Texas Water Resources Institute

Fall 1993
Volume 19
No. 3

Legislature Agrees on Compromise to Manage Edwards Aquifer

Bill Requires Permits for Most Users to Pump Groundwater, Establishes Water Market

A wide-sweeping array of bills was passed by the last session of Texas Legislature that will dramatically impact water users.

The most prolonged and hard-fought battle concerned whether any additional legislation was needed to manage the Edwards Aquifer. The end result was a comprehensive bill that will regulate groundwater pumping in the region. Legislators made it clear that, for now, at least, groundwater regulations will not be extended statewide.

Despite the fact that dealing with as complex and controversial an issue as the Edwards Aquifer was difficult and unpleasant, the debate may have opened the door for innovative laws and policies that Texas has needed for many years. The bill includes provisions that will protect endangered species, gather data on water use, adjudicate water rights, encourage limited water marketing, and promote the development of surface water in the San Antonio area.

In this newsletter, we will examine the anticipated impact of the Edwards Aquifer bill. Please keep in mind that the only information we have so far is contained in the legislation. Specific details that will directly affect area water users will be contained in rules that will be developed later. Also, the implementation of the bill (which was scheduled for September 1) has been indefinitely delayed. Some groups have raised concerns about provisions in the bill that call for an appointed Board of Directors. After those questions are resolved, the main provisions in the bill are expected to be retained.

Why the Legislature Was Forced to Develop an Edwards Aquifer Management Plan

First, some background information needs to be presented to understand why the Legislature drafted the Edwards Aquifer management plan.

In 1991, the Sierra Club filed a lawsuit that claimed that the U.S. Fish and Wildlife Service and other agencies were not adequately protecting endangered species that depend on the aquifer. The Sierra Club argued that Comal and San Marcos springs, which are the only home for endangered species such as the San Marcos salamander, the San Marcos gambusia, fountain darters, and Texas wild rice could dry up if the aquifer was overpumped. Because no management plan was in place, and since pumpage had steadily increased over time, many claimed that was a real possibility. In January, federal judge Lucious Bunton in Midland ruled in favor of the Sierra Club and ordered that a satisfactory plan be developed to protect endangered and threatened species. If the Legislature could not develop a satisfactory management plan by May 31, the judge threatened to develop and implement his own plan. Many legislators felt a great deal of pressure to come up with an acceptable compromise before the deadline, because they feared that a federal plan would include harsh pumping restrictions. The judge is expected to rule in October on whether the plan adequately protects endangered species.

The debates that led up to the final bill outlined several areas of contention, usually between urban and rural interests. Many of the flashpoints had economic implications: Would agricultural producers and urban residents share water cutbacks equitably? Would those whose water use is reduced, or who saw the value of unirrigated lands drop dramatically be compensated? Could agricultural producers irrigate new lands? Would water markets be developed? If large amounts of water rights were purchased and transferred to San Antonio, what would happen to the tax base in Uvalde and Medina counties? If a drought hit after farmers had planted their crops could they still get access to enough water to produce a decent harvest? If a groundwater management plan were imposed over the Edwards Aquifer, could similar state intervention be forthcoming throughout Texas? Many irrigators objected to elements of the bill that increase government interference (monitoring pumping and being subjected to using only permitted amounts of water).

The final legislation addressed many of these points.

The Bill's Immediate Impact

How will the bill affect water users in the region?

