills. House Bill 721 directed the TWDB to conduct studies on ASR projects in the state water plan and to conduct a survey to identify the relative suitability of various aquifers for use in ASR projects by Dec. 15, 2020. Additionally, the Legislature appropriated \$500,000 in funding and three full-time employees for the TWDB to complete this work.

As a result of the passage of House Bill 720, state water appropriations can now be used for recharge into aquifers through ASR or an aquifer recharge project if certain conditions are met and the TCEQ determines that the water is not needed to meet instream flow needs.

Environmental groups opposed the legislation, maintaining that “[t]he bill was based on the questionable premise that there are unappropriated volumes of water in streams in excess of what is needed for the environment.”<sup>140</sup> The Texas Alliance of Groundwater Districts and the Texas Water Conservation Association, along with other industry groups, supported the bill.

Finally, as a result of the passage of House Bill 1052, the TWDB is now authorized to use the State Participation Fund account to fund interregional projects and desalination and ASR projects that are not in the state water plan.

### **Brackish Groundwater Desalination**

Brackish groundwater is defined as groundwater with a total dissolved solids content of between 1,000 to 10,000 parts per million. Desalination is the process of removing total dissolved solids and other minerals from brackish groundwater.

With freshwater resources becoming scarcer, water planners and providers are turning to brackish groundwater as a water supply option. The TWDB estimates that more than 2.7 billion acre-feet of brackish groundwater in 26 of the 30 major and minor aquifers underlies the state.<sup>141</sup> Thus, brackish groundwater is potentially an important resource to meet water supply shortages in Texas. Similar to ASR, however, water planners in Texas have been slow to embrace brackish groundwater desalination, primarily because a lack of regulatory certainty impedes project development but also because fresh groundwater resources have been sufficient to meet the state’s water needs in the past.

In an effort to advance development of brackish desalination in Texas, the TWDB provided funding totaling \$2.7 million for 17 projects and studies related to brackish groundwater desalination between 2003 and 2011, including the implementation of demonstration projects, preparation of guidance manuals, and conducting research studies.<sup>142</sup> Out of this effort grew the Brackish Resource Aquifer Characterization System (BRACS). Under the BRACS program, TWDB maps and characterizes brackish parts of aquifers in detail and builds datasets that can be used for brackish groundwater exploration and to estimate aquifer productivity.

In 2015, the 84<sup>th</sup> Legislature passed House Bill 30, which most significantly, directed the TWDB to designate brackish groundwater production zones (BGPZ) in four aquifers — the Carrizo-Wilcox, the Gulf Coast Aquifers, the Blaine Aquifer, and the Rustler Aquifer — to determine the volumes of groundwater that a BGPZ can produce over 30-year and 50-year periods without causing significant impacts to water availability or water quality, and to make recommendations on reasonable monitoring to observe the effects of brackish groundwater within the zone.<sup>143</sup> During the 85<sup>th</sup> legislative session, Gov. Abbott vetoed continued funding to support work for House Bill 30.<sup>144</sup> The TWDB has submitted a legislative appropriations request for the 86<sup>th</sup> legislative session for funding for groundwater availability modeling and the BRACS program.

The state's effort to promote brackish groundwater development appears to be working despite the fact that Texas does not have a comprehensive brackish permitting and management scheme. For example, in 2012, there were 46 municipal brackish desalination plants in Texas with a capacity greater than 25,000 gallons per day. As of 2016, that number climbed to more than 200 desalination plants in Texas.<sup>145</sup> In the 2017 State Water Plan, eight regional water planning groups (regions E, F, H, J, L, M, N, and O) recommended groundwater desalination as a water management strategy.<sup>146</sup> If these strategies are implemented, groundwater desalination may produce about 111,000 acre-feet per year of additional water supply by decade 2070, representing 1.3% of all new supplies in the state.<sup>147</sup>

With this increase in brackish groundwater desalination has come additional efforts to establish concrete and uniform permitting rules for brackish groundwater production. Currently, production of brackish groundwater is governed by local GCDs, which as discussed in Issue 2 above, have unique rules that do not necessarily address the complexities inherent in the development of brackish groundwater. Most GCDs do not actually have separate rules governing brackish groundwater production.

