Managing Natural Resources in the Heart of Texas: Challenges and Opportunities

Annalisa Peace
Greater Edwards Aquifer Alliance
The Texas Commission on Environmental Quality (TCEQ) has designated the Edwards Aquifer as the major aquifer in the state most vulnerable to pollution.

Little to no filtration is provided as water enters directly into the Aquifer through faults, stream beds, and terrain characterized by uniquely porous Edwards limestone.
The Edwards is a uniquely prolific aquifer characterized by rapid groundwater recharge and rapid open channel flow.
This rock also makes the Edwards uniquely prolific.
Surface water across Edwards/Trinity Aquifer region is scarce

- Surface waters and streams less prevalent in aquifer region
- Streams lose water through fissures as they flow across porous karst
- 75% of aquifer recharge occurs directly through streambeds that cross the Recharge Zone
- Available water derived from groundwater springs and seeps
The Edwards Aquifer is the source of the largest springs in Texas
The Edwards Aquifer Ecosystem sustains essential freshwater flows to bays and estuaries.
“Our fundamental position is that water in its natural state is entirely dedicated to supporting the environment. There is no surplus. As that water is used for human purposes, its environmental support capability is reduced.

As more of water is used for human purposes, not only is there less water available for environmental support, but there starts to be competition for the water among human needs. There never is a surplus. There is only a willingness by people to claim that certain amounts of water can be placed to human use with certain restraints.

The challenge is in adequately defining the constraints so that adverse social and environmental impacts are minimized.”

Con Mims, Executive Director, Nueces River Authority - Water Transfers: from areas of surplus to areas of scarcity 9/24/2011
Edwards Aquifer Ecosystem

Home to 50 unique species of plants and animals

- Black capped Vireo
- Golden cheeked Warbler
- Barton Springs salamander (*Eurycea sosorum*)
- Texas Blind salamander (*Eurycea rathbunii*)
- Texas wild rice
- Fountain darters
A poll taken in the 1990’s by Texas Monthly found that 80% of Texans want to retire to the Hill Country.

We are literally loving the Hill Country to death.
The Texas Hill Country is one of the fastest growing areas in the nation:

Fastest Growing Cities in the Nation (U.S. Census Bureau 2015)

#1: San Marcos – 2015 population growth rate 7.9%
   (Since 2010, the city’s population has increased by 30 %)
#4: Austin - 2015 Population Growth Rate: 2.5%
#5: San Antonio - 2015 Population Growth Rate: 1.8%

U.S. Census Bureau - Resident Population Estimates for the 100 Fastest Growing U.S. Counties With 10,000 or More Population in 2010: April 1, 2010 to July 1, 2013

#10 – Kendall County 13% growth
#14 – Hays County 12% growth
#17 – Williamson County 11.5% growth
#31 – Travis County 9.4% growth
#34 – Comal County 9.2% growth
#44 – Guadalupe County 8.9% growth
THE WORLD’S POPULATION, CONCENTRATED

If the world’s 6.9 billion people lived in one city, how large would that city be if it were as dense as...

- **Paris**: 12,159,530 square miles, 31,638,360 square kilometers
- **San Francisco**: 369,039 square miles, 960,680 square kilometers
- **New York**: 7,305,644 square miles, 18,912,244 square kilometers
- **London**: 3,172 square miles, 8,235 square kilometers
- **Singapore**: 230,000 square miles, 601,082 square kilometers
- **Houston**: 1,074,760 square miles, 2,790,849 square kilometers
TCEQ Paves the Way for Shit Creek(s)
State environmental agency rejects science in favor of allowing sewage in creeks
BY JACOB COTTINGHAM, FRI., DEC. 5, 2008

TCEQ administrative law judges recommended allowing the Belterra subdivision to discharge treated effluent into Bear Creek, while the agency's commissioners rejected the city of Austin and BS/EACD's request for a ban on discharge within the watersheds of Barton and Onion creeks.

For a local example of the great "global warming debate," just look at the controversy over discharge of treated effluent — sewage in laymen's terms — in the Edwards Aquifer Watershed. On one side are the familiar government entities and environmental groups, such as the Barton Springs/Edwards Aquifer Conservation District, the city of Austin, Hays County, and the Save Our Springs Alliance. On the other are development interests and their lawyer, Andy Barrett, whose lobby list on file with the Texas Ethics Commission includes water giant Aqua America Inc. and an assortment of development and energy companies. Ostensibly in the middle are the commissioners of the Texas Commission on Environmental Quality — all appointed by industry-friendly Gov. Rick Perry. Each side has its own set of scientists, talking points, and convictions, making any environmental topic a lengthy point-counterpoint discussion.

