

EXPLORE, ENJOY, PROTECT!
This eco-tour guide to the heart of Texas – the Greater Edwards Aquifer Ecosystem – provides an introduction to the Texas Hill Country. We invite you to explore the region and its many clear running streams, scenic vistas, cold springs, show caves and bat caves, big cities and small ranching communities, and parks and preserves. Along the way we hope you will gain a better understanding of and appreciation for our natural and cultural heritage.

This guide is also a call to action. The heart of Texas is under assault from urban sprawl. Unless concerned citizens take action, the Hill Country will very soon be lost to land fragmentation and road building, its streams and springs polluted and pumped dry. We invite you to join the Greater Edwards Aquifer Alliance and the thousands of concerned Texans who are jumping in to save the heart of Texas.

GETTING ORIENTED: The Great Springs of the Edwards Aquifer

The Edwards Aquifer is a mysterious maze of underground rivers, chutes, and rivulets that provides the essential source of life for most of the residents of Central and South Central Texas. Most of the Edwards Aquifer is hidden to all but a relatively few trained geologists, water engineers and cave enthusiasts. However, many are familiar with its prolific springs that emerge along the ragged edge of the Hill Country.

Known as “Great Springs,” these springs nourished native peoples for thousands of years. Beginning in the early 1700s, European immigrants settled around the Great Springs, utilizing their flows for milling, irrigation, fishing, drinking, recreation, and religious purposes. In the following 300 years, the Great Springs sustained the development of all of the major cities in central and south central Texas. From northeast to southwest, the largest of the Great Springs of the Edwards Aquifer are:

Salado Springs – The historic Stagecoach Inn, on the east side of Interstate 35 at Salado, was located just above Salado Springs, the 12th largest in Texas. Salado Springs are the major outflows from the northern segment of the Edwards Aquifer.

Barton Springs – Texas’ capital city was located on the banks of the Colorado River in part because of the reliable and abundant flows of Barton Springs, the 5th largest in the state. Located in Austin’s Zilker Park, Barton Springs Pool is open for swimming all year, with free swimming in winter months.

San Marcos Springs – The San Marcos Springs are the 2nd largest in Texas. The San Marcos River begins at the springs on the campus of Texas State University and flows through the City of San Marcos park system. The river is popular for snorkeling, diving, inner tubing, canoeing, kayaking and swimming.

Hueco Springs – Hueco Springs, the state’s 7th largest, flow into the Guadalupe River at the well-known Hueco Falls rapid, 3.5 miles upstream of Gruene, the inner-tubing capital of Texas.



Baptismal service at Barton Springs, 1925

Comal Springs – Emerging in New Braunfels’ historic Landa Park, Comal Springs are the largest in Texas and the south-west United States. Landa Park’s spring-fed pool and the Schlitterbahn water park a short distance downstream on the Comal River are enjoyed by hundreds of thousands of Texans every year.

San Antonio Springs – Historically the state’s 6th largest, San Antonio Springs emerge on the campus of Incarnate Word College in downtown San Antonio and flow through Brackenridge Park. Spanish missionaries located here in 1718; the City of San Antonio followed. Today, San Antonio is the largest city in North America wholly dependent on groundwater, and thus the future of the city depends on sustainable management of the Edwards Aquifer.

San Pedro Springs – Located a short distance north of downtown San Antonio, San Pedro Springs emerge in San Pedro Park, the second oldest public park in the United States (next to Boston Commons). San Pedro and San Antonio

Springs emerge at relatively high elevations in the Edwards Aquifer and have suffered drastically reduced flow due to heavy pumping by cities and farmers in the southern Edwards region.

Leona Springs – This large group of springs is the source of the Leona River and supported the development of the town of Uvalde.

Las Moras Springs – Emerging at Brackettville in Kinney County, these Springs are also known as Fort Clark Springs; they are the 11th largest in Texas and emerge in a swimming pool shared by the surrounding residents.