A recent study conducted by the Baker Institute reveals that over 90% of GCDs do not distinguish between brackish and fresh groundwater in their permitting rules.<sup>148</sup> Of the 96 GCDs reviewed by the authors, only nine (9.4%) provide regulations for brackish groundwater production that differ from regulations for fresh groundwater production.<sup>149</sup> According to the study, the intent of most brackish groundwater rules is to incentivize brackish groundwater production, protect fresh groundwater, and to protect aquifers from water quality impacts related to brine disposal.<sup>150</sup>

During the 85<sup>th</sup> legislative session, Rep. Larson attempted to enact a permitting and management framework for brackish groundwater development projects in Texas. HB 2377

established a baseline for GCDs to use to implement rules related to brackish groundwater desalination permits if they are located over a designated BGPZ. The legislation required that brackish permitting rules allow amounts and rates of withdrawal “not to exceed and consistent with the withdrawal amounts” identified during the designation of the relevant BGPZ, provide for 35-year permit terms, and require monitoring of the aquifer to ensure no negative impacts on water quality.<sup>151</sup> Gov. Abbott vetoed the bill, stating that the bill’s permitting rules were “unduly prescriptive and would create a separate and complex bureaucratic process for the permitting of brackish wells.”<sup>152</sup>

During the 86<sup>th</sup> legislative session, two bills filed related to brackish groundwater passed. Senate Bill 1041 extended the time by which the TWDB must identify and designate BGPZs to Dec. 1, 2032. Additionally, the Legislature appropriated \$2 million and two full-time employees for the TWDB BRACS program.

Rep. Larson’s House Bill 722, similar to House Bill 2377 that Gov. Abbott vetoed during the 85<sup>th</sup> session, created a separate permitting framework for brackish groundwater permits. This time the governor did not veto the bill. According to the Texas Water Conservation Association, the bill was “intended to provide greater access to brackish groundwater by simplifying procedures, expediting processing, reducing expenses, and providing flexibility to certain applicants within a GCD.”<sup>153</sup>

### **ASR/Brackish Groundwater Desalination and Property Rights**

As discussed in Issue 1, in Texas, landowners own the groundwater beneath their land in place. This law, which ignores the hydrogeological reality that groundwater is often not static, complicates efforts to manage not only native fresh groundwater, but also brackish groundwater and groundwater injected and produced through ASR. With respect to ASR, landowners express concern over whether the injection of non-native water into groundwater formations could degrade the quality of native groundwater. With respect to brackish groundwater, landowners are concerned that the injection of certain types of waste into deep underground formations could degrade the water quality of brackish groundwater. Based on case law, the migration of injected water across a property line could be considered a trespass. In *Hastings Oil Co. v. Texas Co.*, the Texas Supreme Court upheld an injunction prohibiting subsurface trespass by an oil and gas company whose well crossed the property line underground.

More recently, this issue was addressed in a Texas Supreme Court case, *Environmental Processing Systems, L.C. v. FPL Farming Ltd.* In this case, the defendant injected industrial waste into an aquifer formation over 2,100 meters below ground, and the waste allegedly migrated across a neighbor’s property line, potentially contaminating brackish groundwater beneath his land. The plaintiff landowner argued that the potential contamination harmed the value of his property because technological advancements in groundwater desalination could make the salty water beneath his property drinkable in the future. Interestingly, “[a]s part of its response, the defendant cited prior case law to counter the proposition that “land ownership extends to the sky above and the earth’s center below,” (*Coastal Oil & Gas Corp. v. Garza Energy Trust*), staking out a position that would seem to logically contradict *Day’s* holding that

landowners own groundwater in place — or at least begs the question of the depth at which the property line is drawn.”<sup>154</sup>