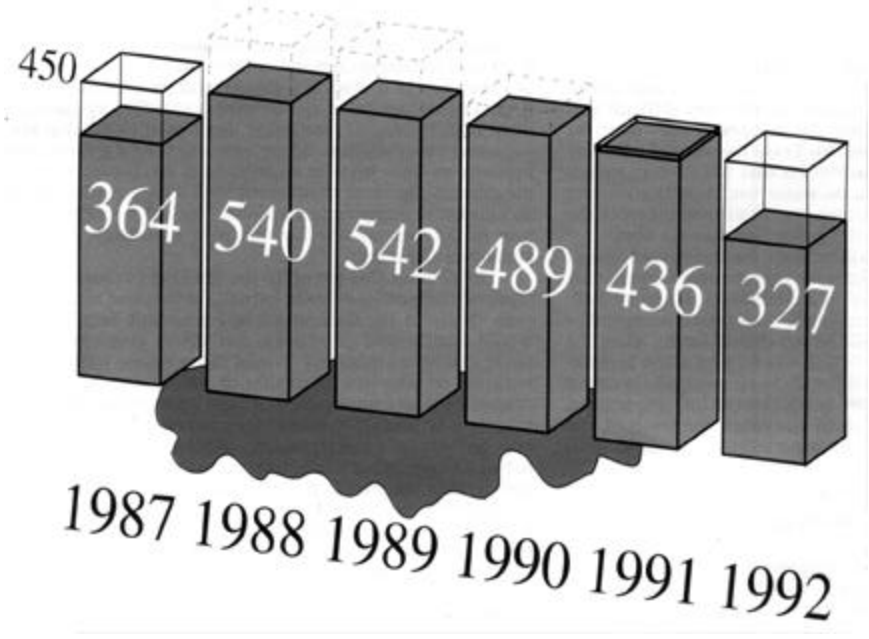
In essence, the bill replaced the Edwards Underground Water District with a new agency, the Edwards Aquifer Authority. The Authority was set to begin operations September 1. The Authority has the power to manage, conserve, preserve, and protect the aquifer, increase recharge and prevent waste. It does not have the authority to regulate surface water.

The Authority will be governed by a nine-member Board of Directors. The Board will be comprised of three members from San Antonio and Bexar County, two representatives of spring interests, one member from a downstream area, and three agricultural representatives. The act also creates a 20-member South Central Texas Water Advisory Committee, which will interact with the Authority when issues related to downstream

water rights are addressed. For example, the Committee can ask the Board of Directors to reconsider any action that may harm downstream users. Members will be appointed by county commissioners and city councils in the region. A Legislative Oversight Committee comprised of three members of each the House and Senate will report to the full Legislature on how effective the Authority has been and whether the features of the bill have been implemented.

Bill Limits Pumping to 450,000 AF Annually; Sets Framework for Management Plan

The overall aim of the bill is to limit pumping to an amount that will protect springflows and downstream water users during "normal" conditions, while allowing the aquifer to be effectively utilized. For example, the long-term average annual recharge is roughly 682,000 acre feet (AF). Computer modeling studies performed by the U.S. Geological Survey, the Texas Water Development Board, and others have shown that flows at the springs should total at least 180,000 AF. This would provide Comal Springs with flows of 150 cubic feet per second (cfs) and San Marcos Springs with a rate of 100 cfs. Subtracting the springflows from the long-term recharge shows that the amount that could be safely pumped could be nearly 500,00 AF per year. The bill sets the initial pumping limit at 450,000 AF annually. In practical terms, the bill requires that overall pumping be reduced from current levels. For example, actual pumping was greater than the 450,000 AF cap in three of the last five years (see figure).



The amount that can be pumped could be increased in years when rainfall and recharge are high, but could be lowered during droughts. The cap will be in effect until the year 2008 when pumpage will be reduced to 400,000 AF per year. A water management plan designed to reach the 450,000 AF goal has to be developed by June 1994. The management plan must address conservation, future supplies, and demand management. The bill requires the Authority to develop a 2 0-year plan to provide alternate water supplies for the region. That plan is to include five-year goals that have to be updated regularly.

In addition, a plan to manage groundwater during "critical periods" when aquifer levels are low has to be implemented by September 1995. This plan is to distinguish between "discretionary" and "non-discretionary" uses. For example, discretionary uses are not essential and their use is to be reduced as much as possible during low water periods. On the other hand, although non-discretionary uses (such as drinking water) must be provided, plans must also be developed to reduce their consumption by the greatest practical extent. The bill establishes a hierarchy of water use priorities that will be used to rank non-discretionary versus discretionary uses. Municipal, domestic and livestock uses are given the highest priority, followed by industrial and crop irrigation, residential landscape irrigation, and recreational use.