There are three TCEQ-related issues in play, which seem to blend into a single case: One is the contested case of the Belterra development in Hays Co. This was a battle before two TCEQ administrative law judges, with each side arguing whether or not to discharge treated effluent from Belterra into Bear Creek, which feeds the recharge zone of the Edwards Aquifer. Following on its heels is the joint petition filed by the city of Austin and the BS/EACD, which asked the TCEQ for a change of rules to prohibit discharge into the Onion or Barton watersheds. A third TCEQ case on the horizon concerns Jeremiah Venture's massive residential development in Hays Co., which is seeking a permit to discharge effluent on thin soil covering the recharge zone.
THE SUMMIT AT STONE DOMINON OAK AT CIBOLO CULEBRA CREST

A COMMUNITY OF GENERIC, PIECE O'CRAP McMANSIONS
slapped together with cheap materials and shoddy workmanship

RIDICULOUSLY OVERPRICED

FROM THE LOW $800'S

OFFERED BY SWEENCO.

(210) 342-3088
• Rapid regional population and urban growth predicted to continue.

• Multiple jurisdictions with no coherent plan or vision for the region

• Publicly funded infrastructure projects that encourage growth in sensitive areas

• no land use powers in unincorporated areas

“Government, private corporations and citizens must act promptly to direct urban development away from the aquifer through control of infrastructure investment....” and “Restrict impervious cover to levels that will sustain existing water quality.”

Flash Flood Alley

The Central Texas Hill Country is the most flash flood-prone area of North America.
Since 1996, flash floods have claimed 198 lives in Texas.
(National Weather Service)

Current regulatory measures are inadequate: Increased Impervious cover on the Edwards Aquifer Recharge Zone increases storm water flows, erosion, and flooding, requiring cities to spend billions of dollars for storm water management projects to mitigate downstream flooding
Regulations permit extensive site modification thus altering the hydrologic regime

Sand filter is prevalent BMP across the Edwards/Trinity region
Edwards Rules treat storm water as a pollutant

On the Edwards Recharge Zone:
Up to 85% impervious cover allowed in San Antonio
Up to 100% impervious cover allowed under State Law
Structural controls often fail to prevent pollution.

A study conducted by GEAA in 2010 on permanent structural controls (BMP’s) found that at any given time, approximately 10% - 15% of the 3,000 permanent BMP’s in Bexar County do not function sufficiently to achieve the desired result of preventing non-point source pollution from infiltrating the Aquifer.

Temporary BMP’s installed to prevent pollution on construction sites frequently fail to achieve this goal.

http://www.aquiferalliance.net/Library/GEAAPublications/BMP_Final.pdf
Pollutants found in Barton Springs or Contributing Stream Sediments Above Levels which are Toxic to Aquatic Life

<table>
<thead>
<tr>
<th>Heavy Metals</th>
<th>Pesticides</th>
<th>Polyaromatic hydrocarbons</th>
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<td>Pyrene</td>
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- Outdoor Ant. & Cricket Spray
**Increased Urbanization in the Edwards Aquifer Recharge and Contributing zones is Impairing Water Quality**

- Results of EAA well tests (2011 – 2012*) detecting anthropogenic or “emerging” contaminants (pharmaceuticals and personal care products)

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<tr>
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<th>Chemical Name</th>
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- *excludes results from test well near Cibolo Nature Center
- Lincomycin and sulfamethoxazole are antibiotics ·Diltiazem is a blood pressure medication · Carbamazepine is an epilepsy medication · Cotinine is a nicotine metabolite
Between January 2008 and May 2012 eighty three spills totaling 809,000 gallons (2.5 acre/feet) of raw sewage occurred on Edwards Aquifer Recharge Zone.
“Organized Wastewater collection is what drives development.”
Gene Dawson, president, Pape Dawson Engineers, Inc.
“Business in, waste out” San Antonio Express News, April 9, 2014

As opposed to On-Site Sewage Facilities (OSSF), centralized wastewater service results in projects of greater density, and encourages growth that follows the installation of oversized water and sewer mains.
Some issues with protection of Central Texas karst aquifers:

- The State has no density restrictions for the Edwards Aquifer Recharge Zone.

- Neither the State nor municipalities require adequate protection of the Edwards Aquifer Contributing Zone. Most Edwards Aquifer Authority regulations extend protections for five miles into the Contributing Zone.

- The State treats storm water as a pollutant, requiring measures to seal the Aquifer from recharge, or to mitigate water quality through the use of engineered Best Management Practices (BMP’s).

- Current engineered structures required by the state to mitigate water quality are often poorly designed and poorly maintained.

- Public investment in infrastructure does not take environmental services of the Edwards and Trinity aquifer watersheds, encouraging growth where it is least appropriate.

- Counties lack the authority to regulate land uses

- The State often grants powers of eminent domain to Municipal Utility Districts and other entities, empowering them to encroach on contiguous privately held land.
Preserving Caves and Recharge Features

Impervious Cover Limits for the Edwards Aquifer Recharge Zone are the best strategy we have to preserve Caves.

Other strategies include protections for endangered karst species.

Effective Habitat Conservation Plans are needed.
Incompatible land uses...

Martin Marietta Quarry next to San Antonio Ranch
Infill development is occurring within drainage areas on the Edwards Recharge Zone.
Much of the recent growth in Bexar County has taken place over the Recharge and Contributing zones of the Edwards Aquifer, resulting in a trend of increased contamination of our water supplies and spring flows. Area homeowners must be educated about the geology of the Edwards Aquifer and how to live in this extremely environmentally sensitive area.