Ultimately, the Texas Supreme Court resolved the case without deciding whether the migration of waste-injected underground constitutes a trespass or would give rise to injunctive relief or damages. However, “the case highlight[s] questions about environmental and private property protections for brackish groundwater” and raises questions about whether ASR operators could face liability for trespass caused by the migration of source water across property boundaries.<sup>155</sup>

## Produced Water

The Permian Basin is an oil and gas producing area covering over 86,000 square miles located in West Texas including part of the Trans Pecos and Southeastern New Mexico. The area has experienced a recent surge in production as a result of hydraulic fracturing. Today, the Permian Basin is one of the largest shale plays in the United States.

Oil and gas production requires water (for both drilling and completion) and generates wastewater (as a byproduct of oil and gas production). As hydraulic fracturing has increased the demand for groundwater in this arid region, more scrutiny is being placed on both the volume of freshwater used in the process and methods to reuse the wastewater that is generated.

Water needs for oil and gas production, including the increased volumes required by hydraulic fracturing, can be significant, ranging from around 12 million gallons to upwards of 42 million gallons per well. Some of this injected water and chemical mix will return to the surface for weeks following fracturing operations (termed flowback). Water that is trapped in the oil and gas bearing formation will also be generated along with the oil and gas resources for the life of the well. In the Permian Basin, formation water volumes can be as high as 10 times the volume of produced oil or gas (sometimes even higher). Finally, maintenance chemicals are routinely injected into the well through the course of operation and some of these chemicals will return to the surface via the oil and gas production. All this water, termed produced water, can be generated in significant volumes, and because of constituents present must be properly managed. A recent report published by the Groundwater Protection Council projected 415 billion gallons of produced water generated in Texas in 2017.<sup>156</sup>

The water needed for hydraulic fracturing does not have to be freshwater, although many times freshwater is used. Lower quality water like brackish groundwater or recycled produced water (use of produced water from producing wells for hydraulically fracturing subsequent wells) are options. In recent years oil and gas producers are attempting to rely more heavily on alternatives to freshwater sources. However, moving water around is expensive, and depending on the distance between an available water source and the location of drilling operations, it may be more economical to acquire fresh groundwater than to transport brackish or produced water to a drill site.

In addition to water needs, produced water management and disposal present challenges. Currently the vast volume of produced water is disposed by deep well injection (regulated under the Safe Drinking Water Act Underground Injection Control Program). However other options exist, including recycling (as previously mentioned) and potential reuse or surface discharge. The recycle of produced water is being conducted with greater frequency and is a good option for lessening the demand for fresher water sources. However, care must be taken to minimize leaks and spills, including having both engineering controls and management programs in place to readily identify, contain, and address leaks and spills when they do occur. In most cases, the recycle of produced water requires little to no treatment.

Other options being considered for produced water management and disposal include the reuse of this water (following robust treatment) outside oil and gas exploration and production operations, or discharge into surface waters. Reuse options include irrigation, livestock watering, aquifer storage and reuse, and reuse for other industrial purposes. However, the reuse or discharge of produced water raises significant human health, environmental, and ecological concerns. Knowledge gaps exist with both the chemical and toxicological characterization of produced water and proven effective and efficient robust treatment technologies for this complex and highly variable wastewater.

Produced water typically has elevated total dissolved solids (TDS) many times greater than typical seawater. (TDS are referred to as salt content, although more chemicals than just sodium and chlorides are present.) In the Permian Basin, TDS can range upwards of 100,000 mg/l (seawater is around 35,000 mg/l), potentially even higher. Treating this high TDS water is both difficult and costly, and it is important to note there are many more constituents of concern potentially present that are difficult to treat, including inorganics, organics, and possibly radionuclides.