San Felipe Springs – Fed by the Edwards and other limestone formations, Texas’ 4th largest springs provide the water supply for the City of Del Rio. Emerging just north of Highway 90, San Felipe Creek flows 24 miles to the Rio Grande.

Goodenough Springs – Historically Texas’ 3rd largest, these springs are now covered by Amistad Reservoir on the Rio Grande. Fed by Edwards-associated limestones and other formations, the pressure head from the reservoir has reduced flow considerably.

These Great Springs, and the patterns of settlement which they engendered, have been shaped by forces more than 100 million years old, from a time when the sea covered almost all of what is now Texas. Over the eons, the calcium carbonate shells of marine organisms that lived in this shallow sea accumulated hundreds of feet thick, forming the Edwards, Trinity and other associated limestones. The sea made its final retreat 60 million years ago, and terrestrial life forms took over.

Then, 17 million years ago, the earth shifted, breaking and lifting a large piece of this coastal plain 300 to 1,200 feet up along what is now called the **Balcones Fault** zone. This line of uplift – beginning north of Waco and arching south and then west to near Del Rio – marks the boundary between the

nowhere else on Earth. We invite you to join with us – the Greater Edwards Aquifer Alliance – to learn the ways of the heart of Texas and to take action to sustain and preserve the water, wildlife, scenic beauty and cultural heritage of the Edwards Aquifer and the Texas Hill Country.

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\$3.00

GUIDE TO APPRECIATION AND CONSERVATION OF THE GREATER EDWARDS AQUIFER ECOSYSTEM

forested limestone Hill Country to the north and west and the gently rolling Blackland Prairie and Texas Coastal Plain to the east and south.

Over time, the forces of erosion carved what we recognize as the flat-top, stair-stepped Hill Country out of the uplifted limestone of the Edwards Plateau. Millions of years of slightly acidic rain percolated down through the faulted and fractured limestone, dissolving the rock and creating spaces that hold and convey water. These spaces range from tiny “honeycomb” pores to large caverns. Many of the largest of these caves are now open for touring and are listed in the box at right.

The Edwards is known as a **karst** aquifer, characterized by rapid, open-channel water flow and by a thin to nonexistent soil cover. Because of these physical factors, the Texas Commission on Environmental Quality has recognized since 1989 that the Edwards Aquifer is more vulnerable to pollution than any other major aquifer in Texas.

Nature has divided the aquifer into three segments. The **Northern Edwards Aquifer** is isolated north of the Colorado River basin, reaching from central Travis County up to southern Bell County. The **Barton Springs segment** falls immediately south of the Colorado, in southwest Travis and northern Hays counties. Except for pumping that supplies with water, almost 90 percent of water flows in this segment emerge at Barton Springs. The **Southern, or San Antonio, segment** begins near Buda and is roughly one hundred times larger than the Barton Springs segment. It feeds all of the other Great Springs of the Edwards, from San Marcos to Del Rio, and is the sole source of drinking water for more than 1.5 million people.

Tracing the path of rainfall as it flows through **three distinct zones** found in each of the three Edwards Aquifer segments, it first falls in the upstream areas known as the **contributing zones** or drainage area (shaded light purple on the map). There it collects in draws, small streams and then larger creeks and rivers, which generally flow to the south and east toward the Gulf of Mexico. When these waterways cross onto the Balcones Fault zone – known as the **recharge zone** – water plunges down through sinkholes, caves, and fractures into the porous Edwards formation. Once underground, the water then flows through the aquifer along the major fault lines toward the Great Springs.



