Myths and Facts About Groundwater Marketing

A GUIDE FOR LANDOWNERS AND GROUNDWATER CONSERVATION DISTRICTS

ENVIRONMENTAL DEFENSE
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Executive summary

With so much information being spread regarding water rights and water marketing in Texas, deciphering fact from fiction can be hard. Concerns about groundwater marketing have grown as the state begins to move forward in preparing for future water needs. Groundwater marketing—the buying or leasing of the right to use the water beneath another's land—is a mechanism for transferring the resource either to another area or another use, which in many cases involves transfers of water from agricultural to municipal use. Though water marketing has been an important tool for meeting municipal demands in California and other states in the West for decades and has occurred in parts of Texas for many years, only recently has groundwater marketing been promoted as a significant strategy for meeting statewide future water demand in Texas.

In response to several proposals by private marketers to acquire rights to pump large amounts of groundwater and distribute it to distant cities, groundwater conservation districts across the state are evaluating the impacts of proposed projects on their district and formulating rules to govern "exports." At the same time, landowners are evaluating proposals from water marketers that want to acquire the permanent or temporary right to pump water from beneath their property.

There are currently a number of controversial large-scale groundwater development proposals being marketed which raise questions about the nature of groundwater rights under Texas law, the ability of local groundwater districts to manage the aquifer under their jurisdiction and the options available to landowners who are approached by potential groundwater marketers. This report is intended to provide background information to landowners that are considering water marketing proposals and groundwater districts that are managing areas with marketing interests in order to help them make decisions based on all appropriate considerations.

Myths and facts

MYTH #1

The state's population will double by 2060, and as our water usage is expected to increase, the state will experience severe shortages if no new water sources are found.

FACT: Meeting the water demands of the state's growing population will be challenging. Yet, there are a number of available alternative water supply strategies such as advanced conservation and drought management, as well as supply enhancements such as land stewardship and saltwater and brackish water desalination.

In some parts of the state, groundwater marketing, which usually involves transfers of water from rural to urban areas, can play a role in meeting the demands of the state's growing population in a cost-effective manner. As with all water supply options, ensuring that proposed groundwater marketing projects do not adversely impact our state's rivers, bays, and aquifers is critical to supporting Texas' abundant fish and wildlife and preserving the quality of rural life.

MYTH #2

Groundwater marketing is a new concept for Texans.

FACT: Some cities have been buying or leasing groundwater from ranchers since the 1950s.

Groundwater marketing is nothing new in Texas, though the scale of several recent marketing proposals is unprecedented. One example is in the Texas Panhandle, where the Canadian River Municipal Water Authority (CRMWA) has several large-scale water marketing arrangements in place that involve pumping water from large tracts of land and piping it to 11 different cities, including Amarillo and Lubbock. This project is currently acquiring additional land and has a goal of 300,000 total acres and as much as 67,000 acre feet of annual production.

Since the mid-1990s, there has also been an active groundwater market in the Edwards Aquifer region near San Antonio. In 1993, the Texas Legislature created the Edwards Aquifer Authority to regulate groundwater pumping in the region. The EAA has the authority to issue transferable withdrawal permits to pumpers based on their historic use. San Antonio has been a dominant force in the regional groundwater market, acquiring through lease and purchase from farmers the rights to more than 50,000 acre feet/year.[1]

