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Cover photo: Sunrise over Coastal Bend Bays & Estuaries Program land. ©2017 John Reuthinger. See winning photos at [WildlifeinFocus.org](http://WildlifeinFocus.org)

## **San Antonio's Edwards Aquifer Protection Program: review and analysis**

Francine Sanders Romero<sup>1,\*</sup>

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**Abstract:** The City of San Antonio's Edwards Aquifer Protection Program utilizes land and conservation easement acquisitions to protect the quality and quantity of Edwards Aquifer recharge. This review considers four key components of its viability: (1) establishing the need for action, (2) choosing an appropriate strategy and funding source, (3) defining purchase guidelines, and (4) demonstrating the program's impact.

Overall, the analysis concludes that the program has been well adapted to the city's need to protect the recharge and contributing zones beyond its regulatory jurisdiction. As such, it may serve as a significant model for other cities, particularly in Texas, where regulations may face legal and cultural resistance. The City has effectively educated the public on the value of this sales tax funded measure, even though some justification of its premises, such as inevitable development in western counties, remains subjective. A strong foundation is also evident, with a consistent focus on acquiring land that fits the original, narrow intent of the effort. An impediment to its continuation, however, may be the difficulty of presenting clear evidence of its success, a challenge for all policies designed to avert future harms to natural resources.

**Keywords:** Edwards Aquifer; Edwards Aquifer Protection Program; land acquisition; San Antonio

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## Terms used in paper

Short name or acronym	Descriptive name
APO	Aquifer Protection Ordinance
CAB	Conservation Advisory Board
City	City of San Antonio
EAA	Edwards Aquifer Authority
EAPP	Edwards Aquifer Protection Program
EPA	Environmental Protection Agency
ETJ	extraterritorial jurisdiction
LAP	Land Acquisition Program
SAWS	San Antonio Water System
TCEQ	Texas Commission on Environmental Quality
TLGC	Texas Local Government Code
WQLAP	Water Quality Land Acquisition Program

## INTRODUCTION

Efforts to ensure sustainable management of the Edwards Aquifer attract interest from scholars and practitioners, who typically emphasize the regulation of water withdrawals.<sup>1</sup> Researchers have paid less attention to complementary strategies that protect supply rather than rationing demand, particularly by preserving the land where recharge occurs. This omission is likely because such efforts, at least on a large scale, have been relatively scarce. However, a land-based approach to water protection can play a key role in groundwater management, and a recent report from the Texas Farm and Ranch Lands Program called it, “a low-cost, effective strategy for protecting Texas’ water resources.”<sup>2</sup> This review provides a summary and analysis of one significant effort in this regard, the City of San Antonio’s Edwards Aquifer Protection Program (EAPP).

<sup>1</sup>See Robert L. Gulley and Jenna B. Cantwell, *The Edwards Aquifer Water Wars: The Final Chapter?*, 4 *Texas Water Journal* (2013), available at <https://journals.tdl.org/twj/index.php/twj/article/view/6423>. Todd H. Votteler, *Raiders of the Lost Aquifer? Or, the Beginning of the End to Fifty Years of Conflict over the Texas Edwards Aquifer*, 15 *Tulane Environmental Law Review*, 258-335 (2002; 2004, revised). Todd H. Votteler, *The Little Fish That Roared: The Endangered Species Act, State Groundwater Law, And Private Property Rights Collide Over the Texas Edwards Aquifer*, 28 *Environmental Law* 845-879, (1998).

<sup>2</sup>Texas A&M IRNR, *Texas Farm and Ranch Lands Conservation Program Evaluation Report* (2016), available at [http://www.txaglandtrust.org/pdfs/TFRLCP%20Eval%20Report%2020161219\\_FINAL.pdf](http://www.txaglandtrust.org/pdfs/TFRLCP%20Eval%20Report%2020161219_FINAL.pdf).

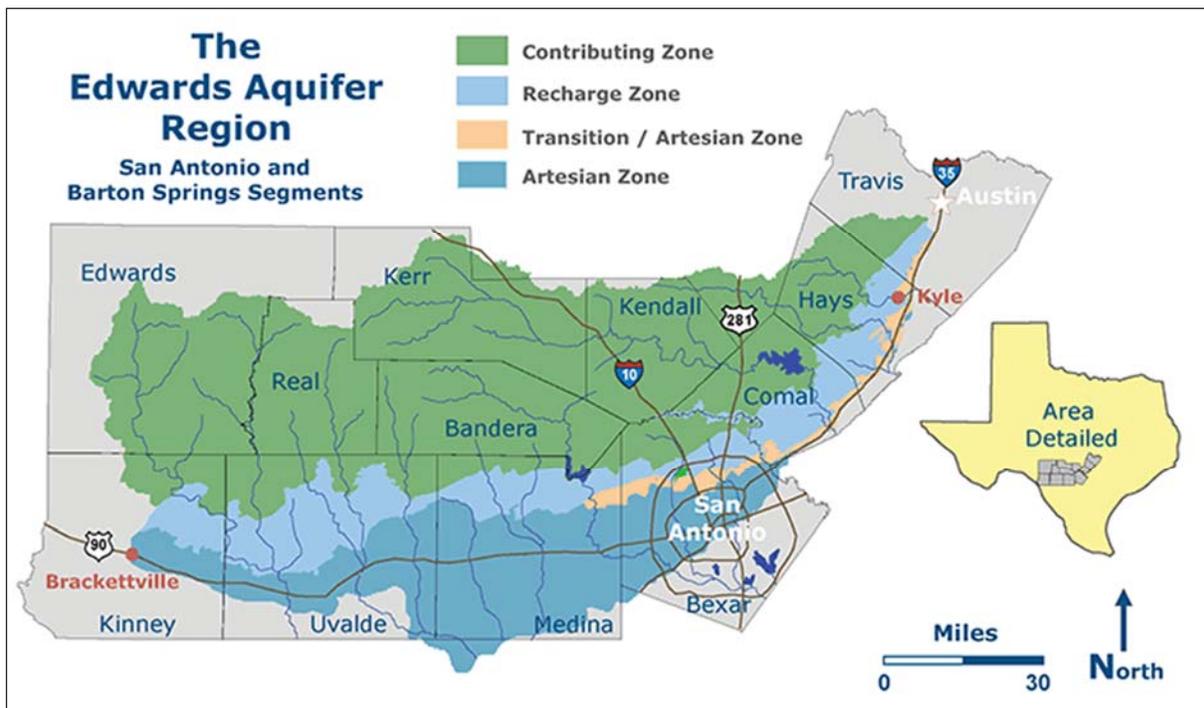
In place since 2000, \$225 million has been spent through this program to preserve 146,075 acres in the Edwards Aquifer recharge and contributing zones.<sup>3</sup>

EAPP employs a simple and indirect mechanism for water management—acquire land and/or conservation easements to protect the recharge potential of the Edwards Aquifer, thereby securing this critical regional water supply. Identifying key elements of its success and considering those elements within the context of existing literature on natural resource protection can advance understanding of this approach to protecting groundwater. Below, following a brief background section, this paper examines four components of the history and evolution of EAPP: (1) establishing the need for action, (2) choosing an appropriate strategy and funding source, (3) defining purchase guidelines, and (4) demonstrating impact.

## SAN ANTONIO AND THE EDWARDS AQUIFER

The origins and growth of the City of San Antonio (City) are closely linked to its ready access to the San Antonio segment of

<sup>3</sup>These figures represent a summary of expenditures and purchases after full spendout of the 2010 funds, and with the 2015 funds still to be accessed. See Francine S. Romero, *Aquifer Protection Visionary* (2017), San Antonio Express-News (March 28, 2017), available at <http://www.mysanantonio.com/opinion/commentary/article/A-milestone-in-Edwards-recharge-protection-11034278.php>.



**Figure 1.** Hydrogeology of the Edwards Aquifer. Source: Eckhardt, supra Note 21.

the Balcones Fault Zone Edwards Aquifer, but rapid growth in the region threatens the quality and quantity of that groundwater.<sup>4</sup> As Figure 1 illustrates, the process by which supply reaches the City begins when “surface water from springs and streams originating on the Drainage Area [also called the contributing or catchment zone] reaches the Recharge Zone where much of the flow sinks into the Edwards Limestone,” and then “flows down gradient to the Artesian Zone.”<sup>5</sup> From there, it either naturally flows or is pumped to the surface. While variable, movement of groundwater through the aquifer is generally west to east. The recharge zone for San Antonio’s artesian zone occurs in Bexar, Comal, Hays, Kinney, Medina, and Uvalde counties, with Medina and Uvalde counties effectively composing 70% of that zone.<sup>6</sup> The drainage, or contributing zone, includes several counties, as illustrated in Figure 1.

<sup>4</sup>Sarah Goodyear, *Hot, Crowded and Smart*, Next City (July 22, 2013), available at <https://nextcity.org/features/view/hot-crowded-and-smart-san-antonio-water-system-drought>; Joe Nick Patoski, *Edwards Aquifer Authority has come a long way*, San Antonio Express-News (September 25, 2016), available at <http://www.mysanantonio.com/opinion/commentary/article/Edwards-Aquifer-Authority-has-come-a-long-way-9242337.php>.