There are significant knowledge gaps to sufficiently characterize produced waters. For one, analytical methods either don't exist or, because of elevated TDS levels, don't work properly. Many current analytical methods, particularly approved methods that are routinely run by commercial labs and can be used for regulatory purposes, were not developed to account for the high TDS levels present in produced water. Modified sample preparation techniques required to account for the elevated TDS levels can significantly raise the detection levels achieved by the analytical methods. Thus, the ability to identify and quantify constituents of concern at meaningful levels may not be possible using currently available methods. Additionally, toxicological information is not available for the majority of the constituents that are potentially present in produced water. Without this critical information, it is difficult to design and monitor treatment processes, as well as develop appropriate technical and regulatory guidance to ensure adverse impacts do not occur from reuse or from intentional discharge to surface waters.

Considering both water demands and produced water management, there are a number groundwater management concerns related oil and gas activities in the Permian Basin:

- The Trans Pecos area hosts a number of springs, the most notable being the Balmorhea spring. Many of these springs have stopped or reduced flow during all or part of the year for

multiple reasons. Additional oil and gas-related groundwater use could compound the impacts to these springs.

- The potential impacts on groundwater resources from increased use of freshwater as well as of brackish groundwater is of concern. The increase use of fresh groundwater can impact the availability of this resource for other current as well as future users (i.e. overdrafting or mining of the groundwater), as well as potential adverse impacts to surface waters that are connected and interact with the groundwater. Additionally, increased use of brackish groundwater could result in adverse impacts to other groundwater resources. The interaction and potential communication between brackish groundwater and other groundwater resources are not well understood or defined.
- The reuse of produced water outside oil and gas operations has the potential benefit of providing a new source of water in this arid area. However, numerous critical issues must be more thoroughly identified and addressed given the current knowledge gaps concerning constituents present, including the ability to even detect constituents of concern; the potential toxicological aspects of constituents of concern; and the technical and economic challenges of effectively, efficiently, and robustly treating this fluid. Additionally, the reliability of produced water as a source of water must be factored into any projected reuse. Although produced water is generated throughout the life of a producing oil and gas well, reduced production — or even the shutting in of wells during a pronounced oil and gas production downturn, as has recently occurred — will reduce or even curtail this water source.
- Texas and New Mexico regulate groundwater differently; thus, transboundary issues must be considered. Increased use of groundwater on the Texas side of the Permian Basin might impact the availability and accessibility of groundwater on the New Mexico side. Conversely, the potential authorization of reuse or the discharge of treated produced water into surface waters in New Mexico could raise issues with water quality and related impacts (i.e. human health, environment, and ecosystems) on groundwater and surface waters in Texas.

## **Additional Groundwater Management Concerns: Transboundary Aquifers**

Groundwater beneath the state of Texas is not isolated by state boundaries. Aquifer formations extend beyond Texas' boundaries into neighboring states as well as into Mexico. Policymakers have spent considerable time negotiating the use of shared surface water, such as through the Rio Grande Compact, which defines how Texas, New Mexico, and Colorado manage flow in the Rio Grande, and through the 1944 Water Treaty with Mexico, which governs how the United States and Mexico share water in the Rio Grande and Colorado rivers.

When it comes to management of groundwater in transboundary aquifers, however, Texas has done little to define how the resource can be jointly managed, and “there are currently no

internationally recognized legal instruments or entities that address water quality, pumping, and availability in transborder aquifers.”<sup>157</sup> The lack of coordinated aquifer management is already causing rifts between Texas and New Mexico, discussed in Issue 3 above, and scholars are pointing out that Texas’ failure to develop policy to manage transboundary aquifers with Mexico is a latent crisis that must be addressed. In a 2012 paper, Gabriel Eckstein writes that as a result of the lack of joint management, “the region's groundwater resources are being overexploited on both frontiers as populations and industries pump with little regard for sustainability or transboundary consequences.”<sup>158</sup> Eckstein pronounces, “[a] new approach must be identified, a new paradigm for the administration of transboundary aquifers along the Mexico-U.S. frontier,” one that places the burden of developing policy on local communities rather than the federal government.