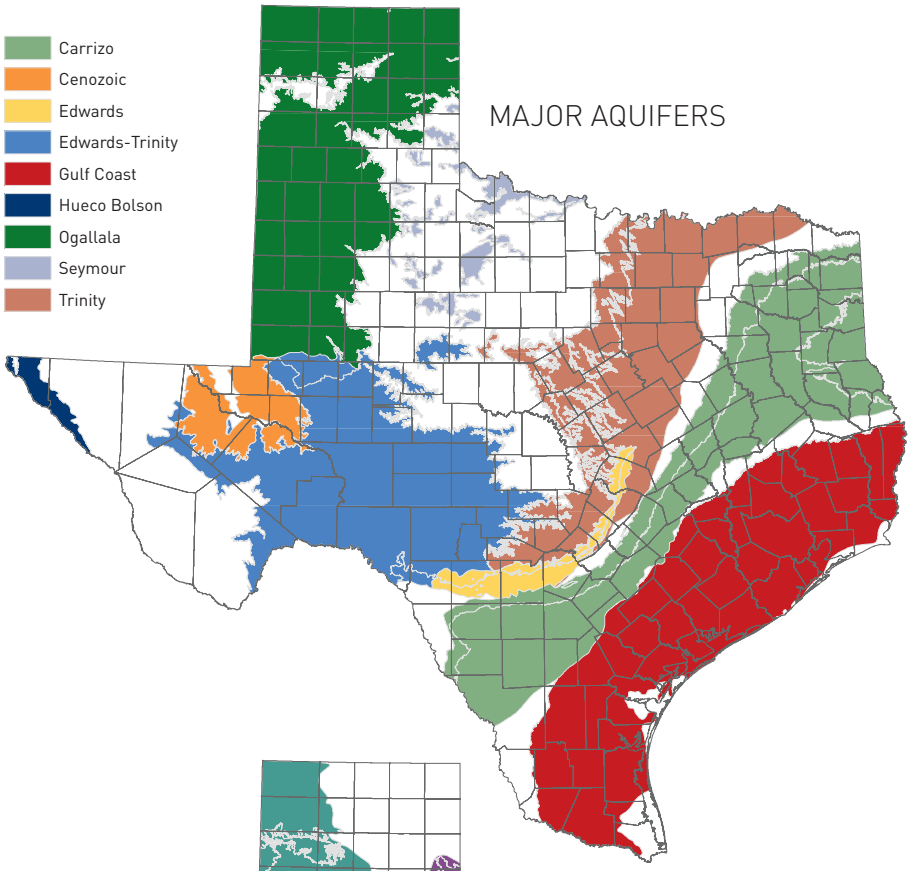
MYTH #3

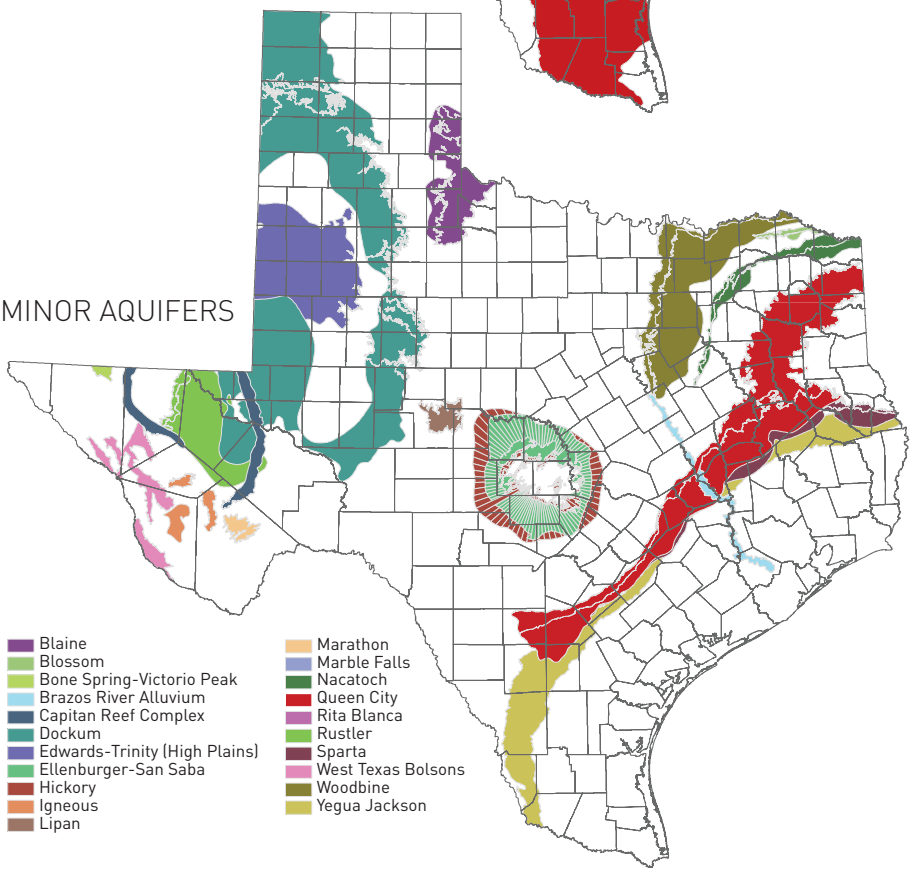
If an aquifer contains billions of gallons of water, the proposed volume of groundwater to be withdrawn from one property is merely a drop in the bucket.

FACT: Many of Texas' aquifers stretch from one side of the state to the other and underlie thousands of square miles. The volume of water contained in the whole aquifer may be huge, but the volume of groundwater that is physically available on the local scale may be vastly limited in comparison.

Depending on the physical composition of the aquifer—its hydrogeology—a seemingly minor volume of water may not be so minor at a local scale. Landowners should study their aquifer (see inset) and learn about the availability of groundwater in the area in order to evaluate the significance of proposed groundwater withdrawals.