<sup>5</sup>Edwards Aquifer Authority, *About the Edwards Aquifer*, available at <http://www.edwardsaquifer.org/scientific-research-and-data/edwards-aquifer-overview>.

<sup>6</sup>Leslie Lee, *Protect our land, Protect our Water*, txH2O, Texas Water Resources Institute (2014) 2, available at <http://twri.tamu.edu/publications/xh2o/summer-2014/protect-our-land-protect-our-water/>. U.S. Dep’t of

Several governmental entities have regulatory authority over the Edwards Aquifer. Some of their associated rules focus directly on water withdrawals, while others target pollutants and impervious cover that could threaten recharge quality and quantity. Created by the Texas Legislature in 1993 in response to a U.S. District Court ruling, the Edwards Aquifer Authority (EAA) is a political subdivision of the state, whose mission is to “manage, enhance and protect the Edwards Aquifer.”<sup>7</sup> As an EAA-authorized permit holder, the San Antonio Water System (SAWS) passes along its own EAA-mandated restrictions to its customers through limits on landscape watering and water waste runoff.<sup>8</sup>

At the federal level, the Environmental Protection Agency (EPA) classified the Edwards as a sole source aquifer in 1975, a label that indicates it provides at least 50% of supply for its service area.<sup>9</sup> Per the Safe Drinking Water Act of 1974, this classification triggers review of federally funded development

the Interior, U.S. Geological Survey, *Recharge to and Discharge from the Edwards Aquifer in the San Antonio Area, Texas*, 1997 2 (1998).

<sup>7</sup>See <http://www.edwardsaquifer.org/>. For a map of the EAA’s jurisdictional boundaries, mostly in the recharge and artesian zones, see <http://www.arcgis.com/home/webmap/viewer.html?webmap=aed0e4eddc794ec49d740a267d42560a&extent=-101.1491,28.3085,-96.6364,30.6845>.

<sup>8</sup>See <http://www.saws.org/conservation/droughtrestrictions/YearRound.cfm>.

<sup>9</sup>See [https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#What\\_Is\\_SSA](https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#What_Is_SSA).

projects overlaying the recharge zone in order to limit contamination potential.<sup>10</sup> The Texas Commission on Environmental Quality (TCEQ) implements similar, but separate, state rules on all projects over the Edwards Aquifer recharge zone.<sup>11</sup>

Locally, the City enforces its own Aquifer Protection Ordinance (APO) that governs levels of impervious cover for new construction in the recharge zone. As the APO is similar to the EAPP, in that it focuses on limiting development per se, albeit by regulation, it is explained in further detail below. With one exception, prior to the EAPP there had been no policy in place in this region to protect land from development through acquisition. That exception was the SAWS Sensitive Land Acquisition Program (LAP), launched in 1997.<sup>12</sup> The LAP used a water supply fee to purchase land or easements in the recharge zone, in partnership with several land trusts. More than 9,000 acres were protected, with the last documented purchase in 2007.<sup>13</sup>

The EAPP began in 2000 when City voters approved a 1/8 cent (.125 %) sales tax increase to raise \$45 million for purchase and preservation of land in the Edwards Aquifer recharge and contributing zones. While the EAPP would later expand its geographic range, the immediate impetus was the rapid development of recharge zone acreage in Bexar County. Since then, the EAPP has been reauthorized and expanded in both scope and funding, with a new round of \$90 million approved in 2005, \$90 million in 2010, and \$100 million in 2015, with expenditures ongoing from the 2015 fund.<sup>14</sup>

<sup>10</sup>Congressman Henry B. Gonzalez, representing Texas's 20<sup>th</sup> congressional district, added the sole source aquifer amendment to the federal Safe Drinking Water Act. While the legislation never had a notable impact on limiting development over the Edwards Aquifer recharge zone, it helped spark a local conversation on the topic. See Laura A. Wimberley, *Establishing "Sole Source" Protection*, in Char Miller, editor, *On the Border: An Environmental History of San Antonio*, Pittsburgh University Press (2001) 169-181. In 1976, Gonzalez also introduced a failed bill "to appropriate \$76 million to purchase the Bexar County portion of the recharge zone." See Lanny Sinkin, *Private Profit over Public Good Led to Failure to Protect Aquifer Recharge Zone*, The Rivard Report (June 8, 2012), available at <https://therivardreport.com/private-profit-over-public-good-led-to-failure-to-protect-aquifer-recharge-zone/>.

<sup>11</sup>In a confusing duplication of terms, the TCEQ program regulating potential pollutants reaching the aquifer has the same name, Edwards Aquifer Protection Program, as the City's acquisition endeavor. See Texas Commission on Environmental Quality, *Edwards Aquifer Protection Program*, available at <https://www.tceq.texas.gov/permitting/eapp/program.html>.

<sup>12</sup>San Antonio Water System, *Water Resource Protection and Compliance*, available at: <http://www.saws.org/environment/ResourceProtComp/aquifer-protection/acquisition.cfm>.

<sup>13</sup>San Antonio Water System, *SAWS Board Approves Conservation Easement Purchase in Uvalde County*, July 12, 2007, available at [http://www.saws.org/latest\\_news/NewsDrill.cfm?news\\_id=451](http://www.saws.org/latest_news/NewsDrill.cfm?news_id=451).

<sup>14</sup>San Antonio City Council first voted to place these measures on the ballot, after which they were approved by voters in a general election, in May (2000, 2005, 2015) or November (2010). The 2000 ballot measure was designated as Proposition 3 and all subsequent measures as Proposition

## ESTABLISHING THE NEED FOR ACTION

A key initial step in adopting any natural resource protection policy, especially one that requires voter endorsement, is for proponents to establish and promote a reliable narrative of its necessity. In an early piece on the topic of open space protection through voter-approved funding, Danziger pointed out the importance of communicating this "urgency of need" to citizens.<sup>15</sup> Furthermore, the information presented must be clear and accurate. As Steelman and Asher caution, when advocates approach voters with "a calculated degree of manipulation," the policy becomes suspect and any initial support will soon dissipate.<sup>16</sup>

In the case of the EAPP, the first component of the narrative is simply the mechanics of the Edwards Aquifer flow to the San Antonio pool. Second is the threat to quality and quantity of aquifer recharge posed by increased development/impervious cover in those zones. Third is the likelihood of substantial population growth in these key western counties. For the EAPP to gain initial acceptance and continued support, the City's leaders and other advocates had to communicate each of these effectively to citizens.

The first component, premised on well-established hydrogeology of the aquifer, requires only elementary presentation through explanation or maps for any residents not already aware of this dynamic. Proponents appear to have easily gained widespread public acceptance of these facts. As The Nature Conservancy Texas State Director Laura Huffman noted, central Texas is "one of the few places in the country where you can say the word *aquifer* and people know what you're talking about."<sup>17</sup> Beginning in 2000 and continuing through subsequent ballot measures, the City has promoted this message to voters. For example, its "Guide To 2015 Sales Tax Propositions" brochure includes maps, explanations, and "fun facts" on Edwards hydrogeology.<sup>18</sup> Elected officials, from Mayor Howard Peak in 2000 to Councilman Ron Nirenberg in 2015,

1. In 2015, \$10 million was set aside for grants for innovative, demonstration projects for recharge enhancement in Bexar County, available at <http://saprop1edwardsprojects.org/>. The EAPP and the Linear Creekways program share the 1/8 cent allotment, to reach their full funding amount, see <http://www.sanantonio.gov/Finance/bfi/Tax-Rate-Summary>.

<sup>15</sup>Burton Danziger, *Control of Urban Sprawl or Securing Open Space: Regulation by Condemnation or Ordinance?* 50 California Law Review 493 (1962).

<sup>16</sup>Toddi A. Steelman and William Ascher, *Public Involvement Methods in Natural Resource Policy Making*, 30 Policy Sciences 71-90 (1997).

<sup>17</sup>Amy Crawford, *Liquid Assets*, Nature Conservancy Magazine (2017) at 54.

<sup>18</sup>See <https://www.sanantonio.gov/Portals/0/Files/AquiferPark/EdwardsInitiative-Booklet-English.pdf>.

have also stressed the EAPP's significance through speeches and newspaper editorials.<sup>19</sup>

While basic aquifer dynamics found ready public acceptance, the next two components of the narrative were more ambiguous, beginning with the link between physical development and the recharge process. As Crawford emphasized, it makes fiscal sense for cities to invest in upstream watershed protections in the form of some limit to construction and impervious cover. This may prevent expensive treatment fixes or potential supply shortages.<sup>20</sup> Nevertheless, in the absence of a looming crisis, the public may not embrace this strategy. Furthermore, while the scientific community generally accepts the negative impact of development on recharge quality and quantity, there is no agreed upon trigger level at which impervious cover causes significant harm.<sup>21</sup> This can make it difficult to justify spending public money to preclude any, or virtually any, development.