A suite of presentations, online resources, social media, and print materials will teach them about actions they can take to protect our Aquifer, including how to handle and store hazardous materials, what common household practices pose a threat to the integrity of sewage systems, and how to plant and maintain landscaping in this unique region.

Modeled on the successful campaigns in Kentucky and Florida, GEAA will work with the creators of these programs to adapt them to the Edwards region.

Low Impact Development (LID) is an environmentally-friendly approach to developing land and managing storm water runoff that uses natural vegetation to treat storm water close to where it originates and allow it to infiltrate into the aquifer. LID emphasizes conservation and use of on-site natural features to preserve water quality.

TCEQ recommendations for employing LID on the ERZ

- Preserve and mimic the natural runoff system
- Maintain areas of natural vegetation and major trees
- Minimize impervious surface areas
- Use native or adapted plants, minimize turf
- Convey site stormwater through vegetation prior to release or storage
- Surround faults and sinkholes with vegetated buffer 25 feet wide
- Use integrated pest management (IPM) vs. insecticides
We can do much, much better

Villanova University traffic island
Portland OR streetscape swale

- Biofiltration may capture up to 100% rainfall
- Filters out 95% pollutants in plant + soil layer
- Special soil mix applied in areas of thin soils
- Applications: parking lot islands, filter strips, pre-treatment swales, rain gardens
LID used in sequence for water quality

“stormwater treatment train” or recharge sequence

City of Chicago Green Agenda
The GEAA LID for Karst and Arid Regions Initiative Includes:

- A Landowner’s Guide – how to maintain the integrity of your karst landscape
- LID demonstration projects – Our team will work with developers of sites within our region to incorporate LID into the design and build out.
- Workshops for citizens/landowners/city staff and developers. For Kendall County these could be coordinated with the Upper Cibolo WPP
- Seeking funding for these initiatives from Federal and State grants, municipalities, agencies, and other sources
Karst regions have special issues for LID

- Stormwater runoff carries pollutants from impervious roadways and parking lots, which enter aquifer quickly through porous karst.
- Stormwater in urbanizing karst regions tends to concentrate water, eroding and destabilizing limestone bedrock.
- Investigation of subsurface geology and avoidance of known sinkhole areas important if considering use of infiltration
LID principles for Karst Aquifers

- Respect the context of the Edwards Plateau and nearby Texas Hill Country
- Balance growth with preservation of the natural drainage and infiltration system
- Take a systems approach to development, integrating water planning from the onset
- Use every building project as an opportunity to improve groundwater collection, quality and monitoring
- Integrate aquifer management into site programs through LID multiple use projects
ECOREGIONAL CONTEXT: KEY CONCEPTS

The Edwards Aquifer is an irreplaceable resource that has been subjected to significant urban growth and development, resulting in loss of recharge due to impervious cover replacing native landscape cover.

The Edwards is a karst aquifer, a type of aquifer that is especially susceptible to contamination because pollutants from runoff, leaks, spills, lawn treatments, and other sources can reach the water table within minutes and travel quickly through the aquifer with effectively no filtration.

The need exists for an integrated approach to water management over the aquifer that will maintain the natural hydrologic regime to the extent possible, including the need to recharge the aquifer safely.
New GEAA Programs for 2015 – Community Rain Gardens

GEAA proposes to work with Home Owners Associations, schools, and businesses to create Community Rain Gardens, similar to the many community garden programs popular throughout the United States. GEAA will teach homeowners how to maintain existing water quality structures and will engage them in installing Low Impact Development (LID) projects such as swales, rain gardens, and specific plantings to enhance filtration of stormwater before it enters the Aquifer. Landscape architects with expertise in LID will be employed to design and help homeowners to properly install and maintain site specific LID enhancements.

We hope to educate homeowners on the Edwards Aquifer Recharge Zone how to identify and report non-compliant systems, to enhance the function of the systems in their neighborhoods, to understand the need to use drought tolerant plants for water conservation, and to generally educate them on the importance of protecting the Edwards Aquifer.

Under Your Feet Campaign
GEAA is contracting Western Kentucky University to produce a campaign to educate people who live on the Recharge Zone on how to protect the Aquifer.
Permanent Protection of the San Geronimo Valley

The San Geronimo Valley is approximately 7,000 acres within Northwest Bexar County and proximal Medina County.

The San Geronimo Creek and significant recharge features found in the upland areas are estimated to contribute approximately seven to fifteen percent of the entire recharge of the San Antonio segment of the Edwards Aquifer. The San Geronimo Valley is under immense pressure from encroaching development, with plans underway to provide roadways and flood control based on the scenario that the entire area will be developed out. Permanent protection of this area through the purchase of conservation easements would preempt plans for development, thus preserving this important region so that it will continue to contribute significant volumes of high quality recharge to the Edward Aquifer in perpetuity.
For more information about GEAA and our member groups visit

www.AquiferAlliance.org

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