Golden-Cheeked Warbler (*Dendroica chrysoparia*)



Andy Grubbs swimming in the Valdivia Farms Sinkhole

Photo by Allan Cobb

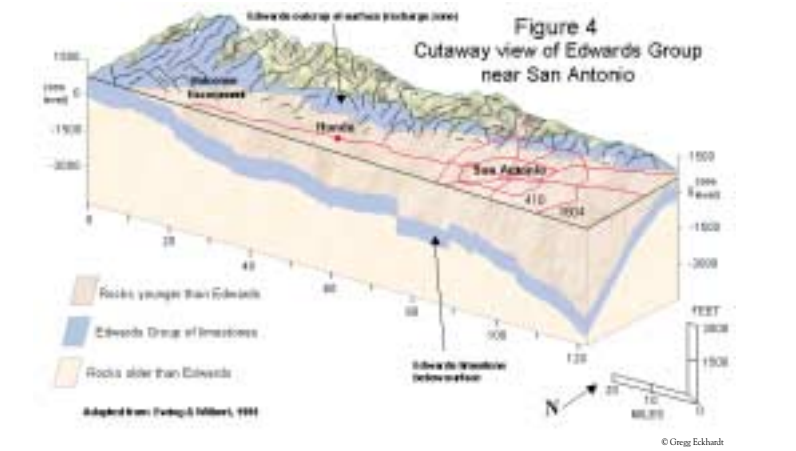
A significant portion of the Edwards Aquifer – known as the **artesian zone** and shown in green – rests below the surface, covered by younger geologic formations. These overlying formations protect the underlying aquifer from pollution at the surface. From the large map you can see that most of San Antonio is built over the artesian zone, allowing the city to drill its municipal wells directly down into the aquifer. But the city is growing rapidly in the vulnerable contributing and recharge zones, putting the aquifer, its unique wildlife and springs, and the city’s own water supply at risk.

UNIQUE LIFE AT RISK

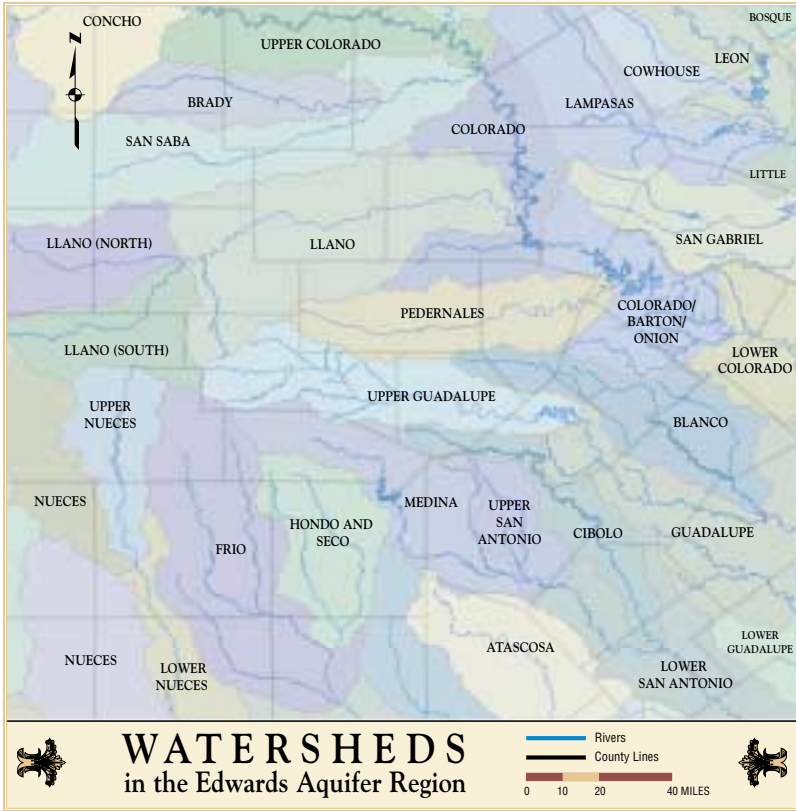
The contributing and recharge zones of the three Edwards Aquifer segments, combined with the bisecting Colorado River watershed, make up most of the Texas Hill Country. This region is blessed with more than 60 species of plants and animals that live here and nowhere else in the world. Blind salamanders, catfish, crustaceans, and other “cave critters” have evolved in isolated habitat “islands” within the aquifer, in the dry caves above the water table, and at the springs. The Barton Springs and Austin Blind Salamanders live only at Barton Springs, Texas Wild Rice and the San Marcos gambusia live only in the San Marcos River, and the Texas Blind Salamander is known only from a few caves that reach into the Southern Edwards Aquifer.