San Antonio did not face an urgent catalyst for action in this regard as, for example, New York City did in the 1990s. Although New York City does not rely on an aquifer, its water supply originates in massive watersheds outside city limits, similar to the San Antonio context. The federal Safe Drinking Water Act updates of 1986 required all municipal water originating from surface sources to be filtered, which for New York City would have required construction of expensive filtration systems (estimated at between \$10 and \$20 billion) for its Catskill/Delaware and Croton watersheds. In order to avoid this burden, New York City instead received permission to initiate its LAP in 1997. Like the EAPP, New York's LAP is based on acquiring land and conservation easements to prevent development-linked pollutants reaching the municipal water supply.<sup>22</sup>

While San Antonio's main water supplier, SAWS, also functions without filtration for Edwards water, there have been

<sup>19</sup>See Linda Prendez, *Mayor sways officials*, San Antonio Express-News (April 26, 2000), at 1H; Ron Nirenberg, *Aquifer protection needs to be renewed*, San Antonio Express-News (May 17, 2014), at A15.

<sup>20</sup>Crawford supra Note 17, at 48.

<sup>21</sup>Chester L. Arnold and C. James Gibbons, *Impervious Surface Coverage: The Emergence of a Key Environmental Indicator*, 62 American Planning Association Journal (1996) 246, report that degradation of streams first appears with 10% impervious cover, and at 30% is "so severe as to become almost unavoidable." However, for the range in between those two endpoints, the point at which regulation is necessitated remains subjective. Furthermore, the development community may resist any limits. Also see David Todd and Jonathan Ogren, *The Texas Landscape Project*, Texas A & M University Press (2016) 219; Gregg Eckhardt, *The Edwards Aquifer Website*, <http://www.edwardsaquifer.net/faqs.html>.

<sup>22</sup>See David Soll, *Empire of Water*, Cornell University Press (2013). Adam Wisnieski, *City's Watershed Protection Plan Seeks Difficult Balance Upstate*, City Limits (June 15, 2015) 3 (online), available at <http://citylimits.org/2015/06/15/citys-watershed-protection-plan-seeks-difficult-balance-upstate/>.

no major alarms triggered by contamination and/or possible federal filtration requirements, although some observers have warned of this risk.<sup>23</sup> Drought periods, with the most recent in 2011, underscore the impact of significant impervious cover on recharge *quantity*, but public attention may wane when the drought ends. For City dwellers, the immediate impact of drought is more likely to be the landscape watering limits imposed by SAWS than fears of actually running out of water. As Lindgren, et al. reported, "(a)lthough recurring droughts and floods have caused appreciable short-term fluctuations in water levels, long-term hydrographs (about 80 years) indicate no net decline (or rise) of water levels in the San Antonio area."<sup>24</sup>

Finally, the third component of this narrative is that EAPP acquisitions would serve as an essential, proactive bar to the impact of imminent growth in Medina and Uvalde counties in particular. Since this premise is grounded partly on demographic projections, it has faced some resistance. In 2005, a San Antonio Express-News columnist suggested as much, opining that the EAPP, "is dedicated to sucking \$90 million from the wallets of consumers and using it to enrich back country land speculators," implying these lands were becoming valuable *solely* because of the EAPP's interest, and that pending growth in the area was a myth.<sup>25</sup> And, in 2017, Councilman Joe Krier stated that his "constituents question the logic behind San Antonio protecting land outside of the city and county limits," because they are "skeptical that the land would ever be developed anyway."<sup>26</sup>

There is, however, considerable media coverage of new residents moving to Texas, with San Antonio projected to gain 28% more residents by 2030.<sup>27</sup> The Texas Demographic Center estimates population increases of 53% in Medina County and 35% in Uvalde County by 2050.<sup>28</sup> More immediate than these projections, residents can readily observe intensive

<sup>23</sup>Robert Rivard, *The Edwards Aquifer Comes Under Increasing Threats*, The Rivard Report (June 8, 2012).

<sup>24</sup>R.J. Lindgren, A.R. Dutton, S.D. Hovorka, S.R.H. Worthington, and Scott Painter, *Conceptualization and Simulation of the Edwards Aquifer, San Antonio Region, Texas*, Scientific Investigations Report 2004-5277, U.S. Department of the Interior, U.S. Geological Survey, available at <https://pubs.usgs.gov/sir/2004/5277/pdf/sir2004-5277.pdf>, 41-42.

<sup>25</sup>Roddy L. Stinson, *Don't look now, but you are standing next to a bottomless pit*, San Antonio Express-News, (April 19, 2005) 3A.

<sup>26</sup>Iris Dimmick, *Council Votes to Protect 2,830 More Acres Over Edwards Aquifer*, Rivard Report (March 30, 2017), available at <https://therivardreport.com/council-votes-to-protect-2830-more-acres-over-edwards-aquifer/>.

<sup>27</sup>Robert Rivard, *Check Out San Antonio (and All U.S. Cities) in 2030*, Rivard Report (January 22, 2015), available at <https://therivardreport.com/check-san-antonio-u-s-cities-2030/>.

<sup>28</sup>Texas Demographic Center, 2014 Population Projections Data, available at <http://osd.texas.gov/Data/TPEPP/Projections/>.

growth already occurring in eastern Medina County in particular as San Antonio sprawls in a westward direction. While much of this growth may be at a less intense level than occurs within the City, even the spread of single-family homes on smaller ranchettes can exert significant impact on recharge by fragmenting and contaminating natural flow.

Overall, the foundational narrative establishing a need for the EAPP was strong, with some aspects of the argument more objective than other aspects. Most citizens and public officials either already understand, or can be easily educated on, Edwards Aquifer hydrology. On the other hand, the impact of development on recharge functions cannot be precisely demonstrated, and future growth in the western counties is not guaranteed, despite current trends. Still, voters may pay less attention to the details of future growth and simply decide it makes sense to ensure preservation sooner rather than later.

Ultimately, the final vote counts indicate strong public agreement with the need for the EAPP. Support started out high and increased over time, with approval moving from 55% in both 2000 and 2005 to 66% in 2010 and 78% in 2015.<sup>29</sup> A poll conducted by The Nature Conservancy early in 2015 revealed the strength of support for that round, indicating that 54% of voters were “definitely in favor,” and 24% “probably in favor,” even months before the vote.<sup>30</sup>

## CHOOSING AN APPROPRIATE STRATEGY AND FUNDING SOURCE

### Regulatory Challenges

Given this substantial public backing for a land-based approach, the crucial next step was to identify a strategy that best fit the goal. Preservation of any natural resource may occur via regulation, acquisition, or incentive-based tools, or some combination of those. Generic regulatory approaches, where a particular practice is required or banned, are common. Regulation is relatively inexpensive compared to both public acquisition and to policies that financially incentivize sustainable management of private land. Because regulation only requires the price of enforcement, it can more efficiently protect resources.

Yet, a regulatory strategy may fall short of effectiveness. Since some natural resources, such as aquifers, transcend political boundaries, there is likely no single entity (e.g., city or county) possessing jurisdiction for full control. Furthermore,

<sup>29</sup>See Bexar County Elections Department, Election Results (2000, 2005, 2010, 2015), <https://www.bexar.org/2186/Election-Results>.

<sup>30</sup>The Nature Conservancy, San Antonio Voter Support for Protecting Water Supply in the Edwards Aquifer and Linear Parks (2015), available at <https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/texas/multimedia/san-antonio-voter-poll.pdf>.

inter-jurisdictional collaboration or coordination is difficult and uncommon. As Lubell, et al. observed, “since common interests do not necessarily lead to common action, partnerships will not emerge automatically in response to potential benefits.”<sup>31</sup> Others (Bengston, et al. 2003; Steelman 2000) found these limitations constrain open space protection in particular.<sup>32</sup>

As noted above, various entities enforce numerous policies directly focused on Edwards Aquifer *water*, such as the withdrawal rules enforced by EAA and the pollutant controls overseen by TCEQ. Other researchers have focused on the impact and challenges of those. Here, however, I focus on the topic at hand—a strategy of protecting water supply indirectly, by limiting development of the *land* overlaying the recharge and contributing zones.

In San Antonio's case, only one regulation targeting land development to protect groundwater has been successfully enacted.<sup>33</sup> The 1995 APO controls impervious cover over the recharge zone, setting maximum levels by category/location of development.<sup>34</sup> However, several factors dilute this policy. First, illustrating the common mismatch of political and natural resource boundaries, it only applies within the relatively small area of the recharge zone that falls within the City limits or its extraterritorial jurisdiction (ETJ).<sup>35</sup> (Since the majority of recharge to the San Antonio pool occurs in unincorporated areas of counties that lack zoning and most subdivision regulatory authority, county officials have virtually no power to limit development, even if inclined to do so.)

Second, even within its jurisdiction, the APO was constrained by state protection of vested rights in the development process,

<sup>31</sup> Mark Lubell, Mark Schneider, John T. Scholz and Mihriye Mete, *Watershed Partnerships and the Emergence of Collective Action Institutions*, 46 *American Journal of Political Science* 148-163 (2002), at 159.