Users Must Seek, Obtain Water Rights Permits

To limit pumping to the 450,000 AF limit, the Authority will take several steps. Most of these were set to take effect on September 1. First, a moratorium restricts pumping on wells that were drilled after June 1. Second, the Authority requires current water users to file applications for water rights permits. The applications have to be completed by March 1994. In the interim (until water rights permits are issued later in 1994) existing users can continue to withdraw and beneficially use water without waste if they have filed an application for a permit. The amount of water used during this interim period cannot exceed the maximum amount that was used in any year during the historic use period (June 1972 to May 31,1993).

Third, the Authority will begin to issue permits to most users that will allow them to pump given amounts of groundwater. The only individuals that would not be required to obtain permits are domestic and livestock users that use less than 25,000 gallons per day. Permits will first be issued to existing users based on historic use levels or their annual average pumpage over any period of more than three years. If enough water is available, current users will be granted the maximum amount of water they "beneficially" used (without waste) during any year from 1972-1993.

The permits specify the maximum rate and volume of water that can be pumped annually. Irrigators may receive permits for at least 2 AF per year for every acre they can prove "with convincing evidence" was irrigated and put to a beneficial use. This may be interpreted to mean they would receive 2 AF per acre (or less) if they show this much water is needed for specific crops. Aquifer users will also have to file annual written reports showing the amount of water they pumped.

What happens if the amount of water rights applied for is greater than the cap? A likely scenario may be that agricultural producers would first be assigned 2 AF per acre. After that amount had been subtracted from the cap, the amount of remaining rights applications would be reduced evenly across the board. However, this is not clearly spelled out in the bill.

The bill includes lengthy definitions of waste and beneficial use. Beneficial use is described as "the amount of water that is economically necessary for a purpose

authorized by law, when reasonable intelligence...and diligence are used in applying the water to that purpose." "Waste" consists of pumping excessive amounts of groundwater that threaten or cause poor quality water to intrude into the aquifer and limit its use, the use of wells that produce water for purposes that are not beneficial, excess tailwater from irrigation, and willfully or negligently permitting water from the aquifer to escape into any river, creek, or lake.

If the water use by current users is less than the cap regular, term, and emergency permits can be issued. Term permits could be interruptible if aquifer levels fell below 665 feet at San Antonio and 865 feet at Uvalde. Term permits are typically valid for less than 10 years, although they can be renewed. Emergency permits can only be issued to prevent the loss of life or severe short-term threats to the public health and safety, but are valid for less than 30 days.

The Authority cannot levy taxes, but those who apply for water rights will have to pay a modest permit application and well registration fee. They will also be charged based on the volume of water they pump. The bill provides that agricultural use fees will be only 20% of the rate charged to municipal users. If the Authority adopts the same budget as the District (about $6 million), the fee for municipal users would be roughly $12 per AF and the charge to irrigators could be roughly $4 per AF.

The bill also provides a mechanism to increase conservation. All users are required to submit plans to conserve and reuse water as a condition of obtaining water use permits. When water is reused, users will receive credits that "create" water supplies they can market to others. In addition, the Authority can issue loans or grants to water users to increase their efficiency. If they do so, a portion of the water that is saved is returned to the Authority so it can be reallocated.

The bill also rules that the Edwards is a "unique aquifer" and not an underground stream. That struck down a 1992 Texas Water Commission (TWC) ruling that declared that the water in the aquifer was the property of the state. It also recognizes that the owner of the land above the aquifer still maintains ownership rights. The bill allows the Authority to acquire permitted rights from existing users. The Authority could then sell or transfer these rights to other users or hold the rights "in trust" or retire them as a means of reducing demands on the aquifer. Significantly, the bill allows the Authority to receive loans from the TWDB to aggressively purchase water rights.

Bill May Increase 'Limited' Opportunities for Water Markets

Limited opportunities will be created by the bill that will allow water markets to develop. The bill allows the Authority to establish rules to allow individuals to market the water they create through conservation. Holders of irrigation water rights can lease up to 50% of their initial water right. The remaining amount must be used according to the terms of the permit and can only be transferred if irrigated lands are sold. The bill also stipulates that water taken from the aquifer must be used within the Authority's boundaries. In general, the bill allows water rights holders to market their water rights throughout the

region. However, the bill bans the "physical transfer" of water outside the boundaries of Uvalde and Medina counties. It could allow parties from other parts of the region to purchase and retire the rights to pump a set amount of water. Non-agricultural users will be allowed to market all their water rights.