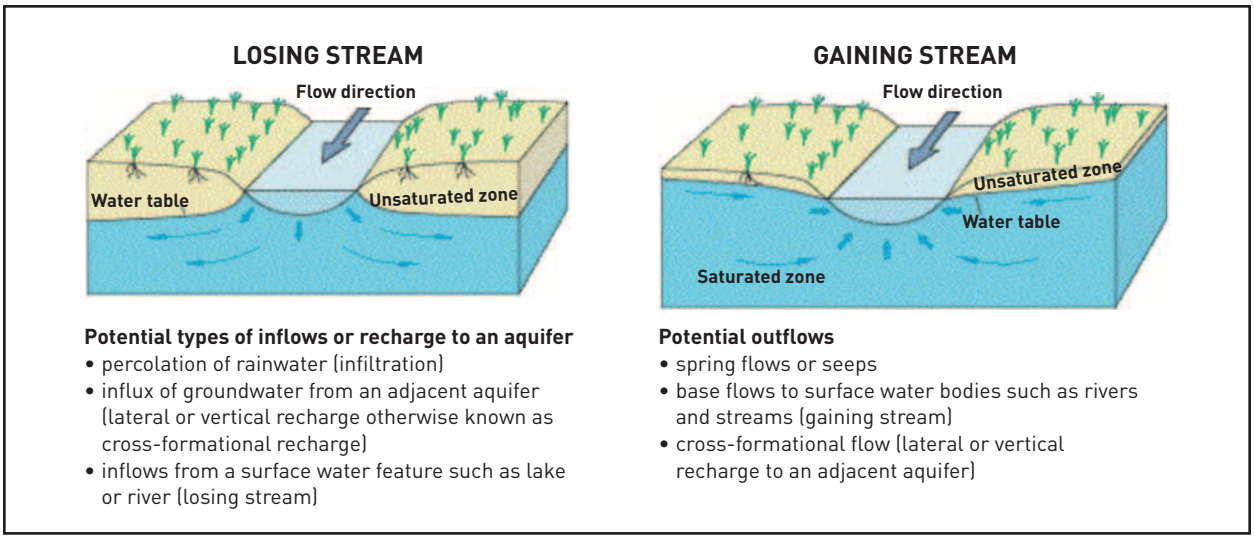
Get to know your aquifer





Texas has nine major aquifers and 21 minor aquifers. While minor aquifers tend to be smaller in scale with regards to aerial extent and/or volume of groundwater, they still may be an integral water resource to the local area. All aquifers possess unique hydrogeological characteristics that dictate how much water can be stored (storage capacity), how and at what rate groundwater is replenished (recharge rate), and what level of interaction there is with other aquifers or surface water resources (degree of interconnectivity). The rate of groundwater movement can also vary from aquifer to aquifer, depending on its geologic composition. Contact your local groundwater conservation district for more information regarding the aquifer in your area. Contact information if available through the Texas Alliance of Groundwater Districts, at www .texasgroundwater.org or (713) 705-4861. If you are not located within the boundaries of a district, contact the Texas Water Development Board at (512) 463-7847 or via e-mail at roger.quincy@twdb.state.tx.us. Detailed aquifer information is also available in the USGS' Groundwater Atlas of the United States (www.capp.water.usgs.gov/gwa).Source: Maps from www.twdb.state.tx.us.

Inflow – outflow = change in storage volume



Potential types of inflows or recharge to an aquifer
- percolation of rainwater (infiltration)
- influx of groundwater from an adjacent aquifer (lateral or vertical recharge otherwise known as cross-formational recharge)
- inflows from a surface water feature such as lake or river (losing stream)

Potential outflows
- spring flows or seeps
- base flows to surface water bodies such as rivers and streams (gaining stream)
- cross-formational flow (lateral or vertical recharge to an adjacent aquifer)

Source: USGS Circular 1186

MYTH #4

If a buyer's proposed pumping plan is shown to not cause a significant impact to the groundwater table in the vicinity of the extraction well, it is safe to assume that impacts from the pumping will not be experienced elsewhere.

FACT: Groundwater exists in a state of equilibrium, an intricate balance between inflows and outflows dictated by the hydrogeology of the aquifer and its relationship with the land surface. Any level of pumping can alter that balance, changing the volume in storage of which the effects can be felt miles away.

To evaluate potential pumping impacts, it is important to understand the hydrogeology of the aquifer in question (see *Get to Know Your Aquifer*, page 2) and have a basic understanding of a water budget.

For a comprehensive overview of these and other important hydrological concepts, see *Ground Water and Surface Water: A Single Resource,* by the United States Geological Society, Circular 1139. Visit www.usgs.gov or call 1-888-ASK-USGS.

MYTH #5

There are pools of "stranded surplus" groundwater in certain areas that should be pumped.

FACT: It is misleading to characterize any groundwater as "surplus" or "stranded." Groundwater deposits may support spring and base flows for nearby surface water features or provide cross-formational recharge to other aquifers.

The removal of groundwater by pumping and delivery for use outside the aquifer recharge area can affect the aquifer's water balance as follows: 1) there may be a decrease in outflow—the water leaving the aquifer as discharge via seeps, springs, base flows, or cross-formational recharge and/or 2) there will be a reduction in the volume of water in storage.

If the groundwater system is not discharging, the water is still not "stranded" but merely in storage, available to meet future water needs. The decision whether to pump the stored water for current use should weigh the potential of an immediate financial

gain against the importance of protecting future water needs. This is the most important decision that most groundwater conservation districts are required to make.

MYTH #6

Increasing groundwater withdrawals will enhance the volume of recharge to the system.

FACT: With an increase in withdrawals, the volume of water stored in an aquifer will decrease. The decreased volume leaves room for the aquifer to capture "additional" water as recharge; as the water table declines due to pumping, additional storage capacity becomes available.

Even if additional storage becomes available, however, there may not always be sufficient rain to recharge the system. During a drought there will be little or no recharge. Alternatively, an increase in pumping in an adjacent aquifer may decrease the potential of cross-formational recharge.