As a step toward addressing management of transboundary aquifers, in 2017, the TWDB completed a study examining issues related to the transboundary aquifers shared between Texas, Mexico, and surrounding states. The intent of the study is to “help decision makers and stakeholders understand Texas’s and her bordering states’ current groundwater resources, policies, and approaches to managing those resources and to identify successful steps forward.”<sup>159</sup> The study encourages local governments to develop new methods for managing transboundary groundwater, without necessarily relying on federal agreements or interstate compacts, and highlights the memorandum of understanding between the cities of El Paso and Juarez as an example “of how international communities can achieve useful and lasting results for sharing limited groundwater resources.”<sup>160</sup> The agreement “supported implementing cross-boundary projects of common interest, developing plans to extend the aquifer life, and supporting efforts to secure future water supplies.”<sup>161</sup> Additionally, according to the report, the United States-Mexico Border 2020, an ongoing federal program to address natural resource issues, including water, could serve as a framework to developing policies governing transboundary aquifer management.<sup>162</sup>

# Endnotes

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- <sup>1</sup> Edwards Aquifer Auth. v. Day, 369 S.W.3d 814, 817 (Tex. 2012).
- <sup>2</sup> See <https://www.twdb.texas.gov/groundwater/>
- <sup>3</sup> Texas Water Development Board, Texas Aquifer Study 13-17 (Dec. 2016).
- <sup>4</sup> Tex. Water Code § 36.002
- <sup>5</sup> Cuius est solum, eius est usque ad caelum et ad inferos (English translation: for whoever owns the soil, it is theirs up to the sky and down to the depths) is a Roman legal principle of property law that was passed down to common law and civil law systems. Black's Law Dictionary.
- <sup>6</sup> Harry Grant Potter III, *History and Evolution of the Rule of Capture, Conference Proceedings: 100 years of Rule of Capture: From East to Groundwater Management*, Texas Water Development Board (2004).
- <sup>7</sup> Tex. Water Code § 36.0015(b).
- <sup>8</sup> *Id.*
- <sup>9</sup> The Texas Supreme Court has crafted a few exceptions to the rule of capture. A landowner cannot pump and use groundwater maliciously with the purpose of injuring a neighbor or in a manner that amounts to wanton and willful waste of groundwater. See *City of Corpus Christi v. City of Pleasanton*, 154 Tex. 289, 276 S.W.2d 798, 801 (1955). A landowner can be held liable for the negligent pumping of groundwater that causes subsidence of adjacent land. See *Friendswood Dev. Co. v. Smith-Southwest Indus., Inc.*, 576 S.W.2d 21, 30 (Tex. 1978).
- <sup>10</sup> Texas Water Development Board, 2017 State Water Plan, Chapter 6 at 67.
- <sup>11</sup> *Id.*
- <sup>12</sup> Texas Water Development Board, Texas Aquifer Study 13-17 (Dec. 2016).
- <sup>13</sup> *Id.* at 13.
- <sup>14</sup> *Motl v. Boyd*, 116 S.W. 458 (1926); In re Adjudication of Water Rights of the Upper Guadalupe Segment, 642 S.W.2d 438, 445 (Tex. 1982).
- <sup>15</sup> Tex. Water Code §11.021(a).
- <sup>16</sup> Edwards Aquifer Auth. v. Day, 369 S.W.3d 814, 817 (Tex. 2012).
- <sup>17</sup> *Id.*
- <sup>18</sup> *Id.* at 825.
- <sup>19</sup> Texas Water Conservation Association, *The Application of Oil and Gas Law to Groundwater: Analyzing Correlative Rights and So Called "User-Based" Rules* at 7 (2016). (TWCA White Paper).
- <sup>20</sup> James M. Griffin, *Interjecting Economics Into the Groundwater Policy Dialogue*, 8 Texas Water Journal 97-112 at 106 (2017) (Griffin, Interjecting Economics).
- <sup>21</sup> Guitar Holding Co. v. Hudspeth County Underground Water Conservation District No. 1, 263 S.W.3d 910 (Tex. 2008).
- <sup>22</sup> Gerald Torres, *Liquid Assets: Groundwater in Texas* at 122, Yale Law Journal (2012).
- <sup>23</sup> Guitar at 914.
- <sup>24</sup> Torres, *Liquid Assets* at 158.
- <sup>25</sup> Ken Paxton, Attorney General of Texas, Opinion KP-0216 (September 26, 2018).
- <sup>26</sup> TWCA White Paper at 11.
- <sup>27</sup> *Id.*
- <sup>28</sup> *Id.*
- <sup>29</sup> Day, 369 S.W.3d 814, 840-841 (Tex. 2012).
- <sup>30</sup> TWCA White Paper at 6.
- <sup>31</sup> Edwards Aquifer Auth. v. Bragg, 421 S.W.3d 118 (Tex. App. 2013).