A unique feature of the bill may substantially increase the amount of artificial recharge activity that is taking place in the region. The bill encourages the Authority to enter into cooperative contracts with other agencies to increase artificial recharge from injection wells or surface water dams. In fact, the bill states that the Authority may not "unreasonably deny" requests to enter into potential recharge projects if the cooperative agencies file and make plans to protect the quality of the aquifer. The plan benefits local groups that would like to sponsor a recharge project because it lets them pump the same amount of water they added to the aquifer (minus the amount of water discharged through springs).

The amount of water used by individuals will be monitored for the first time. The bill requires that measuring devices be installed on wells to record the flow rate and the total amount of water that has been withdrawn. The authority will pay for cost of purchasing, installing and maintaining the devices on existing irrigation wells.

The bill also creates provisions for increased research by universities, state and federal agencies, and the private sector. It mandates that the Authority complete research on the technical feasibility of augmenting springflows, enhancing recharge, and increasing aquifer yields. Other research areas that are spelled out in the bill include studies to monitor and protect water quality, projects that increase the effectiveness of water resources management (including drought management, water use and reuse), investigations of alternative supplies, and demonstration projects. The bill does not provide a specific source of funding for these projects.

The bill also gives the Authority the power to prevent pollution, to enforce water quality standards in the region, and to regulate activities in the aquifer's recharge zone that may lessen its quality. It also lets the Authority hold water rights permits to protect endangered species.

University Researchers Learn More About How to Manage the Edwards Aquifer

Many scientists from Texas universities have been involved in discovering new information and developing new perspectives on how best to manage the resources in the Edwards Aquifer region. Although they don't always agree on the issues or the ways to solve them, the researchers are working to gather information that tells us more about some of the complex issues that face the region.

For example, Glenn Longley and Nisai Wanakule are researchers at the Edwards Aquifer Research and Data Center in San Marcos. Longley and others have been instrumental in recording the biology and life histories of endangered species that live in Comal and San

Marcos Springs. Comal Springs stopped flowing when beset by droughts in the 1950s. Longley has worked to use rapid assessment techniques to determine water quality in surface waters of Seco Creek and other portions of the Edwards Aquifer watershed. He has also been involved in use assessments that would maximize the use of the San Marcos River, without threatening its quality. Throughout the negotiations that led up to the passage of the bill, Longley was a visible proponent of ensuring the "minimum" acceptable flows be guaranteed to protect the springs.

Wanakule is developing computer models to simulate how water levels in the aquifer and downstream areas react to different management strategies. Wanakule is working on a project that was funded by TWRI to develop simulation models that can utilize limited data and real time measurements of recharge from stream and river gauging stations. The modeling is intended to reflect flow patterns and rates in limestone karst aquifers like the Edwards. Model outputs provide accurate, short-term estimates of aquifer levels at seven key index wells located in different reaches of the aquifer and flows at San Marcos and Comal Springs.

Developing new and innovative management strategies for the region that maximize economic gains has been the goal of a team of economists from Texas A&M University, the University of Texas at San Antonio (UTSA), and the Austin office of the Environmental Defense Fund (EDF). Participants in the project include Ron Griffin and Bruce McCarl of the Texas A&M University Agricultural Economics Department, Bob Collinge and John Merrifield of the Economics and Finance Division of UTSA, and Peter Emerson of EDF. They collaborated on a technical report, *The Edwards Aquifer: An Economic Perspective*, that was published by TWRI while the Legislature was deliberating what the final bill should include. The report outlined many of the myths surrounding popularly held views about the consequences of managing the aquifer through water markets, water rights permits, and other strategies. In particular, it answered such questions as: Do pumping restrictions take away individual property rights? Are new reservoirs the best water supply options? and Will water markets injure current users? The authors recommended that groundwater rights be adjudicated, that pumping limits be assigned, that the transfer or marketing of water rights be permitted, and that a system of linking buyers and sellers of water rights be established. Most of these ideas were incorporated into the final Edwards Authority bill.