Again, it is important to understand the hydrogeologic properties of the aquifer in question. While not likely with most aquifers in Texas, it is possible that a decline in the water table could cause a permanent decline in storage capacity, and may even cause subsidence. For example, some portions of the Gulf Coast aquifer, notably in the vicinity of Harris and Galveston Counties, experience a compaction of subsurface clay layers resulting from water level declines which decreases the aquifer's storage capacity.[2]

MYTH #7

The easiest and most common way to acquire groundwater is to acquire land, because the water below the surface comes with the land.

FACT: Texas courts recognize groundwater as an estate in real property that can be conveyed separately from the other rights associated with land ownership.[3] That means that it is possible for a landowner to lease or sell his groundwater rights and retain title to the land. At least three different legal mechanisms are used in Texas to transfer groundwater rights: (1) conveyance of the land and associated groundwater; (2) conveyance of the groundwater rights, but not the surface rights; and (3) lease of the groundwater rights for a specific term.

Whether a landowner chooses to convey his/her water rights through a lease or through absolute conveyance will depend on the circumstances of the specific situation. From the landowner's perspective, a lease may be advantageous because it is possible to include a provision that makes the groundwater rights revert to the landowner after a specific period of time should the lessee not begin drilling and production. The reversion would give the landowner an opportunity to lease the right to someone else, should the deal not go forward. In addition, because most groundwater leases include a royalty provision, the landowner may realize substantial financial benefits if the project is successful. On the other hand, the landowner may prefer an outright conveyance of the groundwater rights if the purchaser is willing to pay a premium.

In general, groundwater leases contain provisions analogous to those found in oil and gas leases. For example, leases contain provisions that cover the rights of a lessee to use the land surface as well as limitations of use by the lessee. Other provisions commonly included relate to the payment of royalties to the landowner, pooling of

production units, metering of water wells, payment of taxes and fees, environmental compliance, the landowner's right of termination, and compliance with applicable groundwater conservation district requirements.

MYTH #8

If a landowner sells or leases his groundwater, the pumper has the right to use all of the available groundwater.

FACT: The landowner can reserve some of his water by including explicit terms in the sales agreement or lease. To protect the landowner's rights, the agreement should be written to reserve some of the water for the landowner's use. For example, the lease could provide that the landowner may construct or continue to operate water wells for his/her own domestic or livestock purposes.

MYTH #9

Because Texas cities need water so badly, a landowner will always be able to lease or sell his/her water at a high price.

FACT: Whether a marketer/purchaser is interested in acquiring a landowner's water rights and the price he is willing to pay will depend on a variety of factors.

The value of groundwater to a purchaser depends on (1) the quantity and reliability of the water supply, (2) the cost and availability of delivery system to transport the water to its final destination, (3) the quality of the water, and (4) the regulatory framework within which the transaction will be carried out.[4] To justify a large capital investment in a water delivery system, most purchasers will be interested in rights to a long-term, reliable, large quantity of water. As a rule, the greater the capital investment required to get the water to the point of delivery (that is, the farther the well is from the city), the less valuable the water is to the purchaser.

The quality of the water source is another important factor influencing price. Whether the water can meet the buyer's needs without expensive treatment will affect the price the buyer is willing to pay.

The extent to which a particular source of groundwater is attractive to a purchaser also depends on the regulatory framework that governs the transfer. The rules that are relevant to groundwater marketing are established by groundwater conservation districts where districts exist.

In general, a purchaser will review the district's permitting and production rules (and the transfer rules, if a transfer outside the district is planned) to determine what will be required to complete the transaction. In addition, he/she will evaluate the rules to determine whether they provide a predictable framework for defining and protecting the groundwater right. More details on a district's authorities and responsibilities to establish production rules are discussed further below (see Myth #10.)

There is a wide range of prices for groundwater leases and permanent acquisitions. In the Panhandle, for example, lease prices range from $7 per acre foot per year to $100 per acre foot per year.[5] In the Edwards Aquifer region, the prices range from $90 to $100 per acre foot per year. Permanent acquisitions in the Edwards cost from $700 to $2,800 per acre foot and upwards.[6]

MYTH #10

There is nothing an individual landowner can do on his/her land to increase the value of the groundwater resource.

FACT: Sound land stewardship can have tremendous benefits for groundwater.

Given that all our surface and groundwater supplies originate with precipitation falling on the 150 million acres of open space in Texas, the good land stewardship can be an important supply enhancement and water quality protection tool. Sound land management techniques may increase aquifer recharge and enhance local spring flows. Well-managed land with good vegetative cover captures rainfall, facilitating the infiltration of the water into the soil and enhancing the potential for recharge of the underlying aquifers.

Understanding local conditions is paramount when implementing brush management as a strategy to increase groundwater availability. Its usefulness as a mechanism to increase recharge is highly variable and depends on the ecologic and climatic region and a range of physical characteristics. For example, brush management on sites with good precipitation rates and shallow soils that drain rapidly and are underlain by fractured material, such as the Texas Edwards Plateau, are most likely to increase groundwater recharge.

Sound land stewardship practices can also benefit groundwater quality. Avoiding the excessive use of pesticides and fertilizers at the surface and the implementation of best management practices can result in a reduced level of impact to both surface and groundwater features.

