

ISSUES AND TRENDS IN TEXAS WATER MARKETING

Ronald C. Griffin

Texas A&M University

Gregory W. Characklis

Azurix Corp

INTRODUCTION

Rising water scarcity in Texas sparked several institutional changes supportive of water marketing in the latter half of the 20th century. In two of these situations judicial action introduced promarketing changes where the Texas Legislature had been slow to respond to evolving scarcity. Our objectives in this paper are to provide an abridged discussion of these changes and to observe the progress of Texas water marketing to date.

FOUR MAJOR WATER DOCTRINES

In and out of Texas, water policy commentators have bemoaned the use of two separate policy doctrines for ground and surface waters. The main complaint is that optimal conjunctive use is frustrated by the use of two conflicting doctrines, especially given the hydrologic relationships that bind ground and surface water. Texas, however, employs four doctrines. The applicable doctrine depends on the water body:

1. A style of correlative water rights is used in a large segment of the Rio Grande River basin. Water rights are transferable and are severed from land rights, but they do not have dated seniorities. The impacts of dry-period shortages fall almost entirely on irrigators, as municipal water supplies are protected under the current allocation procedure.
2. Rest-of-Texas surface water is managed by the prior appropriations doctrine. Rights are severed from land and are transferable. The shortage hierarchy depends on the seniority of the right rather than the type of use.
3. The Edwards Aquifer, which serves the San Antonio region, has been undergoing adjudication. Pumping rights are being quantified and assigned. This course of action was selected by the State, so that Texas could comply with federal judicial pressure stemming from Endangered Species Act enforcement. Once completed, water rights will be transferable independent of land. Because of its

fractured limestone character and its strong linkages to surface water flows, the supply of water from the Edwards is highly stochastic, much like a river. The primary policy to be employed for assigning drought shortages is not yet defined.

4. Rest-of-Texas ground water is allocated in accordance with the absolute ownership doctrine (sometimes referred to as the "rule of capture"), a common property arrangement that borders on being an open access institution. All landowners overlying an aquifer are entitled to pump as much water as they see fit, untethered by any "reasonability" criterion as would be practiced in most other states.

As a consequence of the multiple policies practiced for different water bodies, Texas has some broad experience with the emergence of water markets and related institutions. The following four sections observe some of the particular experiences forthcoming from each of these situations. After discussing the individual circumstances of each of these four settings, some crosscutting observations for the State will be presented.

RIO GRANDE RIVER BASIN

The Rio Grande flows from southern Colorado to the Gulf of Mexico, but periods of the year find little or no water in the riverbed between El Paso and the point where tributary inflow from the Rio Conchos enters from Mexico. For the purposes of water rights administration, the Rio Grande is defined as that portion of the river flowing south out of Amistad Reservoir and on to the Gulf of Mexico. This region, commonly referred to as the Rio Grande Valley, is highly dependent on surface water.

The severe drought of the 1950s led to an extended legal battle over Rio Grande water that was settled in 1971 with a state court adjudicating regional water rights. Rights entitle users to a portion of the combined storage of Amistad and Falcon reservoirs, the volumes of which are apportioned by treaty between the United

States (U.S.) and Mexico. Administering water right accounts and transfers on the U.S. side of the basin is the responsibility of the Rio Grande Watermaster's office. The vast majority (~99 percent) of rights are designated for use in either municipal or irrigation activities. Urban uses have a higher priority and make up approximately 15 percent of annual water use.

The monthly process of allocating new reservoir inflows among right holders employs an accounting device referred to as the "municipal reserve," which is recharged before prorating remaining inflows to irrigators (Characklis, Griffin, & Bedient 1999). The current size of this reserve is 225,000 acre-feet, and it does not decline during the year, regardless of the amount of water used by municipalities. The size of the municipal reserve is updated periodically to keep pace with the continuing transfer of water from agricultural to urban use. The last update took place in 1986. Since that time, the number of municipal rights has grown to approximately 320,000 acre-feet, giving rise to discussions over whether the size of the municipal allocation should be increased.

Water rights within the region can be bought, sold, or leased. Transfer procedures are relatively unrestrictive as a result of both a well-conceived regulatory framework and some region-specific characteristics (such as a lack of concern over third party impacts or instream flow requirements). The relative simplicity of the transfer process, in conjunction with rapid regional development, has resulted in one of the most active water markets in the country. Movement of water rights has been almost exclusively from agricultural to urban use, with municipalities acquiring on the order of 10,000 acre-feet of additional rights per year. While cities continue to acquire rights, they do so primarily in anticipation of future growth and consistently use only about 65 percent of the water to which they are entitled. Prices for water rights are ranging from \$1,200 to \$1,400 per acre-foot, with rumors of offers as high as \$1,700. Temporary transfers, generally in the form of one-year leases (or "contract" water in local parlance), account for a great deal of market activity with 20,000 to 80,000 acre-feet changing hands annually.