<sup>32</sup> David N. Bengston, Jennifer Fletcher, Kristen C. Nelson, *Public Policies for Managing Urban Growth*, 69 *Landscape and Urban Planning* 271-286 (2003). Toddi A. Steelman, *Innovation in Land Use Governance and Protection*, 44 *American Behavioral Scientist* 579-597 (2000). See Craig R. Smith, *Institutional Determinants of Collaboration: An Empirical Study of County Open-space Protections*, 7 *Journal of Public Administration Research and Theory* 1-21 (2009), on the challenge of providing goods across generations.

<sup>33</sup> Courts struck down several prior efforts. In 1976, for example, a City referendum invalidated the requisite zoning granted to developers of a shopping mall over the recharge zone at the Highway 281/1604 intersection, but the Fourth Court of Texas Appeals reversed that vote two years later. In 1978, San Antonio City Council approved an 18-month moratorium on all recharge zone construction, to allow for studies of its impact, but the ban was blocked by both federal and state courts. See Eckhardt, *supra* Note 21.

<sup>34</sup>See [http://www.saws.org/environment/ResourceProtComp/aquifer\\_protection/ordinance.cfm](http://www.saws.org/environment/ResourceProtComp/aquifer_protection/ordinance.cfm). The APO is enforced by SAWS.

<sup>35</sup>Texas state law grants large cities such as San Antonio a five-mile ETJ beyond city limits where certain municipal development regulations apply. See <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.42.htm>.

per Section 245 of the Texas Local Government Code (TLGC).<sup>36</sup> Donohue and Sanders reported that 30% of recharge zone properties filed plans for development in advance of the APO's passage, a strategy that released them from subsequent limits.<sup>37</sup> Finally, impervious cover is permitted at levels higher than scientists recommend, even given the disagreements on the precise point at which impervious cover threatens recharge quality and quantity. For example, within City limits, commercial developments (without vesting) may include up to 65% impervious cover over the recharge zone.

Another factor undermines the likelihood of vigorous enforcement of this and other potential regulatory efforts. Although the vested rights doctrine has likely meant the avoidance of potential lawsuits, future legal challenges could determine that regulation of land to protect water supply is too far removed from a legitimate use of the police power. In the case of regulation, costs are borne primarily by the landowner, whose options for sale and development are now limited. Therefore, it is at least arguable that land-based controls provide a public benefit that can be legally obtained only through the exercise of eminent domain and compensation to the owner.<sup>38</sup> As Eckhardt observed, "Texas is a state that is very respectful of private property rights, and many will simply not accept the notion that land use and development should be regulated."<sup>39</sup>

## The Acquisition Option

Daniel Press, an advocate of the superiority of acquisition strategies for land protection (for whatever underlying purpose), is skeptical of regulatory approaches. Even at their strongest, he argued, they slow, rather than stop, development.<sup>40</sup> In San Antonio, the APO's limitations demonstrate that point. However, the challenges of pursuing an acquisition-based strategy may also be substantial and surprisingly analogous to the barriers to regulation. For example, coordinating regional collaboration on land purchases can be difficult; that would require two entities identifying an appropriate funding source and agreeing on purchase guidelines. If a city is willing and able

to act unilaterally, it is at least possible to extend acquisition beyond its borders, unlike its confined regulatory jurisdiction. Even that process can be tricky, however, since state restrictions on expenditures of public funds may constrain acquisition efforts as well.

In fact, such a barrier occurred with the EAPP, resulting in the City advocating for a change to state law to improve its acquisition strategy. At the inception of the program in 2000, section 334.001 of the TLGC provided just five options for a "venue" (using the state terminology) funded by a City-imposed sales tax. The one that best fit the City's intent was for a "municipal parks and recreation system, since it at least allowed for land purchases."<sup>41</sup> However, another TLGC provision (331.001) limits parks purchases to "the county in which the municipality is situated," thus restricting expenditures to Bexar County and precluding acquisitions in the western counties.<sup>42</sup>

Therefore, under the 2000 EAPP, the City spent \$45 million to buy about 6,500 acres, in fee-simple land purchases, classified as new parkland in order to comply with state law. These early acquisitions included some publicly accessible natural areas that remain in the municipal park inventory. These purchases, which were mostly completed by 2005, are illustrated in Figure 2 and noted in the key as Proposition 3 (2000) Properties. The City later transferred some acquisitions, including parcels associated with the Government Canyon State Natural Area, to the Texas Parks and Wildlife Department.

While the 2000 EAPP averted development on substantial recharge acreage, the process was slow and expensive. It had become clear to proponents that a legislative change would allow the City to more efficiently employ the sales tax tool. This came with a 2004 amendment to the TLGC, advocated by a City-led lobbying effort, adding the following option to the list of allowable venues: "A watershed protection and preservation project; a recharge, recharge area, or recharge feature protection project; a conservation easement; or an open-space preservation program intended to protect water."<sup>43</sup> The City used this new opportunity to allocate tax funds "for conservation easements and open space preservation over the Recharge and Contributing Zones."<sup>44</sup> Subsequent EAPP authorizations (2005, 2010, 2015) have been primarily expended on con-

<sup>36</sup>See <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.245.htm>.

<sup>37</sup>John M. Donohue, Jon Q. Sanders, *Sitting Down at the Table*, in Char Miller, editor, *On the Border: An Environmental History of San Antonio*, Pittsburgh University Press (2001) 182-195. Also see "Developers Bypass Aquifer Limits", John Tedesco, San Antonio Express-News <http://projects.express-news.com/growth-and-the-aquifer>.

<sup>38</sup>Danziger, supra Note 15 at 484.

<sup>39</sup>Eckhardt, supra Note 21. See <http://www.legis.state.tx.us/BillLookup/Text.aspx?LegSess=85R&Bill=SB1385> for SB 1385, proposed in the Texas Senate in 2017, regarding the mandatory use of conservation easements in lieu of municipal land regulations in certain cases.

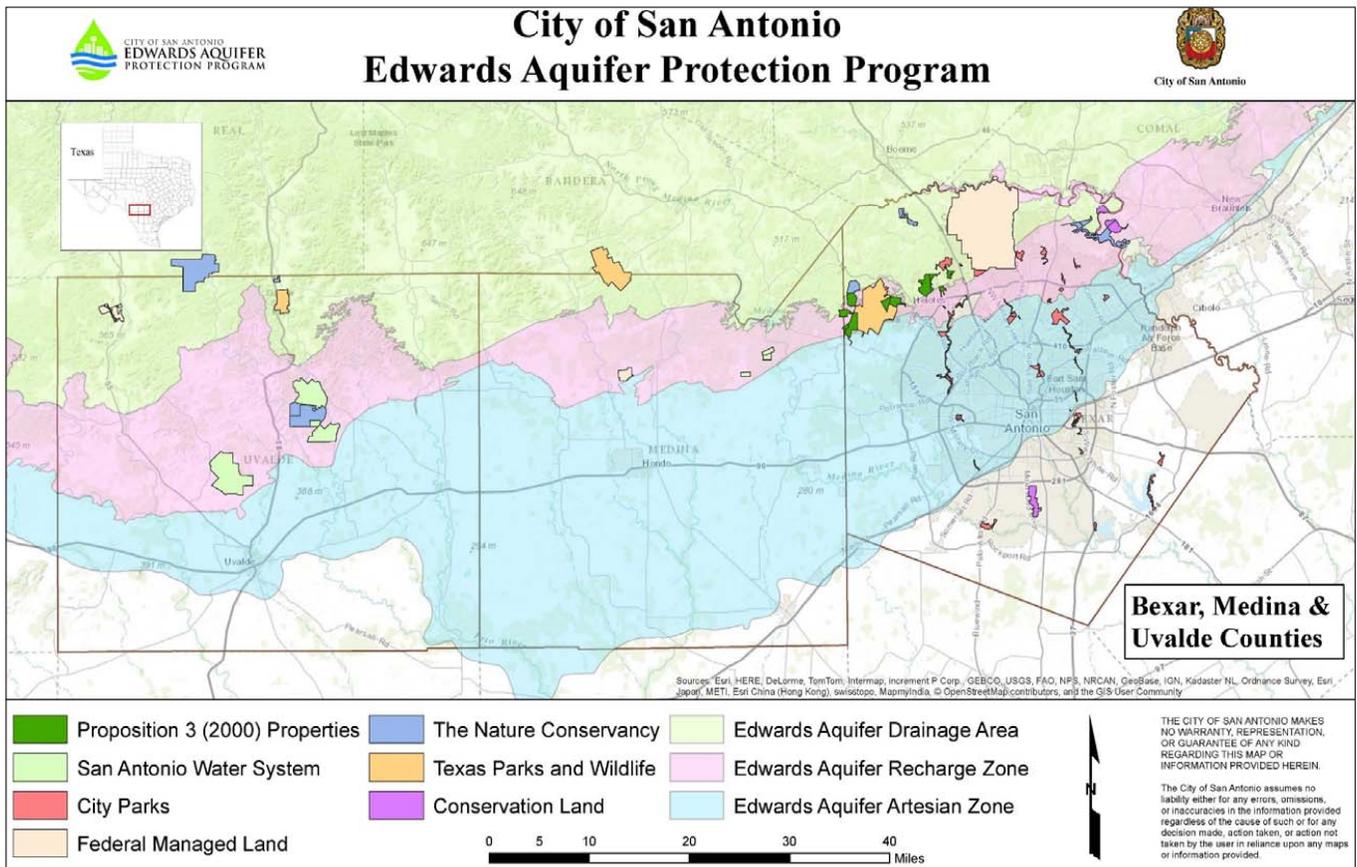
<sup>40</sup>Daniel Press, *Saving Open Space*, University of California Press (2002) 14.