Both as a supply enhancement alternative and for water quality protection, land stewardship practices should be an integral component in water planning activities, both at the individual landowner level and within regional and state-wide water planning efforts. As one of the solutions to our water issues, it is complementary, cost-effective, sustainable, efficient, environmentally sensitive, multi-faceted and governable.

For more information, contact the local Soil and Water Conservation District (www.tsswcb.state.tx.us), local county extension agent (county-tx.tamu.edu), or the local NRCS service center (http://www.tx.nrcs.usda.gov/).

MYTH #11

It is economically advantageous for the landowner to negotiate a deal with the groundwater lessee under which his compensation will be based on the lessee's profits.

FACT: Basing price on projected profits is risky for the landowner because the lessee may not realize a profit from the sale of the water for many years, or perhaps ever. Rather than base the price of the water on speculative future profits, it will usually be in the landowner's best interest to negotiate a deal that resembles an oil and gas lease.

The extent to which the lessee/pumper makes a profit from the sale of water obtained from a landowner depends largely on whether the lessee/pumper has a customer lined up, the capital and operating costs associated with getting the water to the point of delivery and the price to be charged to the end user of the water. Specifically, the compensation provision could be designed as royalty payments that would be based on a percentage of the sales *proceeds* received by the lessee. If the point of sale is at the end of a water pipeline off the property, and the price paid includes the cost of transporting the groundwater to the point of sale, the royalty will usually be a share of the proceeds received by the lessee less the portion of the proceeds attributable to the pipeline. The royalty is calculated this way to take into account the fact that the lessee made a substantial capital investment in the pipeline.

In addition to the royalty payment provision, the lease may include a "bonus" payment to the landowner as compensation for entering into the lease. The lease may also provide for "shut in payments," "minimum royalty payments," and/or "delay rental payments." It is advisable for the landowner to consult with a knowledgeable water lawyer before signing a lease or sale agreement for groundwater, in order to make sure that the compensation provisions are designed to serve the landowner's interests.

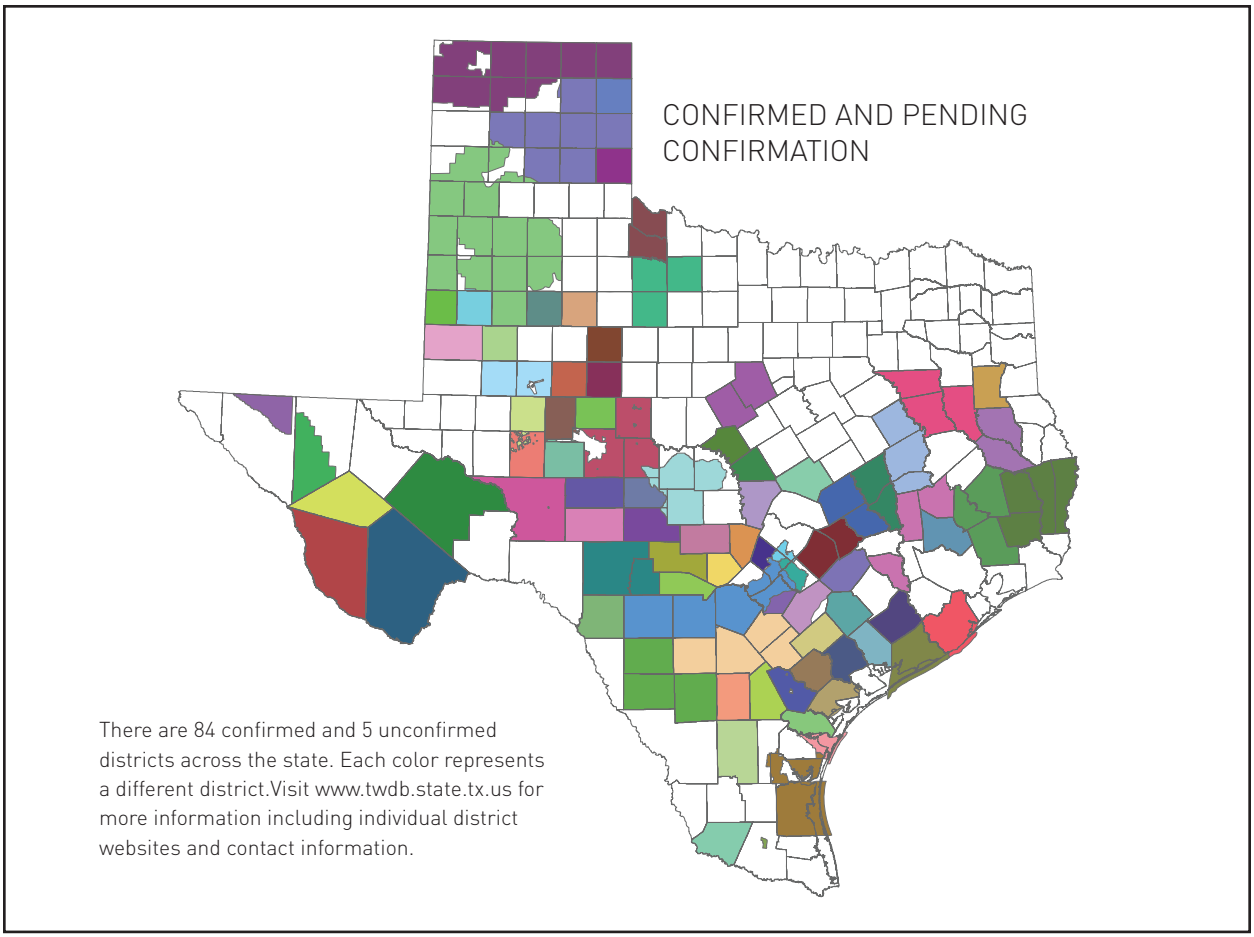
MYTH #12

Promoting groundwater marketing will result in extensive economic benefits for the local economy.