- <sup>32</sup> Order No. 3 Denying Environmental Stewardship, Bette Brown, Andrew Meyer, and Darwyn Hanna Party Status, and Granting Aqua Water Supply Corporation Party Status, In Re: the Application of End Op L.P., for a Well Registration, Operating Permits, and Transfer Permits Before the State Office of Administrative Hearings (Sept. 2013).
- <sup>33</sup> Plaintiffs Original Complaint In the United States District Court For the Western District of Texas, Waco Division, Fazzino v. Brazos Valley Groundwater Conservation District, No. 6:18-cv-00114 (April 13, 2018).
- <sup>34</sup> *Id.* at 15 citing *Marrs v. Railroad Commission*, 177 S.W.2d 941 (Tex. 1944).
- <sup>35</sup> Fazzino v. Brazos Valley Groundwater Conservation District, No. 18-50994 at 9 (5<sup>th</sup> Circuit, May 29, 2020) citing *Vogt v. Bd. Of Comm’rs*, 294 F.3d 684 at 689 (5th Cir. 2002) (internal quotation marks omitted).
- <sup>36</sup> *Id.* at 20 citing *Knick v. Twp. Of Scott*, 139 S. Ct. 2162 at 2168 (2019) (emphasis added).
- <sup>37</sup> *Id.* at 22 citing *Edwards Aquifer Authority v. Day*, 369 S.W.3d at 830.
- <sup>38</sup> *Neches and Trinity Valleys Groundwater Conservation District v. Mountain Pure TX, LLC*, NO. 12-19-00172-CV at 2 (Tex. App – Tyler Sept 18, 2019).
- <sup>39</sup> *Id.* at 4 citing *City of Houston v. Carlson*, 451 S.W.3d 828 at 830 (Tex. 2014).
- <sup>40</sup> *Id.*
- <sup>41</sup> Texas Farm Bureau Newsletter, Issue 12 (March 31, 2017) available at <http://texasfarmbureau.org/wp-content/uploads/2017/03/033117Austin-Newsletter-1.pdf>
- <sup>42</sup> Texas Farm Bureau Newsletter, Issue 5 (February 10, 2017) available at <http://texasfarmbureau.org/wp-content/uploads/2017/02/021017Austin-Newsletter.pdf>
- <sup>43</sup> Texas Rural Water Association, Water Blog (February 17, 2017) available at <https://www.trwa.org/blogpost/1539239/Texas-Rural-Water-Blog?tag=House+Bill+1318>
- <sup>44</sup> *Id.*
- <sup>45</sup> Texas Alliance of Groundwater Districts White Paper, The Appropriate Consideration of a Water Supplier’s Service Area When Groundwater Resources Are Allocated Based On Surface Ownership (2018).
- <sup>46</sup> Ed McCarthy and Russel Johnson Testimony before the House Natural Resources Committee (June 5, 2018).
- <sup>47</sup> D. Green, LAND OF THE UNDERGROUND RAIN: IRRIGATION IN THE TEXAS HIGH PLAINS 1910-1970, at 172 (1973).
- <sup>48</sup> John Thomas Dupnik, P.G. *A Policy Proposal for Regional Aquifer-Scale Management of Groundwater in Texas* 41 (2012) (unpublished Master’s Thesis, The University of Texas), (available at [https://repositories.lib.utexas.edu/bitstream/handle/2152/19658/dupnik\\_thesis\\_20129.pdf](https://repositories.lib.utexas.edu/bitstream/handle/2152/19658/dupnik_thesis_20129.pdf))
- <sup>49</sup> Charles R. Porter, SHARING THE COMMON POOL, WATER RIGHTS IN THE EVERYDAY LIVES OF TEXANS (2014).
- <sup>50</sup> Robert E. Mace et. al., A Street Car Desired Future Conditions at 3 (2008).
- <sup>51</sup> Charles Porter, *Groundwater Conservation District Finance In Texas: Results of Preliminary Study*, *Texas Water Resources Institute*, Texas Water Journal, Vol. 4 No. 1 at 65 (2013); Dupnik at 43.
- <sup>52</sup> Dupnik at 43.
- <sup>53</sup> Testimony of Russell Johnson, Texas Senate Agriculture, Water, and Rural Affairs Committee, Interim Report to the 85<sup>th</sup> Legislature at 31 (2016).
- <sup>54</sup> See Petition for Inquiry of Post Oak Savannah Groundwater Conservation District submitted by Curtis Chubb, Phd before the Texas Commission on Environmental Quality, TCEQ Docket No. 2015-0844-MIS, Executive Director’s Response to the Petition for Inquiry, page 3.
- <sup>55</sup> Petition of the Wimberley Valley Watershed Association Appealing the DFC Set By GMA 9 For The Trinity Aquifer Within The Hays-Trinity Groundwater Conservation District (2010).
- <sup>56</sup> The Bush School of Government & Public Service, Texas A&M University, *An Assessment of Groundwater Regulation in Texas* at 17 (January 2016) (Bush School Report).
- <sup>57</sup> *Id.* at 32.