<sup>41</sup>See Texas Local Government Code, <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.334.htm>.

<sup>42</sup>Texas Local Government Code, <http://www.statutes.legis.state.tx.us/SOTWDocs/LG/htm/LG.331.htm>. Even without that provision in place, it would be difficult to justify the purchase of parks in other counties, given the management expenses and decreased likelihood of use by City residents.

<sup>43</sup>Texas Local Government Code, supra Note 41.

<sup>44</sup>*Edwards Aquifer Protection Program & Linear Creekway Parks Development Program*, (presentation to San Antonio City Council, January 29, 2015, available at <https://www.sanantonio.gov/Portals/0/Files/AquiferPark/PropsLand2.pdf>).



**Figure 2.** EAPP purchases through 2005 and other protected acreage. Source: City of San Antonio Edwards Aquifer Protection Program.

servation easements within the recharge zone in Medina and Uvalde counties, although six additional properties (representing about 800 acres) in Bexar County have been purchased in fee-simple in these subsequent rounds.<sup>45</sup> While the measure allows for contributing zone purchases, the recharge zone has remained the principal focus, a point I return to in the concluding section.

According to Bengston, et al.'s review of generic resource protection mechanisms, the use of conservation easements represents a transition from an acquisition to incentive-based mechanism. The City is not acquiring the property but providing the financial inducement for the owner to manage the land in a particular way.<sup>46</sup> Still, conservation easements do involve the sale of development rights to the City. Whether the acquisition or incentive label is used, there are several benefits to the use of conservation easements over fee-simple acquisitions. For example, easements are considerably less expensive, there are

fewer associated management obligations, and the City avoids the liability concerns that ownership entails.<sup>47</sup>

Conservation easements also fit into the Texas private property ethos, in that they operate on a willing buyer/willing seller model. The EAPP does not utilize eminent domain, so landowners have complete discretion on whether to participate. Interestingly, in her commentary on a very different issue (state law governing groundwater withdrawals in the absence of a groundwater conservation district such as EAA), Puig-Williams observed how that system "only affords the landowner the option to claim and use his property interest rather than preserve or conserve his property for future use."<sup>48</sup> Conceptually, the EAPP presents a markedly different opportunity, one

<sup>47</sup>While easements "grant no right of access to the general public . . . the City of San Antonio, the Edwards Aquifer Authority and their contractors must be allowed to enter the property, with prior landowner notification and approval, to conduct annual monitoring of the easement," see [www.sanantonio.gov/EdwardsAquifer/ConservationEasementFAQs](http://www.sanantonio.gov/EdwardsAquifer/ConservationEasementFAQs).

<sup>48</sup>Vanessa Puig-Williams, *Regulating unregulated groundwater in Texas: how the state could conquer this final frontier*, 7 Texas Water Journal (2016) 92. [https://journals.tdl.org/twj/index.php/twj/article/view/7039/pdf\\_19](https://journals.tdl.org/twj/index.php/twj/article/view/7039/pdf_19)

<sup>45</sup>Lee, supra Note 6.

<sup>46</sup>Bengston, et al., supra Note 32.

that rewards the property owner who seeks to use their land to conserve water resources.<sup>49</sup>

## Identifying Funds

Acquisition options can offer a number of improvements over regulation in particular contexts. A primary barrier, however, is the funding mechanism. Financing preservation through taxes or bond obligation effectively transfers the burden to citizens at large, versus particular landowners, when a municipality chooses acquisition over regulation. In San Antonio, the 1/8 cent sales tax for the initial \$45 million EAPP funding was viable at its initiation in 2000, since there was still room for an additional 1/4 of a cent in the state mandated cap of 2% for municipalities.<sup>50</sup> A voter-approved funding mechanism is a crucial foundation for future public acceptance, according to Berry. He observed that, in the absence of citizen choice, “no value can be imputed to [the acquired good] that has any explanatory or ethical content.”<sup>51</sup>

Beyond the initial identification of a funding source, land acquisition programs must also present a transparent pricing mechanism to justify that purchase value. As Berry noted, the utility of open space, and therefore its objective value, can be difficult to estimate and defend to the public.<sup>52</sup> However, since the EAPP operates through purchase of land or conservation easements, pricing relies on traditional real estate appraisals but with a small twist for easements. An appraiser experienced with conducting conservation easement valuations in this region provides two property appraisals, reflecting the fair market value price with, and without, full development rights. Typically, the forfeit of the full rights, and thus the price paid for the easement, is roughly in the range of 40% of the value with development rights. For example, a ranch valued at \$10 million with full development rights, might appraise at \$6 million with the loss of virtually all development options. Therefore,

<sup>49</sup>For a useful discussion of the link between conservative stewardship and EAPP, see rancher Todd Figg's comments in the San Antonio portion of the documentary, *Water Blues/Green Solutions*, produced by Penn State Public Media, <http://www.waterblues.org/themes/san-antonio/san-antonio-segment>.

<sup>50</sup>Texas levies a state sales tax of 6.25%, allowing cities to add an additional 2% for some combination of general funds and authorized projects. The 2% ceiling for the City of San Antonio was reached in 2012, with approval of a 1/8 cent increase through 2020, for the Pre-K4SA program. Thus, the 2015 EAPP renewal occurred within a different context, in which any newly proposed uses for sales tax funds could have succeeded only by being chosen *instead* of EAPP, although no serious contenders emerged. In addition to the EAPP, Creekways, and Pre-K for SA allocations, the City sales tax includes 1% for the general fund and .75% for transportation projects.

<sup>51</sup>David Berry, *Preservation of Open Space and the Concept of Value*, 35 *American Journal of Economics and Sociology* (1976) 113-124, at 115.

<sup>52</sup>Berry, *ibid.*

the City through the EAPP would pay \$4 million to the owner for the extinguishment of those rights, memorialized through the conservation easement.<sup>53</sup>

As Daniels pointed out in his general review of easement strategies, however, appraisal processes that include projections of lost development value can be controversial. The public may believe that estimate is unrealistically inflated or may argue that the owner should not profit from the “windfall” price, since they did not earn it.<sup>54</sup> Returning to the high levels of support at the polls, however, it would be surprising that citizens would support the EAPP so strongly only to later question the prices paid to protect the land. Indeed, there is no evidence of these sorts of reservations emerging.

Another potential source of contention comes from the other side of this purchase price equation. The “lost” development value, for which the owner is compensated through the price of the easement, is also lost to local property tax rolls. Citizens and officials in the areas of acquisition could protest that these transactions, by removing land from development (and value from property tax appraisals), are constraining the future tax base. In fact, New York City's LAP program has encountered notable resistance from upstate communities for this reason. In response, New York City pays \$157 million a year in property taxes on land acquired in the Catskill/Delaware Watershed to cover the lost development value, although even that has not alleviated complaints.<sup>55</sup> While EAPP easements similarly preclude significant development in perpetuity, San Antonio has avoided any such backlash from the western counties.

Bringing this full circle, the acquisition mechanism matches up well with San Antonio's geographic/legal context. As Daniels noted, the choice of any policy demanding significant financial resources (such as acquisition or incentives) always begs the question of why the goal was not achieved by the cheaper (at least for the government) means of regulation. Specifically concerning land preservation, he suggested that citizens will always ask why the municipality did not use zoning or some other relatively economical regulation to keep the land in its natural state, encumbering the landowner's development options rather than paying for them.<sup>56</sup> However, the fact that most of the recharge zone is beyond the City's regulatory jurisdiction

<sup>53</sup>More precisely, these perpetual easements normally restrict development to 1/2 of 1% impervious cover. Most allow “limited development rights, such as building a small number of additional homes on the land,” while “no-development zones are included in agreements for properties that contain extra-sensitive features, such as sinkholes, streams or springs.” See Lee, *supra* Note 6.

<sup>54</sup>Thomas L. Daniels, *The Purchase of Development Rights: Preserving Agricultural Land and Open Space*, 57 *Journal of the American Planning Association* (1991) 421-431.

<sup>55</sup>Wisniewski, *supra* Note 22, 2 (online).

<sup>56</sup>Daniels, *ibid* Note 54.

renders this question largely moot, and the choice between regulation and acquisition mechanisms is averted.

## DEFINING PURCHASE GUIDELINES

Once a governmental entity has identified a mechanism and funding source, the next challenge for any acquisition program is developing clear guidelines that align spending with goals. As Danziger argued, “absent economic and utilitarian considerations, the planner is left with little or no objective standard or discipline,” leading to a “highly questionable” use of public funds.<sup>57</sup> Land preservation programs in general can be susceptible to imprecision in prioritization, as a number of valid but subjective targets, such as protecting scenic views or preserving farmland can guide purchases. When programs concentrate on acquiring land or development rights to sustain recharge to a particular aquifer, however, developing parcel identification and prioritization methodology tightly bound to the narrow goal should be relatively straightforward.