FACT: In most cases, groundwater marketing will only have important economic benefits for individual landowners unless the proceeds are spent within the local community. In addition, the value of water extends beyond an individual's potential economic gains. So it is important that the marketing activity be properly structured and regulated so as to protect these other values.

In considering whether to lease or sell rights to pump groundwater, it is important to recognize that the value of water is more than the price a marketer is willing to pay for it. Unlike traditional commodities such as oil or livestock, the value of water includes its relationship to the state's cultural heritage, rural economy and way of life, its aesthetic value, and more tangible functions such as supporting springflows and base flows for rivers and streams, and maintaining soil moisture levels for plants. Plus, if too much water is exported, it is possible that the diminished local supply will be insufficient to support future economic development. It is extremely difficult to quantify these values on the same scale as the price that municipalities are willing to pay for water supplies.

Groundwater conservation districts



Source: TWDB

MYTH #13

The rule of capture results in a free and open market and is good for groundwater marketing.

FACT: A functioning market depends on certainty and the ability of the purchaser and seller to quantify and protect his/her rights. Under the rule of capture, one's groundwater rights are not certain or secure, especially for the long term.

Rather than resulting in a free market, the rule of capture can encourage conflicts between neighbors and produces significant uncertainty about the future of the water right. Under the rule of capture, the right to pump is not quantifiable and a landowner is entitled to pump as much water as he or she desires, without regard to the impact on adjoining landowners.[7] In short, one's water cannot be protected from a neighbor's pumping activity. Understandably, the water is less desirable to a potential purchaser under these circumstances.

A groundwater district has the authority to restrict the rule of capture by limiting or altering groundwater ownership rights in order to manage the groundwater resources within its jurisdiction.[8] The establishment of the groundwater district is fundamental to the protection of the resource, but it is also important for the district to have a strong framework of rules in place. One component of the rules should be

the establishment of pumping limitations that provide for the long-term viability of the groundwater resource, ensure the availability of groundwater for local uses into the indefinite future and protect spring flows.

MYTH #14

Groundwater districts cannot adequately regulate groundwater marketing to ensure protection of the aquifer and associated outflows such as spring flows and base flows to rivers and streams.

FACT: Groundwater districts have broad powers to regulate groundwater withdrawals.

Groundwater districts are the state's preferred management tool under state law.[9] As of July 2006, there were 84 established districts across the state. Chapter 36 of the Texas Water Code[10] authorizes districts to issue rules that limit and regulate well spacing between property lines and adjoining wells, impose production limits on wells, and restrict production based on acreage or tract size.[11]

In addition to giving districts the authority to restrict production, the law provides for joint planning between districts and mandates the establishment of "desired future conditions" for aquifers across the state. These conditions are a management goal which can include objectives such as maintaining consistent aquifer levels and providing for adequate spring flows.[12]

Several districts have rules in place that limit pumping based on average annual recharge or other measures of aquifer sustainability. For example, the Menard County Underground Water District has imposed a cap on pumping from the Edwards-Trinity Aquifer and the Hickory Aquifer.[13] The Blanco-Pedernales Groundwater Conservation District's rules are designed to protect against "aquifer mining"—the condition where production from the aquifer exceeds the average available recharge of the aquifer.[14] The permitting rules of the Lone Star Groundwater Conservation District and Refugio Groundwater Conservation District provide that operating permits may be limited when pumping exceeds the annual amount of recharge[15] (Lone Star GCD) or causes the water table to drop below a specified level (Refugio GCD).[16]

Recognizing the relationship between aquifer use and potential reduction in surface water flows in western Hays County, the Hays-Trinity GCD adopted a criterion in its management plan to limit pumping in the District to the amount of groundwater that could be used while maintaining 90[17] percent of stream leakage (spring flows, seeps, and gain flows in streams and rivers.)[18]

A number of districts require meters on all permitted wells to ensure that permit limits can be enforced and to facilitate the implementation of drought management programs. Meters give an accurate measure of water usage and provide verifiable data that can be used to prove historical water usage, demonstrate compliance with permit limits and prevent waste.

The Lone Star GCD[19] and the Post Oak Savannah GCD[20] both have rules requiring meters for wells capable of producing 25,000 gpd. North Plains GCD[21] and Panhandle GCD requires flow meters on all new wells.