- <sup>58</sup> Lone Star Groundwater Conservation District Press Release (Sept. 26, 2016).
- <sup>59</sup> *Id.*
- <sup>60</sup> Texas Alliance of Groundwater Conservation Districts, White Paper on GCD Permitting (September 2018).
- <sup>61</sup> *Id.*
- <sup>62</sup> See *Fort Stockton Holdings, LP v. Middle Pecos Groundwater Conservation District*, No. P-7047-83-CV (83<sup>rd</sup> District Ct. of Pecos County, filed Dec. 27, 2011); *Forestar Real Estate Group, Inc. v. Lost Pines Groundwater Conservation District*, No. 1539 (335<sup>th</sup> District Court of Lee County, filed April 17<sup>th</sup>, 2014); *City of Conroe v. Lone Star Groundwater Conservation District*, No. 15-08-08942 (284<sup>th</sup> District Court Montgomery County, filed August 31, 2015); *Flying L Guest Ranch v. Bandera County River Authority and Groundwater Conservation District*, CVOC-18-0000015 (198<sup>th</sup> District Court of Bandera County, filed January 1, 2018).
- <sup>63</sup> <http://texasfarmbureau.org/wp-content/uploads/2017/05/050517Austin-Newsletter.pdf>
- <sup>64</sup> Charles R. Porter, SHARING THE COMMON POOL, WATER RIGHTS IN THE EVERYDAY LIVES OF TEXANS 8 (2014).
- <sup>65</sup> Texas Water Development Board, *Texas Aquifer Study* at 27 (Dec. 2016).
- <sup>66</sup> *Id.*
- <sup>67</sup> Nathaniel Toll, et. al., Water Resource Management of the Devils River Watershed, Final Report, Southwest Research Institute (August 2017). The study concluded, “Decrease in or cessation of spring flow in the Devils River upstream of Pecan or Hudspeth springs is attributed to pumping in the upper Devils River watershed. The impact of additional future pumping near Pecan or Hudspeth springs on the Devils River watershed was found to decrease spring discharge near Pecan or Hudspeth springs and decrease flow in the Devils River where it discharges to Amistad Reservoir. The impact of this potential pumping on Devils River discharge is proportional to the amount of water pumped.”
- <sup>68</sup> TWDB Report 375, Groundwater-Surface Water Interaction in the Brazos River Basin: Evidence from Lake Connection History and Chemical and Isotopic Compositions at 1 (2010).
- <sup>69</sup> Brian Hunt and Brian Smith, Surface and Groundwater Interactions in Onion Creek and the Blanco River (September 2016).
- <sup>70</sup> *Motl v. Boyd*, 116 S.W. 458 (1926); *In re Adjudication of Water Rights of the Upper Guadalupe Segment*, 642 S.W.2d 438, 445 (Tex. 1982).
- <sup>71</sup> Tex. Water Code §11.021(a).