Distinct Hill Country plant communities are characterized by mixed oak and ash juniper woodlands, oak savannah and shinnery, wildflowers, native grasses and riparian woodlands. Several centuries of farming and ranching have altered the landscape, but the ruggedness of the Hill Country has assured that many of the native plants and animals have survived. For example, mature oak and ash juniper woodlands provide nesting habitat for the endangered Golden-cheeked Warbler, a small migratory songbird that is the only species of bird entirely native to Texas.

Many of the plants and animals unique to the Hill Country are listed as “threatened” or “endangered” by the U.S. Fish & Wildlife Service because they have extremely limited ranges which are being destroyed by rapid urbanization, urban runoff pollution, and/or excessive water withdrawals. The threat of extinction to sensitive fish, salamanders and other species that live in the Edwards Aquifer and its Great Springs is particularly acute. Conservation measures that will sustain these endangered species will assure that the Aquifer and Springs are sustained for human use and enjoyment as well.



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A PLAN TO SAVE THE HEART OF TEXAS

The conservation groups that make up the Greater Edwards Aquifer Alliance drafted a consensus action plan for saving the water, wildlife, scenic beauty and cultural heritage of the Edwards Aquifer region. The **Edwards Aquifer Protection Plan** is based on sound science and sustainable economic development principles. (A copy of the plan is posted at www.greateredwards.org.) The Plan recognizes that absent bold action to reverse current growth patterns and ever increasing consumption and pollution of water, the Hill Country can be ruined within a few short years. The key components of the Plan – ambitious but also practical and necessary – are:

■ **Direct development downstream.** Public investment along the Austin/San Antonio corridor should support development to the east and downstream of the Edwards Aquifer recharge zone. Well-managed, compact growth in less sensitive watersheds is both fiscally responsible and environmentally sustainable.

■ **Purchase parks, watershed preserves and conservation easements.** Local, state and federal governments should promptly commit to directing at least \$500 million to the purchase of parks, watershed preserves and conservation lands over the Aquifer recharge and contributing zones. By creating a regional system of parks, preserves and conservation ranches, we can protect the Edwards Aquifer, curb urban sprawl into the Hill Country and provide much needed recreation lands for all Texans to enjoy. This is less than a year of spending on highway construction in the Hill Country region and about one-half of the corporate personal property taxes that go uncollected in Texas every year. Florida and California voters have together approved more than \$10 billion in recent years for purchase of parks and wildlife refuges, which helped them qualify for large sums of matching federal dollars.

■ **“Not on our aquifer, not with our money.”** This has been the commonsense motto of San Antonio citizens who have recognized since the late 1970s that the greatest threat to the Edwards Aquifer was the expenditure of taxpayer funds to support development over the aquifer recharge and contributing zones. We call for an end to public expenditures and development subsidies of any kind (highway expansions, sewer extensions, fee waivers, loan guarantees, tax abatements, creation of utility “designer districts,” etc.) for projects located over or upstream of the Aquifer recharge zones. Hill Country roadways should be maintained for safety and scenic beauty.

■ **Protect water quality.** In 1997, 37 scientists, engineers, planners and other experts endorsed “Protecting the Edwards Aquifer: A Scientific Consensus,” a report documenting overwhelming scientific agreement that the only reliable way to prevent pollution



© Barton Springs Edwards Aquifer Conservation District

of the Edwards Aquifer is to steer urban development to the east and downstream of the recharge zone. Any development that is allowed in the Edwards Aquifer watershed should be required to limit impervious cover (roads, parking lots, buildings and any other surface that prevents rainfall from percolating into the ground) to no more than 10 or 15 percent of the developable land. Other necessary measures include requiring development setbacks (or “buffers”) from streams and recharge features; prohibiting commercial activities that generate or require significant quantities of hazardous chemicals; and strictly limiting non-native, chemical-demanding landscaping.