In addition to their work on the team project, the economists have also made significant contributions conducting independent research. Griffin's work emphasized the gains to be realized by water marketing and in assessing the extent water markets have developed in Texas. Griffin and Merrifield have evaluated the economics of the ill-fated Applewhite Reservoir project. They found that, in this case, conservation and reallocation made more sense economically than dam building. Collinge has explored if the use of discount coupons and other systems to administer water rights encourage the formation and use of active water markets.

McCarl's work has focused on assessing the economic and hydrologic implications of management plans that have been proposed for the Edwards Aquifer. McCarl has

evaluated the impact of aquifer management plans by utilizing a computer simulation model that incorporates economic, hydrologic, and water use data. The model simulates water use by the agricultural, municipal and industrial sectors and generates annual projections of water levels at key wells and springflows. It assumes that water will be transferred from low-value users (typically agriculture) to higher economic uses when demands exceed the water supply. By comparing the economics of different water use scenarios, the model can be used to assess the impact of different management strategies.

In a new study funded by TWRI, McCarl examined how two plans proposed by the TWC in 1992 could affect water users in the region. In general, the model simulations suggest that agriculture will suffer economic losses as a result of any water regulations, in large part because the value of water is much higher in urban areas. The model suggests that by the year 2000 irrigated acres could decline by as much as 84% and net agricultural income could drop by more than $ 2.5 million. The bill should lessen this negative impact as it limits the amount of water than can transferred out from lands in Uvalde and Medina counties. At the same time, the impact on cities will be relatively insignificant. The results also suggest that the value of agricultural water will continue to drop, while the worth of water used by cities and industries will increase substantially. This could actually help agricultural users who want to lease or sell their water rights as markets develop.

Currently, McCarl and graduate student Perry New are evaluating the ramifications of the bill. Preliminary modeling results suggest that the short-term implications of the bill are that the region's total economy will be reduced by 4%. Agricultural income will drop by nearly 20%, agricultural water use will be reduced by 57%, and up to 91,000 AF will be transferred from agricultural to municipal use.

At UTSA, researchers are developing "decision support" tools that policy makers can use to gain rapid access to information about how management strategies affect various aquifer users. The project is being led by Weldon Hammond and Frank Masch of the Center for Water Research and Richard Howe of the Engineering Division. Much of the work involves developing a computer framework that will increase the ability of managers to utilize complex data sets at remote sites. Another goal is to help existing computer models to more easily interact with one another.

Encouraging conservation in Uvalde and Medina counties is the goal of scientists at the Texas A&M University Agricultural Research and Extension Center at Uvalde. Texas Agricultural Extension Service (TAEX) irrigation specialist Jose Pena is working with TAEX agricultural economist Robert Jenson to assess if it is economical for irrigators in Uvalde County to increase conservation. First, they surveyed irrigators in Uvalde County to determine the amount of water now being used. Then, they used climate data to assess if rain-fed farming (without irrigation) was feasible. Their efforts suggest that it may be practical to modify existing sprinkler irrigation systems to more efficient Low Energy Precision Application (LEPA) systems, but that it may not now be economical for farmers to convert furrow-irrigated systems to LEPA. Still, if 80% of the furrow irrigated systems were converted to LEPA systems, water use in the region could be reduced by

18%. TAEX agricultural engineer Guy Fipps is helping irrigators estimate the amount of water they have historically used to help establish water rights, and Hagen Lipke of TAEX at Uvalde is assessing if dryland farming can be successful in the region.

Because the emotions between urban and rural interests about whether or not groundwater should be regulated ran so high in the region, Don Albrecht of the Texas A&M University Rural Sociology Department surveyed area residents from 1991 to 1992. He gathered information on the most and least important uses of water in the region, strategies to manage the aquifer, and views about the importance of protecting endangered species.

Establishing a Texas Water Bank

One of the most innovative laws passed by the Legislature was the creation of a Texas "water bank" (SB 1030). The bank could become operational as early as January and would be coordinated by the TWDB . The Board would act as a water information clearinghouse that would provide information on persons or organizations in Texas that want to buy, lease, or sell water rights. It could also assist in negotiations between buyers and sellers, promote conservation by encouraging "saved water" to be deposited into the bank, and establish regional banks. Information the bank could provide includes the price of water and the amount that's available.