For the EAPP, the change in state law allowing use of the sales tax for conservation easements in the western counties was an important step toward ensuring the policy's goal of significant recharge protection. Nevertheless, it does not alone guarantee that the City will only pursue appropriate lands in those counties. To support that outcome, the EAPP first employs a Geographic Information Systems (GIS) model that ranks all land in the target area through four data layers, applied down to the 1-meter level. The model was developed by a Scientific Evaluation Team “consisting of aquifer experts convened to prioritize undeveloped properties based on their environmental characteristics in order to achieve maximum value for voter-approved dollars.”<sup>58</sup>

Fifty percent of the model score is determined by best available information regarding the presence of caves, faults, sinkholes, and other recharge features. Biological cover contributes another potential 20%, awarding higher scores for vegetation associated with greater recharge potential. The final 30% is evenly split between property size and adjacency to similarly protected lands (whether through EAPP, conservation easements held by other entities or public ownership).

The first two factors, permeability and vegetative cover, ensure prioritization of properties with the strongest links to recharge quality and quantity. The Edwards Aquifer recharge zone presents some variation in its recharge potential that is considered by these factors. The second two factors, size and adjacency, contribute to building an integrated system of protection, especially in regard to safeguarding entire watersheds from development in an efficient manner. This is accomplished

through the acquisition of contiguous easements on large swaths of land.

Beyond reviewing a parcel's rank in the model, the next step for assessment is a site visit to gather additional evidence. Through an inter-local agreement, the City cooperates with EAA staff to provide detailed geologic reports from these in-person inspections, particularly highlighting observable karst geology such as caves and sinkholes, some of which the model may not have captured. The reports grade each parcel, indicating relative value for quality and quantity of aquifer recharge.

All of these factors work toward ensuring that appropriate properties are considered by the Conservation Advisory Board (CAB), which serves as the initial recommending group, and then by the San Antonio City Council for final decision on acquisition. Furthermore, these procedures enable both bodies to prioritize available land. Either CAB or the city council, however, is free to decline purchase for other reasons. Typically, this might involve a property owner insisting on a price above fair market value or asking for too much flexibility for future development. Another scenario would involve the perception that development is unlikely to occur even in the absence of a conservation easement, for example if the land lacks road frontage or is particularly remote or rugged.

Overall, guidelines that fully reflect the goals of the EAPP provide a foundation for recommended purchases. Even when acquisitions may fulfill some other purpose, such as preservation of a historic ranch or endangered species habitat, the City expends funds only upon evidence of recharge integrity.<sup>59</sup> While opponents could assail any such ranking model as based on questionable science, no criticisms of that sort have emerged for the EAPP. Probably the most likely threat to the program using the model to maximum efficiency is the human factor limitation, i.e., when the property owner of a significant parcel simply is not interested in participation.

## DEMONSTRATING IMPACT

### General Efficiency

While EAPP's decision rules and strategies appear well defined and feasible to implement, the next step toward determining success is whether the property protections are in fact

<sup>59</sup>These sorts of multi-purpose purchases may still raise questions about dilution of the Program's goals. The most controversial in this regard was use of funds for the Bracken Bat Cave in 2014. See Mark Reagan, *Bracken Bat Cave Would Save More Than Bats*, SA Current, (October 14, 2014), available at <https://www.sacurrent.com/sanantonio/bracken-bat-cave-would-save-more-than-bats/Content?oid=2326588>. Iris Dimmick, *City Acts to Protect Bracken Cave's Bat Colony*, Rivard Report (October 16, 2014), available at <https://therivardreport.com/bracken-bat-cave-protected-by-conservation-easement/>.

<sup>57</sup>Danziger, supra Note15, at 484 and 486.

<sup>58</sup>City of San Antonio, Edwards Aquifer Protection Program, available at [www.sanantonio.gov/EdwardsAquifer/About](http://www.sanantonio.gov/EdwardsAquifer/About).

**Table 1.** Comparison of Urban Land Acquisition Programs.

City	Program	Year started	Spent so far (millions of dollars)	Acres Protected	Price Per Acre (Average)
Austin <sup>a</sup>	Water Quality Protection Land	1998	\$143	28,308	\$5,051
New York <sup>b</sup>	Land Acquisition Program	1997	\$438	135,149	\$3,240
San Antonio	EAPP	2000	\$225	146,075	\$1,540

<sup>a</sup>City of Austin, Austin Water, Water Quality Protection Land website <http://www.austintexas.gov/department/water-quality-protection-land>; 2014 Annual Report, available at <http://www.austintexas.gov/edims/document.cfm?id=240099>. Also see Asher Price, *Austin's water quality protection land purchases*, Austin American-Statesman (October 15, 2012). It is difficult to find comprehensive and up to date information on Austin's program in one place, and the numbers from different sources vary a bit from each other.

<sup>b</sup>Wisniewski, supra Note 22.

achieving expectations. There are a number of ways to approach assessment, making this an intricate task. I present a rudimentary first step in Table 1, through a comparison of the EAPP to New York City's LAP and Austin's Water Quality Land Acquisition Program (WQLAP). There are several implications, and limitations, to this simple comparison.

Most obviously, the EAPP has protected more acres, and at a lower average price, than the other two programs, indicating an efficient model of land acquisition. The comparison programs are analogous in that both use a strategy of purchasing land to protect water quality and quantity. As noted above, New York City is protecting surface water and not groundwater but is similarly targeting private lands outside of city limits. Austin's WQLAP, like EAPP, focuses on recharge and contributing lands, with its emphasis on the Barton Springs segment of the Edwards Aquifer recharge and contributing zones.

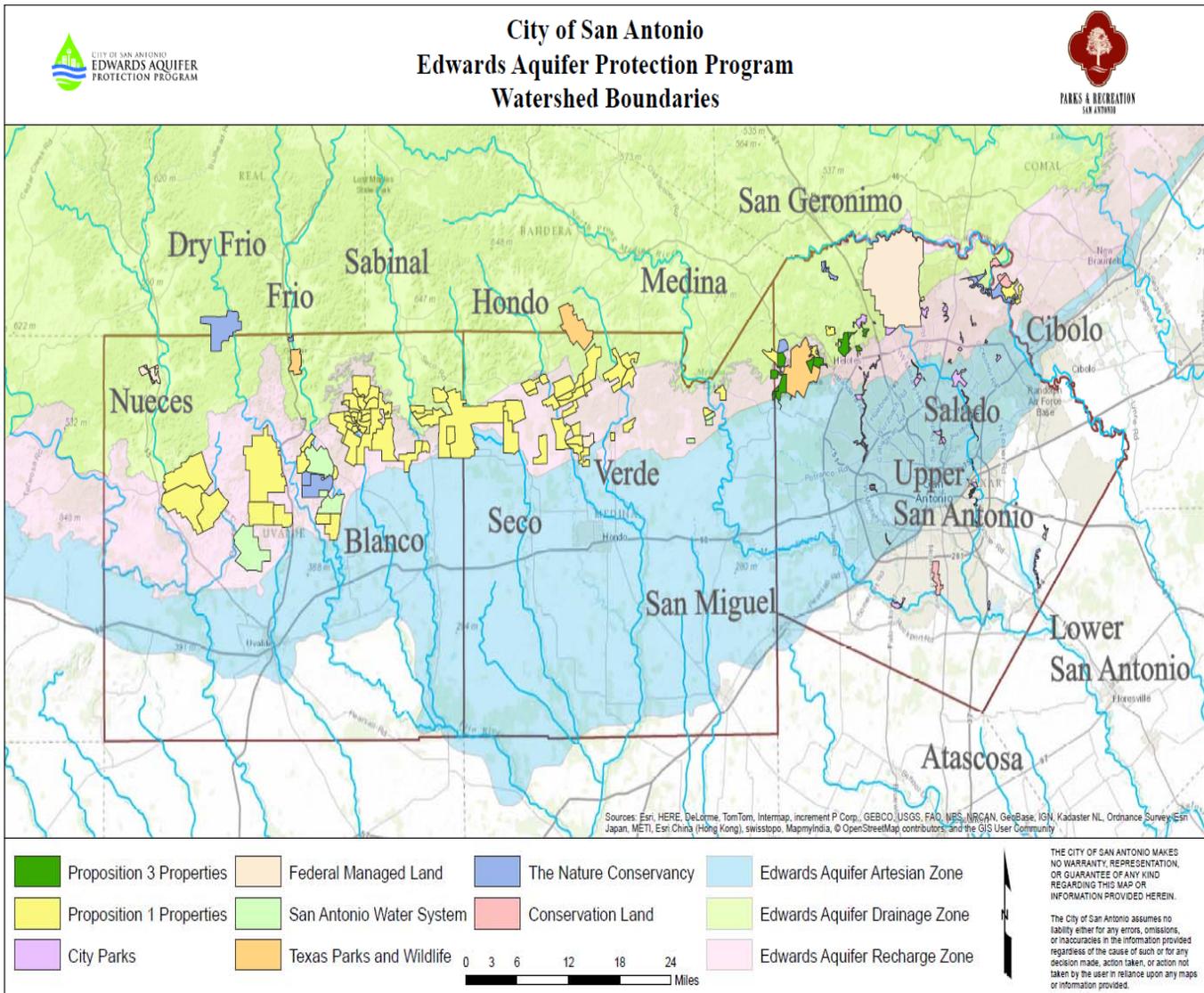
However, the comparison is somewhat unbalanced, as the three programs have important differences. For example, the City of San Antonio has spent most of the EAPP funds on less costly conservation easements, with only about 5% of total expenditures for fee-simple land purchases. In comparison, about 35% of Austin's WQLAP properties are fee-simple. New York City's LAP includes roughly 65% fee-simple lands and has encountered another unique problem, in which "the city's buying presence has created more competition for land, causing prices to rise."<sup>60</sup> Since municipalities are unlikely to pay more than fair market value for fee-simple land or conservation easements, the price per acre indicated on Table 1 simply reflects lower market values in EAPP's area of interest, as well as greater ease in acquiring conservation easements over fee-simple purchase. Still, this simple comparison indicates the EAPP as a comparably efficient use of public funds.