It is important to note that while sales of rights between municipalities and irrigators are allowed, the priority disparity between municipal and irrigation rights results in a prohibition on leasing between the two sectors. This separation has allowed for some interesting price observations as climatic conditions in the region have varied. Municipal users, whose water supply is secure under all but the most extreme drought conditions, see

little fluctuation in the lease price of municipal water. During the period 1994 to 1999, the weighted average of municipal lease price increased from \$20 to \$30 per acre-foot during dry years. The agricultural sector, however, is forced to absorb the majority of any annual shortfall in supply, and therefore sees a much greater increase in price during periods of drought. Over the same period, weighted average prices for irrigation leases were \$10 - \$15 per acre-foot in normal years, but rose as high as \$60 per acre-foot during dry years.

REST-OF-TEXAS SURFACE WATER

In stark contrast to the extensive and everyday water marketing that occurs in the Rio Grande valley, surface water marketing is uncommon in the remainder of the State. Interestingly, the few trades that do occur are often well-trumpeted exchanges of large blocks of water. Texas surface water policy is overtly supportive of water reallocation by water marketing, so it may seem unusual that exchanges are so infrequent. The Texas Water Development Board has even established the Texas Water Bank, essentially a clearinghouse whereby buyers and sellers can find one another, but it is quite idle.

Four reasons go far in explaining the dearth of transactions away from the Rio Grande. First, water scarcity is generally not an issue in Texas's eastern basins during average and wet years. Water marketing does not offer rewards in these places and times. Second, Texas does not possess natural conduits or a federally subsidized "California" infrastructure for wheeling water about the state. Without such conveyance mechanisms, and it is unlikely that such projects could pass a cost-benefit test, an active market bridging water-rich and water-short basins cannot develop.

Third, water right enforcement is spotty except for the Rio Grande River. Whereas in the Rio Grande operating basin the Watermaster's office employs a strong system of constant monitoring and water accounting, elsewhere in the State enforcement is very light and is generally limited to exceptionally dry periods. The problem faced here is double-edged. People don't feel the need to buy things that they can take for free, and they are unlikely to buy something that can be easily taken from them.

The fourth reason for thin water markets in the rest of the state is the presence of river authorities. In some, yet not all, of Texas's 18 separate river basins, one or more river authorities have been established to serve all

or part of the basin. River authorities generally own some water rights, operate some major reservoirs, and enter into water delivery contracts to provide raw or finished water to cities, industries, or water districts. As nonprofit, self-supporting entities, these authorities have generally channelled their excess water or electricity revenues, as well as their borrowing abilities, into extending their domains within their licensed service areas. That is, they have steadily purchased the facilities and associated water rights of lesser public and private water districts. The resulting monopolistic power makes open water marketing infeasible and moves water reallocation to the internal workings of these river authorities. It is noteworthy that no river authority exists in the Rio Grande basin.

For the above reasons, the traditional market ideal of atomistic agents engaging in regular trading has not emerged, except in the Rio Grande region. This is not to say that no transfers have occurred. For example, large blocks of water have been conveyed as part of three significant transactions during recent years.

In 1997, the City of Corpus Christi agreed to terms with the Garwood Irrigation Company (a privately held supplier of irrigation water) regarding the transfer of 35,000 acre-feet, leaving Garwood with 133,000 acre-feet. This transaction represented an interbasin transfer for which no conveyance facilities existed. A subsequent contract between Corpus Christi and the Lavaca-Navidad River Authority (LNRA) involved an additional 41,840 acre-feet annually, but the actual water rights remain under the authority's ownership. Corpus Christi then constructed a 100-mile pipeline from the city to the LNRA's Lake Texana, which is located between Corpus Christi and Garwood's point of diversion. Eventually, a second pipeline can allow the Garwood water to be transported to Lake Texana and on to Corpus Christi.