The bill allows water rights holders to deposit up to half the amount they've been allocated into the bank. Rights that have been placed in the bank are initially protected from cancellation for 10 years. They may be extended by an additional 10 years after the Texas Natural Resources Conservation Commission approves a water rights transfer.

The bank could be useful in helping smooth the development of the Trans-Texas diversion project, which proponents hope will market water from east Texas rivers to Houston, San Antonio and Corpus Christi. It will also be utilized to help coordinate the rush of buyers and sellers that are expected to participate in the Edwards Aquifer water market.

Summary

The actions of the Legislature to develop a management plan for the Edwards Aquifer represent, in many ways, a giant step forward towards better protection and use of water resources in Texas. The bill should improve the chances that springs will continue to flow and that downstream users should receive more water from spring discharges. The bill requires metering and will also tell us how much water individuals are using. The bill also allows water markets to develop, which could provide revenue to farmers who want to sell or lease water rights, while providing water to users willing to pay a higher price. The bill may also clarify what constitutes "waste" and which uses are "essential" and "nonessential."

The bill has the promise to improve water management, but the true test will come when water rights have to be quantified and when droughts occur.

For More Information

Albrecht, Don, *The Future of the Edwards Aquifer: An Analysis of the Views of Farmers and the Non-Farm Public*, Rural Sociology Department, Texas A&M University, 1992.

Collinge, Robert, "Revenue Neutral Water Conservation: Marginal Cost Pricing with Discount Coupons," *Water Resources Research*, March 1992.

Collinge, Robert, Peter Emerson, Ronald Griffin, Bruce McCarl, and John Merrifield, *The Edwards Aquifer: An Economic Perspective* (TR-159), Texas Water Resources Institute, Texas A&M University, College Station, TX, 1993.

Griffin, Ron, and Manzoor Chowdhury, Evaluating a Locally Financed Reservoir: The Case of Applewhite, Journal of Water Resources Planning and Management, 1993 (in press).

Griffin, Ron, and Chan Chang, "Water Marketing as a Reallocative Institution in Texas," Water Resources Research, March 1992.

Griffin, Ron, and Fred Boadu, "Water Marketing in Texas: Opportunities for Reform," *Natural Resources Journal*, Spring 1992.

Frank Masch and Weldon Hammond, "The Role of Edwards Aquifer Models and Databases in Decision Support," *Proceedings of the Spring Meeting of the Texas Section of the American Water Resources Association*, Austin, TX

Longley, Glenn, "The Subterranean Aquatic Ecosystem of the Balcones Fault Zone Edwards Aquifer in Texas: Threats from Overpumping," *Proceedings of the 1st International Conference on Ground Water Ecology*, Tampa, FL, 1992.

McCarl, Bruce, Wayne Jordan, R. Lynn Williams, Lonnie Jones and Carl Dillon, *Economic and Hydrologic Implications of Proposed Edwards Aquifer Management Plans* (TR 158), Texas Water Resources Institute, Texas A&M University, College Station, TX, 1993.

Merrifield, John, "Analyzing the Costs and Benefits of Applewhite Reservoir," *New Waves*, Vol. 3, No. 1, 1990.

Pena, Jose, and Robert Jenson, *Irrigation Water Use Conservation Potential and the Economic Implications of Adopting More Efficient Irrigation Technology in Uvalde County*, Agricultural Economics Department Faculty Paper Series 92-5, Texas A&M University, College Station, TX 1992.

Thorkildsen, David, and Paul McElhaney, *Model Refinement and Applications for the Edwards Aquifer in the San Antonio Region*, Texas (R 340), TWDB, July 1992.

Wanakule, Nisai, *Regression Analysis of the San Marcos Springflows and Water Levels of the Index Well in San Antonio*, Edwards Aquifer Research and Data Center, Southwest Texas State University, 1988.

Wanakule, Nisai, *Stochastic Drought Analysis of the Edwards Aquifer*, Edwards Aquifer Research and Data Center, Southwest Texas State University, 1988.