<sup>60</sup>Wisniewski, supra Note 22; New York City Department of Environmental Protection, Long-Term Acquisition Plan, 2012-2022 available at [http://www.nyc.gov/html/dep/pdf/resources/lt\\_plan\\_final.pdf](http://www.nyc.gov/html/dep/pdf/resources/lt_plan_final.pdf).

Another important indicator of conformity with EAPP's programmatic goal success is the geographic distribution of fee-simple and conservation easement purchases. This tracks roughly proportional to recharge location. About 67% of protected parcels are in Uvalde County, which provides the highest percentage of recharge to the San Antonio pool, 24% in Medina (second highest contributor to San Antonio pool), and 7% in Bexar (lowest contributor of the three counties to San Antonio pool).<sup>61</sup> As Figure 3 shows, indicating all EAPP purchases through 2015, identified as Proposition 3 and Proposition 1 Properties in the key, there is also a pattern of securing blocks within particular watersheds, such as the Blanco Creek and Frio River watersheds, rather than assembling a disjointed patchwork of protected land.

A final indicant of fiscal efficiency is purchases where the City leveraged EAPP funds with other resources. Although limited, there are some examples of this occurring. In 2016, the City expended over \$5 million from the EAPP for fee-simple purchase of a 165-acre portion of the Classen-Steubing Ranch, a parcel with unusually high recharge capacity and imminent

<sup>61</sup>The exact breakdown of recharge to the San Antonio pool is difficult to ascertain, partly because of yearly variation and partly depending on the source. The EAA reports recharge from five counties: Uvalde, Medina, Bexar, Kinney, Comal, and Hays, but it is not clear that all flows to the San Antonio pool. See Edwards Aquifer Authority Hydrologic Data Report for 2006, available at [http://www.edwardsaquifer.org/documents/2007\\_Hamilton-et-al\\_2006HydrologicData.pdf](http://www.edwardsaquifer.org/documents/2007_Hamilton-et-al_2006HydrologicData.pdf). About 37% of that reported recharge occurs in Comal, Hays and Kinney counties. Per an email to the author from Geary Schindel, (Chief Technical Officer, Aquifer Management Services, EAA) on July 21, 2017, "Comal and Hays counties are down gradient of the City's water supply; Kinney County distribution is very small and probably not worth considering. Most of that water discharges at the San Felipe Springs." By eliminating Comal, Hays, and Kinney counties from EAA figures, a very rough estimate is that Uvalde County provides about 56.7%, Medina County 27.5%, and Bexar County 15.7% of recharge to the San Antonio pool.



**Figure 3.** EAPP purchases through 2015 and other protected acreage, with watersheds.  
Source: City of San Antonio Edwards Aquifer Protection Program.

development threat.<sup>62</sup> However, the seller would agree to that transaction only if the City purchased the entire property, which included an additional 39 acres. The city council therefore combined program funds with an option to buy the remaining piece for parkland from a pending bond election.<sup>63</sup>

In 2015, the City secured a matching grant from the U.S. Department of Agriculture Natural Resources Conservation Service's Agricultural Conservation Easement Program to pur-

chase an easement appraised at almost \$7 million on Rancho Blanco, a 1,100-acre property along the San Geronimo Creek Watershed, and one of the few contributing zone properties targeted by EAPP.<sup>64</sup> With the federal grant covering almost \$3 million of that price, the EAPP's portion was reduced to \$4 million.<sup>65</sup> In this case, the two programs have complementary

<sup>62</sup>Josh Baugh, *Part of land deal's funding OK'd*, San Antonio Express-News (June 17, 2016) A3.

<sup>63</sup>See City Council Agenda Item/Map, available at <https://sanantonio.legistar.com/LegislationDetail.aspx?ID=2746971&GUID=81F9CDE3-AD42-4284-A9B4-30FF85151F7F&FullText=1>; <https://sanantonio.legistar.com/View.aspx?M=F&ID=4490679&GUID=B-2C9CD6A-1BC7-4591-86C3-A82F0A6833DB>.

<sup>64</sup>See map at: <https://sanantonio.legistar.com/View.aspx?M=F&ID=3908998&GUID=4FF586F8-9506-4ED1-B309-A2C327E6F13B>.

<sup>65</sup>See <https://sanantonio.legistar.com/LegislationDetail.aspx?ID=2404049&GUID=7A1BB6DB-A093-4642-9348-2D9EFCEA29C6&Options=&Search=&FullText=1>.

goals—recharge protection for the City and native grassland preservation for the U.S. Department of Agriculture.<sup>66</sup>

### Impact on Recharge Quality and Quantity

The full implication of all these indicants, however, is more difficult to estimate. An efficient record of land/conservation easement purchases, in the appropriate locations, is an instrumental measure that does not necessarily demonstrate impact on recharge quality and quantity. One of the inherent limitations of a preventive policy strategy, particularly one that safeguards land to ensure future water integrity, is adequately documenting success. As acknowledged by New York City's Department of Environmental Protection, in justifying its LAP, "land acquisition is an anti-degradation tool that does not have any immediate impact on water quality. Further, it is impossible to predict with certainty whether or how a property protected by LAP might have been developed and how such development would have impacted water quality."<sup>67</sup>

With that proviso in mind, additional evidence appears in an Assessment Report of the EAPP produced by LMI in 2014, commissioned by the City.<sup>68</sup> Its conclusions on recharge quality and quantity impact are favorable but not conclusive, reflecting the difficulties in demonstrating effectiveness of preventive measures. The water quality section does little more than lay out the generic need for local efforts, beyond existing state and federal regulations, to prevent the intensified pollutants linked to residential expansion and commercial or industrial land uses. On this point, all the Assessment Report can do is to highlight the EAPP as a means of potentially minimizing future contamination by protecting critical land from development. Again, the preventive strategy eliminates possible evidence of what might have happened in the absence of EAPP.

The Assessment Report is more specific and detailed, however, on the importance of protecting lands directly along stream-

beds in the recharge zone, stating "management of activities that might degrade water quality in this area (such as urban development, contaminant storage, and industrial activities) is essential for protecting water quality."<sup>69</sup> It points out that the EAPP had protected just 18.4% of recharge zone streams through 2013. The report's authors highlight the role of streams in the contributing zone as well, focusing on the rapid contamination that could affect the Edwards Aquifer if pollutants entered these waters, and observing that the EAPP has protected only 3.6% of contributing zone streambeds. While purchases since 2013 have likely resulted in additional protected land in these areas, this section of the Assessment Report points to both the potential benefits of the EAPP and the limits on what it has achieved so far.

In the water quantity section, the Assessment Report concludes that the EAPP had already protected 51% of current annual SAWS withdrawals from the Edwards Aquifer for delivery to local customers. Figure 4 represents an assessment of various EAPP continuation options against SAWS-estimated future need. The red dot added to this chart emphasizes an important benchmark: the year (2030) in which enough supply would be secured through the EAPP (assuming it is renewed at least at the \$90 million level in 2020 and 2025) to meet the City's projected 2060 demand for Edwards Aquifer water.<sup>70</sup>

This discussion of the dynamic between the EAPP and recharge quantity links to the question of the extent to which impervious cover disrupts recharge volume. The Assessment Report operates on the premise that, in the absence of EAPP protection, *zero* recharge would occur on these properties. This is an oversimplification; allowing development to proceed unabated, while lowering recharge volume, would likely not reduce it to zero. Still, purchases/conservation easements are the only way to ensure an absence of disruption to the natural recharge process.