In 1998, the Lower Colorado River Authority (LCRA) bought Garwood Irrigation Company for \$75 million, thereby acquiring its facilities and remaining water rights. Conversion of this 133,000 acre-feet of "run-of-the-river" water (dependent on available flow) to firm yield provided LCRA with 101,000 acre-feet. LCRA continues to serve Garwood's clients (mostly rice producers), but it will progressively reallocate this water to growing demand in the Austin area.

In 2000, LCRA completed a multipart deal with the Pierce Ranch, another significant holder of Colorado River water rights. The exchange involved a \$17 million dollar payment for roughly 18,000 acre-feet of

senior surface water rights, as well as a 50-year option for the development of ground water on the ranch. Also, part of the deal is a 50-year option allowing the LCRA to construct a surface water reservoir on Ranch property. The agreement calls for the Pierce Ranch to receive 20 percent of future revenues from the sales of ground water or surface water storage. If developed, ground water resources and reservoir storage are estimated to bring LCRA another 50,000 acre-feet of firm yield.

EDWARDS AQUIFER

Federal court rulings forced 1993 and 1995 legislation that abandoned use of Texas's archaic absolute ownership doctrine in the Edwards Aquifer (currently San Antonio's sole source of water). The Edwards acts as a natural interbasin transfer project, and the springflows it produces support several endangered species. Unabated pumping during dry times threatened those springflows and species, so new policy was adopted in the face of considerable inertia and friction. Although adjudication procedures commenced during 1996, it will take a few more years before ground water rights will be assigned. Once permit assignments are finalized, each permittee will be entitled to a specified quantity of annual pumpage. Water rights within the region will be administered by the Edwards Aquifer Authority (EAA). Total permits issued will be in excess of the legislatively mandated 450,000 ac-ft per year, so the EAA will work to trim the excess, probably relying on the market mechanism (purchase, then retire permits). In 2007, total pumpage will be cut further to 400,000 ac-ft/year, although the mechanism for doing so is unclear.

At present there are no seniorities designed into Edwards rights, a fact that promises to be troubling because Edwards flows can vary greatly from year to year (historically ranging from 40,000 – 2 million acre-feet). The EAA has several available options. It can treat assigned rights as correlative shares and announce proportional cutbacks for all right holders during droughts. Alternatively, EAA's enabling statute directs it to label certain uses as "discretionary" and subject to temporary cancellation during droughts. It is also authorized to buy up existing rights as a means to limit pumping, but this mechanism seems better attuned to accomplishing long-term goals.

Water marketing of various types (including both sales and leasing) is occurring prior to the completion of the adjudication process. The city of San Antonio, which is almost entirely dependent on Edwards water for its

municipal supply, has been the primary buyer. Transfers from irrigators to municipalities are subject to some restrictions, however, as current EAA rules state that only 50 percent of an irrigator's adjudicated volume can be sold for urban use. Land sales of irrigated properties have been spurred by the prospects of valuable ground water rights. While the Edwards market is lacking in transparency, with few means of price discovery, recent deals imply water rights (subject to final adjudication and thus somewhat speculative) are selling in the range of \$750 to 800 per ac-ft, with one-year leases going for around \$75. Cities have also funded annual fallowing programs designed to provide irrigators with an incentive not to irrigate.

This is an active and unsettled marketplace. Participants are learning by doing. Until the aquifer is fully and finally adjudicated and until transfer and drought rules are resolved, substantial uncertainty will exist regarding the eventual prices and performance of the Edwards water market.

REST-OF-TEXAS GROUND WATER

The spirit of the absolute ownership doctrine is that ground water access is an original privilege of land ownership. Although this privilege can be separately transferred, much like mineral rights, this right does not attach either constraint or protection regarding the amount of ground water that may be pumped. Recent years have seen the emergence of many Texas ground water districts, which have the stated intent of fostering more conservative ground water use. While the rules of many of these districts have initiated some modest restraints on pumping, many districts have also put in place rules designed to discourage exportation of water (e.g., pumping limitations, export fees, and/or taxes). State policy places no restrictions on the transfer of ground water across basins. This has led to a heightened concern within the agricultural community that local ground water is vulnerable to acquisition by covetous municipalities. This places irrigators in the somewhat paradoxical position of wanting to limit their private property rights in an effort to protect those rights. Symptomatic of this balancing act, district-adopted deviations from the fundamental tenants of absolute ownership have often been minor, while still attempting to limit the threat of exportation.

Further complicating the issue of ground water marketing is the nature of ground water district boundaries, which are generally political rather than hydrologic. Many ground water districts currently cover only a fraction of the total surface area overlaying

an aquifer because most are one-county districts. It remains to be seen how ground water transfers within such an aquifer, but across districts, will be complicated by these political boundaries.