- <sup>72</sup> Tex. Water Code §11.027; See also Douglas G. Caroom, Texas Water Law Institute at 21 (2013).
- <sup>73</sup> Tex. Water Code § 36.002; *Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 817 (Tex. 2012).
- <sup>74</sup> Tex. Water Code §36.001(5).
- <sup>75</sup> Drummond et. al., *The Rule of Capture in Texas – Still So Misunderstood After All These Years*, 37 Tex. Tech L. Rev. 18 (2005).
- <sup>76</sup> See *Pecos County Water Control and Improvement District No. 1 v. Williams, et al.*, 271 SW2d 503 (Tx Civ. App – El Paso 1954) (holding that surface owner owns the underground percolating water and may use it at his will in non-wasteful manner; *Denis v. Kickapoo Land Co*, 771 SW2d 235 (Tex. App. – Austin 1989) (holding that water pumped by defendant was percolating groundwater and that the owner of this water may appropriate it and use it however he pleases even though his use cuts off the flow of such water to adjoining land).
- <sup>77</sup> *Sierra Club v. Lujan*, No. MO-91-CA-69, 1993 WL 151353 (W.D. Tex. Feb.1, 1993).
- <sup>78</sup> Robert Gulley, HEADS ABOVE WATER, THE INSIDE STORY OF THE EDWARDS AQUIFER RECOVERY IMPLEMENTATION PROGRAM, 3 (2015).
- <sup>79</sup> *Sierra Club v. Lujan*, No. MO-91-CA-69, 1993 WL 151353 (W.D. Tex. Feb.1, 1993); See Todd H. Votteler, Ph.D. and Robert L. Gulley, PH.D, The Edwards Aquifer Habitat Conservation Plan, The Water Report, Issue 124 (June 15, 2014).

- <sup>80</sup> Steve C. Young et. al, *Surface Water-Groundwater Interaction Issues in Texas*, Texas Water Journal Vol. 9, No. 1 at 132 (December 17, 2018).
- <sup>81</sup> Tex. Water Code § 36.36.113(d)(2).
- <sup>82</sup> Tex. Water Code § 36.108 (d)(4).
- <sup>83</sup> Douglas E. Norman, *Groundwater Management Zones for Conjunctive Water Conservation in Hays County and the Hill Country Region of Central Texas*, 29 (May 2018), (unpublished Master's Thesis, The University of Texas), (available at <https://repositories.lib.utexas.edu/handle/2152/65821>) .
- <sup>84</sup> Tex. Water Code §§ 36.1071(a)(4) & (e)(3)(E).
- <sup>85</sup> Steve C. Young et. al, *Surface Water-Groundwater Interaction Issues in Texas*, Texas Water Journal Vol. 9, No. 1 at 132 (December 17, 2018).
- <sup>86</sup> Kinnan Goleman, *River Underflow Withdrawals – When Will Texas’ “Two Face” Terminate?*, State Bar of Texas 17<sup>th</sup> Annual Changing Face of Water Rights Course, (2016).
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