If there is a threat of "imminent peril" to the public's health, safety, or welfare, districts have the authority to enact emergency rules that can be effective up to 90 days.[22] Such rules can include a temporary moratorium on the approval of

pumping permits if the district believes that the issuance would compromise the availability of groundwater resources in the district. In the interim, the district can initiate a change in their district rules that will better protect the resource.

Both the Post Oak Savannah GCD and the Fayette County GCD have used temporary moratoriums as a management tool. Post Oak Savannah GCD enacted a 6-month moratorium in 2005 so that the District would have time to establish better groundwater availability estimates. In Fayette County GCD's case, a moratorium was enacted in August of 2005 while the District incorporated results of an aquifer study into its rules. This moratorium was only recently lifted in November 2006.

MYTH #15

Spring water is wasted if it flows downstream.

FACT: Natural groundwater discharges, such as spring flows and baseflows to surface water bodies, are essential to maintaining the flows of Texas' rivers and streams, and help keep our coastal bays and estuaries healthy and productive. In many cases, spring flows help satisfy downstream water rights that have been issued for irrigation, municipal, industrial or other uses.

During periods of drought, spring flow often provides the majority of surface water flows in some of the major rivers. During the summer of 1996, springs emanating from the Edwards aquifer provided for over 80 percent of the water flowing downstream in the Guadalupe River.[23]

Water flowing in rivers and streams sustains riparian vegetation and wetland areas and supplies the bays and estuaries along the Gulf Coast with freshwater inflows. Hunting, fishing and tourism, all of which rely, in whole or in part, on healthy populations of fish and wildlife, are becoming more and more essential to the economic well being of rural and coastal communities. Streams and rivers are also important for recreation, to dilute and further treat our wastewater, for livestock watering and much more.

The San Marcos River in Central Texas is supported in part by outflows from the Edwards Aquifer.

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MYTH #16

GCDs have the authority to prohibit the transportation of groundwater out of the district.

FACT: GCDs cannot adopt rules that explicitly prohibits the export of groundwater.[24] However, districts do have the power to require permits for the transport of groundwater outside the district and to consider factors such as the availability of water in the district and the effect on aquifer levels.[25]

By law, districts must be fair, impartial, and nondiscriminatory when evaluating permits, regardless of the end-user of the groundwater. The law prohibits districts from imposing more restrictive permit conditions on those who plan to transport water out of the district than on in-district users.[26]

Overview of what districts can, cannot, and must do with regard to exports[27]

A district may:

- Require a permit or permit amendment for groundwater exports;
- Charge a reasonable processing fee for permits to transport groundwater out of the district (provided the fee does not exceed application fees for in-district uses.);
- Impose a reasonable export fee or surcharge;
- Consider impacts such as the potential effect of the transfer on aquifer conditions, depletion, subsidence, or effects on existing permit holders or other groundwater users within the district and the approved regional water plan and certified district management plan;
- Periodically review the amount of water that may be transferred under the permit and limit the amount if additional factors warrant the limitation.

A district may not:

- Impose more restrictive permit conditions on exporters than in-district permitees.
- Deny a permit based solely on the fact that it involves the exportation of groundwater.

A district must:

- Be fair, impartial, and nondiscriminatory;
- Structure an export permit such that the period of the transfer is at least three years if construction of a conveyance system has not been initiated prior to the issuance of the permit; or at least 30 years if construction of a conveyance system has been initiated prior to the issuance of the permit. If the conveyance system is begun within those 3 years, the terms are extended to at least 30 years.

In addition to the general permit requirements as outlined in Chapter 36 of the Texas Water Code, Glasscock GCD[28] and Menard UWCD[29] both require applicants for groundwater transport permits to submit additional information on the following: alternative sources of supply that might be utilized by the applicant, and the feasibility and practicability of utilizing them; indirect costs and socioeconomic impacts of the proposed transfer; and the names and addresses of the property owners within a half mile of the proposed pumping location (Menard UWCD requires 1 mile), and the location of any wells on those properties. In addition, Menard UWCD requires the submittal of a technical report on the effect of the proposed transportation on the District's groundwater quality and quantity.

The last word

Groundwater marketing is not a new idea in Texas, but several of the projects under consideration across the state are of a scale never before contemplated. Decisions made now will affect Texas' groundwater resources for generations to come. Groundwater conservation districts and landowners play integral roles in these decisions and the responsibility of making wise and informed choices lay on their shoulders.

For groundwater districts contemplating mechanisms for regulating proposed exports, it is essential to consider ways to protect the future sustainable yield of the aquifer and its essential outflows. For landowners considering whether to sell or lease their groundwater pumping rights, the key lies in understanding and considering a range of factors including the hydrogeology and interconnectivity of the resource, and how the removal of groundwater from beneath their land may impact other local resources, including the current and future local economy.

Resources

Landowner resources

Secrets for Negotiating Texas Groundwater Leases, Texas Real Estate Center, TR No. 1593, Fambrough, November 2002. Available at recenter.tamu.edu or by calling (979) 845-2031.

Groundwater Leases, What Texas Landowners Need to Know, Texas Real Estate Center , Tierra Grande Publication 1628, by Fambrough, July 2003. Available at recenter.tamu.edu or by calling (979) 845-2031.