■ **Conserve water.** Water in the Edwards region is limited. Public and private organizations and individuals need to make water conservation and reuse (rather than expanded water diversions) a top priority.

LEND A HAND

Only caring and active citizens can save the Edwards Aquifer and the Great Springs of Texas. Please demonstrate your support for saving the heart of Texas by making a tax-deductible donation to the Greater Edwards Aquifer Alliance or to one of the Alliance’s member groups.

There are many ways you, your family and your friends can help save the heart of Texas. Learning about the Aquifer Ecosystem is an important start. Familiarize yourself with the information contained in this brochure map. Visit the Great Springs, take along a mask and snorkel, and explore. Hike and camp (where allowed) in the state and local parks. You’ll see first-hand that there are too few of them, and that they’re too small.

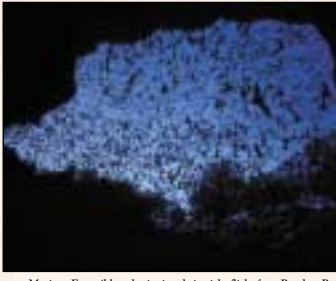
Texas Show Caves

Texas has some unusually beautiful and interesting show caves to offer. Several other caves are now open to guided “Wild Caving Tours.”

Cascade Caverns. Located between San Antonio and Boerne, Cascade Caverns’ tour follows the main 244-m-long passage, which steadily enlarges until ending in a large room highlighted by the historic cave’s namesake – an impressive waterfall. www.cascadecaverns.com.

Cave Without A Name. Located northeast of Boerne, Cave Without A Name has a short trail but is a wonderful cave. A staircase spirals down a pit and opens into a 7-m-high by 12-m-wide passage decorated with large speleothems. The trail ends after 186 m at a large stream passage. www.cavewithoutaname.com.

Caverns of Sonora. Near Sonora off IH-10, Caverns of Sonora is internationally recognized as one of the most beautiful caves in the world. Its basic layout is a complex 3-dimensional maze formed along a few parallel or near-parallel fractures. Most of the passages are lined with sparkling speleothems. www.cavernsofsonora.com.



Mexican Free-tailed bats beginning their night flight from Bracken Bat Cave

Inner Space Cavern. In Georgetown off IH-35, Inner Space Cavern is a large, complex cave with many beautiful formations and interesting displays of Pleistocene-age mammal bones. Visitors enter the cave on a cable car ride and the trail is smooth and sloping, about 550 m (1,800 ft.) long. www.innerspace.com.

Longhorn Cavern. Between Burnet and Marble Falls off Hwy 281, Longhorn Cavern has few formations but lovely wall sculpting and large calcite crystals. At different times the cave was a Comanche hideout, a black powder factory, a dance hall, a restaurant, and a church. www.longhorncaverns.com.

Natural Bridge Caverns. Near New Braunfels off IH-35, Natural Bridge Caverns is the largest Texas show cave and one of the most impressive because of its size and beauty. The cave has massive formations, including totem poles, fried eggs, stalagmites, and a flowstone floor. www.naturalbridgecaverns.com.

Wonder Cave. In San Marcos off IH-35, Wonder Cave is unusual in that it is formed along a fault in the Balcones Fault Zone. The cave is historic in that it is the smallest and oldest continuously operating of the seven show caves in Texas and is now part of the Wonder World theme park. www.wonderworldpark.com.