While ground water ranching and water contracts between landowners and water purveyors have been conducted for decades, increasing levels of water scarcity and, perhaps, some speculative tendencies are creating larger scaled ventures. A recent example involves the sale of approximately 70,000 ac-ft of groundwater rights by landowners in Roberts County to the city of Amarillo. Despite the 70-mile distance and a contractual agreement that the water not be withdrawn for at least 25 years, Amarillo paid ranchers \$275 per ac-ft for the rights (Gilliland, 2000). Another example involves San Antonio's continual quest to supplement its Edwards water source. San Antonio has entered into contractual negotiations with Alcoa Corporation for the rights to purchase ground water originating from a lignite mining operation in the Carrizo-Wilcox aquifer over 100 miles from the city. In another instance, San Antonio and several other cities, have had some preliminary, but well publicized, discussions with a group of landowners in the Texas panhandle regarding groundwater sales and conveyance. While the cost of transporting water 650 miles to San Antonio probably renders this project economically inefficient, the attention received by the proposal is noteworthy.

CROSS-CUTTING ISSUES

It has been interesting, and occasionally entertaining, to observe Texas progress in coping with increasing water scarcity. Public rhetoric still emphasizes our alleged water "needs" (rather than scarcity-sensitive demand) and the supposed gravity of water for achieving economic growth. Legislators and other leaders are still prone to think of and speak of "water requirements," thereby missing and underutilizing demand management tools, especially water pricing. Given these attitudes, were it not for the generally positive contributions of water marketing, it would be easy for Texas leaders to embark on a multitude of expensive water supply and conveyance projects. It is very doubtful that any such project could offer a positive net present value, but Texas law does not require that state projects pass a cost-benefit test. Water markets have done a wonderful service by allaying some of the demand for these public projects.

On the other hand, the infrequency and huge scale of surface water transactions away from the Rio Grande raises serious questions about actual efficiency of these

markets. It appears that rest-of-Texas surface water is being exchanged in a marketplace tainted by market power, noneconomic strategic behavior, and lax water right enforcement.

In their efforts "to make a difference" and respond to voters, legislators have been inclined to tinker with our water law in ways that do not necessarily improve water rights or enhance economic efficiency. These acts can be unsettling for water markets, because the powers embedded in water rights can be suddenly changed. For example, 1997s Senate Bill 1 granted surface water right holders substantial discretion to reuse their return flow, to the detriment of other users who depend on this return flow. This unusual redefinition of surface water rights acted to shift water rights from junior right holders to senior ones, from downstream right holders to upstream ones, and from instream uses to diversionary ones. The same Act also established some new hurdles for interbasin transfers of rights. The most interesting change was that a successful interbasin transfer of a water right would immediately become junior to all other existing water rights in the originating basin. Clearly, it is tough for a water market to perform social service if the rules are always in flux.

From an economic efficiency perspective, it is noteworthy that several Texas water-marketing mechanisms are being conducted in an era of wrongful water pricing. Because the prices are wrong, both for urban consumers and irrigators, the excess demands and excess supplies, which are interacting in water markets, are also inefficient. Prices to final water consumers are

generally misspecified due to the predominance of average-cost pricing and the omission of important opportunity costs such as marginal user costs, marginal capacity costs, and the marginal value of raw water (Griffin, 2000). Since these errors affect both sides of a water market, case studies are needed to examine the direction of water market biases.

Lastly, the current state of Texas water market institutions appears to be underserving public good uses of water. That is, the general bias of present policies is to provide water for diversionary human purposes (agriculture, commerce, municipal, industry) as opposed to natural and recreational *in situ* uses such as instream and estuarine demands. Natural aquatic systems have generally become stressed in Texas as a consequence of overappropriated surface waters.

REFERENCES

Characklis, G.W., R.C. Griffin, and P.B. Bedient. (1999). "Improving the Ability of a Water Market to Efficiently Manage Drought." *Water Resources Research* 35 (March 1999): 823-31.

Gilliland, C.E. (2000). "Got Water? Tapping a New Texas Market." *Tierra Grande* reprint, 3 pgs., <http://RECenter.tamu.edu/pdf/1357.pdf>.

Griffin, R.C. (2000). "Effective Water Pricing." Working paper, under journal review, <http://165.91.113.180/wp/effprice.word>.

now published in the
Journal of the Amer. Water
Resources Assoc. 37
(October 2001)