Sustainablility of Ground-Water Resources, United States Geological Survey, Circular 1186. Available at www.usgs.gov or by calling (888) ASK-USGS.

Questions about Groundwater Conservation Districts, Report B-6120 available thru the Texas Cooperative Extension at tcebookstore.org or by calling (888) 900-2577.

Ground Water and Surface Water: A Single Resource, by the United States Geological Survey, Circular 1139. Available at www.usgs.gov or by calling (888) ASK-USGS.

A Powerful Thirst, Water Marketing in Texas, Environmental Defense, 2004. Available at www.texaswatermatters.org or by calling (512) 478-5161.

A Texan's Guide to Water and Water Rights Marketing, Texas Water Development Board, 2004. Available at www.twdb.state.tx.us or by calling (512) 463-8337.

Landowner & Citizen Information on Groundwater Leasing, Marketing & Sales, Texas Agricultural Experiment Station, SP-195, TWRI-260. Available at tcebookstore.org or by calling (888) 900-2577.

Online resources

Groundwater Resources Division, Texas Water Development Board, www.twdb.state.tx.us

Texas Alliance of Groundwater Districts, www.texasgroundwater.org

Texas Water Resources Institute, twri.tamu.edu

Texas Water Matters, www.texaswatermatters.org

For more information about groundwater conservation districts including how to establish one in your area, see "Questions about Groundwater Conservation Districts," Report B-6120 available thru the Texas Cooperative Extension at tcebookstore.org or by calling (888) 900-2577 or contact Bruce Lesikar of the Texas Cooperative Extension at (979) 845-7453 or via e-mail at b-lesikar@tamu.edu.

Notes

[1] San Antonio Water System Quarterly Report on Water Resources July - September 2005, p. 2-25. Available at http://www.saws.org/our_water/waterresources/watersupply/reportpdf.

[2] Visit www.hgsubsidence.org for more information regarding this phenomena and how the Harris-Galveston Subsidence District manages the aquifer to prevent further subsidence.

[3] For example, see *Evans v. Ropte,* 96 S.W. 2nd 973 (Tex. 1936).

[4] Johnson, Russell S. "Groundwater Transactions: Buyer's Perspective," *Buying, Selling and Exporting Groundwater: Implications for Groundwater Conservation Districts.* Texas A&M University (May 28, 2003), p. 9-10.

[5] *Id.,* p. 8-9.

[6] *Id.,* p. 8.

[7] As with oil and gas law, pursuant to the rule of capture, the well must be under the landowner's property (it is impermissible to drill under one's neighbor's land) and must be properly operated. See Ernest E. Smith & Jacqueline L. Weaver, 1 TEXAS LAW OF OIL AND GAS § 1.1(B)(1) (1998 ed. and 2005 update).

[8] TWC § 36.002.

[9] In 1997, the legislature added language to the Texas Water Code explicitly recognizing groundwater conservation districts as the "preferred method of determining, controlling, and managing groundwater resources" (TWC §36.0015).

[10] The Texas Water Code is available online at www.capitol.state.tx.us/statutes/statutes.html. Some authority may be limited through restrictions placed on a district by its enabling legislation.

[11] TEX. WATER CODE § 36.116.

[12] The state is divided into 16 groundwater management areas (GMAs). Groundwater districts within a single GMA have until September of 2010 to establish desired future conditions for the aquifers within their management area (TWC§ 36.108 (d)). Desired future conditions are to be evaluated in five year increments thereafter. For more information about GMAs and the establishment of desired future conditions, visit the Texas Water Development Board website at www.twdb.state.tx.us/GwRD/GCD/faqmain.

[13] Rules of the Menard County Underground Water District, February 2003.

[14] Blanco-Pedernales Groundwater Conservation District Rules, published February 11, 2002, available at www.blancocountygroundwater.org.

[15] Lone Star Groundwater Conservation District, Amended Rules, Effective February 14, 2006, available at www.lonestargcd.org.

[16] Refugio Groundwater Conservation District, Adopted July 27, 2004, available at www.rgcd.org.

[17] Ninety percent of aquifer system leakage was estimated based on drought of record conditions.

[18] Hays Trinity Groundwater Conservation District, Groundwater Management Plan, Adopted August, 2005.

[19] Rule 9.1, Lone Star Groundwater Conservation District, amended Rules Effective February 14, 2006.

[20] Rule 11.2, Rules of the Post Oak Savannah Groundwater Conservation District, Adopted and Readopted: June 8, 2004 as amended thru May 9, 2006.

[21] Rule 3.3, Rules of North Plains Groundwater Conservation District, Adopted January 19, 2005 and amended on January 20, 2006.

[22] TWC § 36.1011.

[23] Water from a Stone: The Limits of the Sustainable Development of the Texas Edwards Aquifer, Todd Votteler, Southwest Texas State University, February 2000, pg, 189.

[24] 36 TWC § 36.122(o).

[25] *Id.* § 36.122(f).

[26] *Id.* § 36.122(g).

[27] *Id.* § 36.122.

[28] Rule 21(d), Glasscock Rules and By-Laws.

[29] Rule 12.03, Rules of the Menard County Underground Water District, February, 2003.

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