## CONCLUSIONS AND GOING FORWARD

This review of the EAPP has explicated key components of its creation and implementation. Overall, the need for the EAPP appeared well documented and accepted by voters, although some aspects of that narrative are more subjective. The acquisition mechanism adapts well to the hydrogeology of the Edwards Aquifer, given that the City has limited options for regulation. Purchase guidelines focus squarely on the goal of recharge protection. Finally, while there are challenges to documenting impact, the EAPP presents a record of efficient-

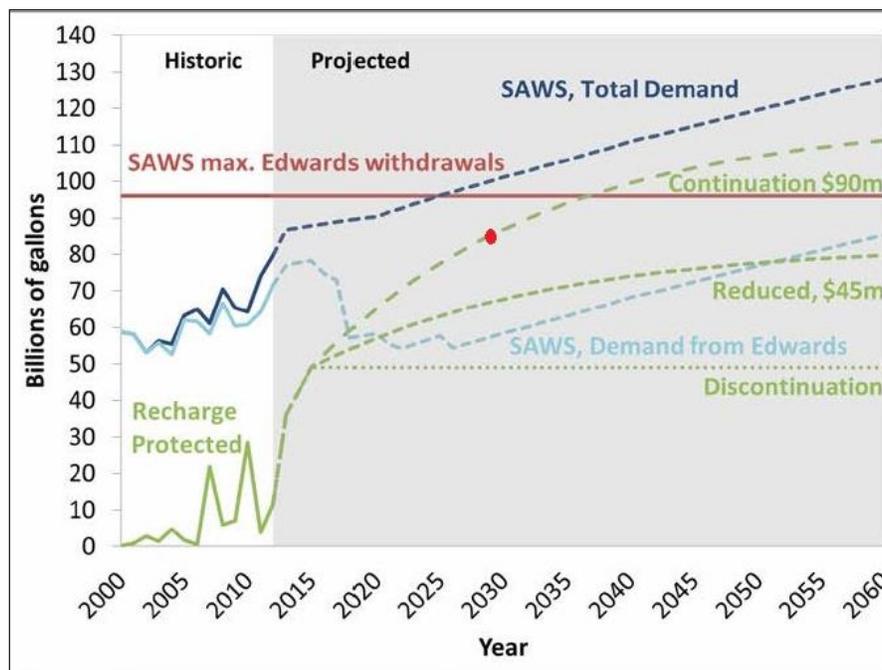
<sup>66</sup>See <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/acep/>.

<sup>67</sup>Soll, *supra* Note 22, 193. Also, see Danziger, *supra* Note 15, on the impossibility of presenting information on what would have occurred in the absence of any acquisition program.

<sup>68</sup>Justin A. Cleveland, et al., *City of San Antonio Edwards Aquifer Protection Program, Office of Eastpoint and Real Estate, Assessment of the Current Status and Long-Term Viability of the City's Edwards Aquifer Protection Program*, Report ATN30TI, LMI (2014), available at [https://www.researchgate.net/publication/272023372\\_ASSESSMENT\\_OF\\_THE\\_CURRENT\\_STATUS\\_AND\\_LONGTERM\\_VIABILITY\\_OF\\_THE\\_CITY'S\\_EDWARDS\\_AQUIFER\\_PROTECTION\\_PROGRAM](https://www.researchgate.net/publication/272023372_ASSESSMENT_OF_THE_CURRENT_STATUS_AND_LONGTERM_VIABILITY_OF_THE_CITY'S_EDWARDS_AQUIFER_PROTECTION_PROGRAM). LMI, originally known as Logistics Management Institute, is a non-profit government contracting and consulting firm founded in 1961. Its Southwest Region office is located in San Antonio, see [http://www.lmi.org/en/About-LMI/Locations-Directions-\(1\)/Southwest-Region/Southwest-Region](http://www.lmi.org/en/About-LMI/Locations-Directions-(1)/Southwest-Region/Southwest-Region).

<sup>69</sup>Cleveland, *ibid*, at 3-1.

<sup>70</sup>This projection is based on SAWS 2012 Water Management Plan, which already included the development of several non-Edwards Aquifer sources, but preceded adoption of the Vista Ridge Regional Water Supply Project. Cleveland, *ibid*, at 4-2.



**Figure 4.** Estimated link between continuation of program and future demand.

Source: Cleveland, *supra* Note 70, 4-7.

ly spending funds to meet the overall goal. This section now describes how particular programmatic components may evolve.

Ironically, the region's rapid population growth, a key pillar of the EAPP's justification, could represent a threat to its continuation going forward. This is largely a matter of perception, linked to the declining share of San Antonio's total water supply that comes from the Edwards Aquifer. In its 2017 Water Management Plan, SAWS shows that the aquifer's share of water provided to customers has dropped from 70% of total supply in 2000 to 42% (drought year)/60% (average year) in 2017. Furthermore, Edwards Aquifer water will represent only 31% (drought year)/52% (average year) by 2070, the result of a diversification initiative, including such endeavors as the Carrizo Aquifer Water Project, H2Oaks Desalination Plant, and the Vista Ridge Regional Water Supply Project.

However, it is important to keep these projections in perspective. The declining percentage is not a function of the City using less Edwards Aquifer water, but rather the result of increasing population requiring a larger supply, in turn diminishing the aquifer's proportional share. The management plan declares that "the Edwards Aquifer has been, and will continue to remain, the cornerstone of San Antonio's water supply," suggesting that the full SAWS-permitted annual Edwards withdrawals will still be necessary.<sup>71</sup>

In sum, these new water sources might weaken but never eliminate justification for Edwards recharge protection. Rather, the major challenge to the EAPP moving forward will more likely be competition for that limited sales tax with exhaustion of the current \$100 million funding pool, probably in 2020. At that point, other funding priorities could present a challenge to securing additional funds for EAPP.

This is where another possible limitation of EAPP emerges, again concerning its justification. While each funding phase met its goal through the efficient expenditure of allocated funds to protect sensitive land, challengers could highlight the absence of a clearly defined, *ultimate* endpoint. In the extreme, that endpoint could be when the City has acquired easements on all undeveloped recharge zone land and perhaps even extending to the contributing zone. That goal is clearly unrealistic, but may present an opportunity to prioritize certain property types even further, such as focusing on land adjacent to river and streambeds.

The question of whether the EAPP should move toward similar protections of contributing zone acreage remains unsettled. Given the basic flowpath from contributing to recharge zone, the former may warrant significant protection, and the authorizing language for EAPP allows purchases in both zones. Nevertheless, that would involve a great deal more funding and years of effort. While "recent research clearly highlights

<sup>71</sup>Available at [http://www.saws.org/Your\\_Water/WaterResources/2017\\_wmp/docs/20171107\\_SAWS-2017-Water-Management-Plan.pdf](http://www.saws.org/Your_Water/WaterResources/2017_wmp/docs/20171107_SAWS-2017-Water-Management-Plan.pdf) (17)

the importance of the contributing zone to recharge," it is too extensive for the EAPP feasibly to protect its entirety.<sup>72</sup>

In short, shifting priorities and emerging competition for the sales tax will challenge EAPP advocates to specify how much is enough, if asking voters to endorse another renewal.<sup>73</sup> Relatedly, defining indicators of success for the EAPP may inherently be its most vulnerable component, given the challenge of demonstrating the prevention of future harms to recharge quality and quantity. To a point, conclusions on whether it has been successful relies a great deal on belief in whether it was necessary in the first place. That public perception seems strong and makes a case for the definition of EAPP's success as simply the evidence that it protects as much sensitive land as possible. However, as competition for the sales tax emerges, the challenge of demonstrating results could shape the community dialogue on future renewals. At the same time, the evidence of accomplishment, at least on the simpler scale of dollars expended and acres protected, may convince citizens that the EAPP has successfully run its course, completing all it set out to do.

Overall, this review makes the case for the rationality and utility of a strategy that focuses on land in order to protect water. Some aspects of the EAPP are specifically linked to the San Antonio context. For example, the hydrogeology of the region, in combination with jurisdictional limits, makes acquisition the only feasible option for protecting sensitive lands that influence the San Antonio supply. Furthermore, the City has benefitted from a market with relatively low land appraisal values, and a steady supply of willing participants. However, this review may provide generalizable principles for any governmental entity considering this approach, emphasizing the importance of clear public communication, guidelines that appropriately match the overarching goal, and the ability to demonstrate the efficient expenditure of funds.

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<sup>72</sup> Ronald T. Green, Geary Schindel, and Rebecca Nunu, *Refined Weighting of Parcels in the Edwards Aquifer Contributing Zone*. Presentation to EAPP CAB, February 24, 2017.

<sup>73</sup>In the wake of the Hurricane Harvey induced gas shortage in the Fall of 2017, and subsequent failure of public transit to fill commuters' needs, the *San Antonio Express-News* already broached the topic. An editorial stated, "(i)f Mayor Ron Nirenberg and a majority of the San Antonio City Council want to better fund transit—bus service, rail and more bike paths—they will have to wrestle with some hard choices. This could mean supporting a dedicated transit fee, or shifting sales tax dollars away from Edwards Aquifer protection or (and this is incredibly unlikely) Pre-K 4SA. Perhaps it's time to look at other ways to protect the aquifer from overdevelopment," available at: <http://www.mysanantonio.com/opinion/editorials/article/Gas-shortage-reveals-VIA-s-flaws-12215996.php>.