Bracken Bat Cave. Just outside San Antonio, off IH-35 near Garden Ridge, Bracken Cave is home to the world’s largest bat colony. Each year, some 20 million Mexican Free-tailed bats gather there to give birth and rear their young. Their emergence from the cave each evening is one of the most spectacular sights in nature. You can see this breathtaking bat colony by becoming a member with Bat Conservation International. www.batcon.org/discover/bracken.html.

Frio Bat Cave. South of Concan, the Frio Bat Cave houses the 2nd largest Mexican Free-tailed bat population in Texas. There are 2,000 feet of cave, with an estimated 10 million bats. The interpretive tour guide will share his knowledge about bats and the history of the cave dating back to the Civil War. You can watch as hawks and falcons catch bats for their evening meal. www.hillcountryadventures.com/sunset_bat_flight.htm.



Urge elected representatives to support funding for a large-scale expansion of existing parks and preserves to protect the Aquifer and preserve the rural heritage of the Hill Country. Ask them to oppose “grandfathering” of projects that will cause pollution or degrade Hill Country habitats.

Vote in the marketplace. Support businesses that support protecting the Edwards Aquifer. Avoid those businesses that demand taxpayer subsidies to develop in the Aquifer watershed or claim “grandfather” status to avoid compliance with water and wildlife protection rules. If you are blessed with personal wealth, consider buying a Hill Country ranch, managing it for watershed and wildlife enhancement and preserving it through a conservation easement. By linking private “conservation ranching” with expanded public parks and preserves, we can protect the water, wildlife and scenic beauty of the Hill Country.

Wherever you live you can help conserve water and prevent pollution by “living lightly on your watershed.” Key elements of living lightly include:

■ Don’t use pesticides, herbicides and chemical fertilizers

wherever possible. Learn about safer alternatives for improving soil and reducing pests.

■ Landscape your lawn with native plants that use less water and need no chemical additives to thrive.

■ Don’t bag your leaves and lawn clippings and ship them to a landfill. Leave them on the lawn or compost them.

■ Use non-toxic household cleaners and store all household chemicals out of the elements in watertight containers. Dispose of household chemicals and other hazardous materials properly.

■ Keep vehicles in good repair and under covered parking, if possible, so fluid leaks don’t wash into area water supplies.

■ Neuter your pets to help reduce pet overpopulation and dispose of your pet’s waste properly, using a “pooper scooper” or “mutt mitt.”

■ If you have a septic system, have it inspected and maintained on a regular schedule.

■ Conserve your own water use, especially in lawn and landscape irrigation.

Greater Edwards Aquifer Alliance

The Greater Edwards Aquifer Alliance is a growing coalition of local and regional organizations working cooperatively to implement the Edwards Aquifer Protection Plan. Please contact us at, or send donations to, 530 Donaldson, San Antonio, TX 78201, www.greateredwards.org or contact and support our member groups directly.

AGUA (Aquifer Guardians in Urban Areas)
www.aquiferguardians.org
530 Donaldson, San Antonio, TX 78201
(210) 732-7262

Alamo Group of the Sierra Club
www.texas.sierraclub.org/alamo
P.O. Box 6443, San Antonio, TX 78209
(210) 222-8195

Austin Regional Group of the Sierra Club
www.texas.sierraclub.org/austin
P.O. Box 4581, Austin, TX 78765
(512) 891-5392

HaysCAN (Hays Community Action Network)
www.hayscan.org
14034 Robins Run, Austin, TX 78737
(512) 288-4817

San Marcos River Foundation
www.sanmarcosriver.org
P.O. Box 1393, San Marcos, TX 78667
(512) 393-3787

Save Our Springs Alliance
www.sosalliance.org
P.O. Box 684881, Austin, TX 78768
(512) 477-2320

San Antonio Smart Growth Foundation
www.smartgrowthsa.org
P.O. Box 460545, San Antonio, TX 78246
(210) 534-8801

Wimberley Valley Watershed Association
www.visitwimberley.com/water
P.O. Box 2534, Wimberley, TX 78676
(512) 847-1582